FOREIGN INDUSTRIAL TARGETING AND ITS EFFECTS ON U.S. INDUSTRIES PHASE I: JAPAN

Report to the Subcommittee on Trade,
Committee on Ways and Means,
U.S. House of Representatives on
Investigation No. 332-162
Under Section 332(b)
of the Tariff Act of 1930

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Preface

On April 19, 1983, the U.S. International Trade Commission instituted investigation 332-162 to obtain information on foreign industrial targeting. The investigation was instituted by the Commission on its own motion at the request of the Subcommittee on Trade of the House Committee on Ways and Means, under section 332(b) of the Tariff Act of 1930 (19 U.S.C. 332(b)) to advise the Subcommittee on the implications of these practices for U.S. industries.

A summary of the information developed in this investigation begins on page 4 of this report. The Commission received the request on March 25, 1983. Public notice of the investigation and hearing was given by posting a copy of the notice in the Office of the Secretary, U.S. International Trade Commission, Washington, D.C., and by publishing the notice in the Federal Register of May 11, 1983 (Volume 48, No. 92, p. 21210). 1/ A public hearing in connection with this investigation was held on June 15, 1983, in the Commission's hearing room in Washington, D.C.

The information contained in this report was obtained from fieldwork, from the Commission's files, from other Government agencies, from information received at the hearing, from briefs filed by interested parties, and from other sources. This report is the Commission's response to that part of the Subcommittee's request regarding Japan's industrial policy. The Commission may further consider and review the subject of this report in subsequent phases of this investigation as appropriate.

1/ A copy of the Commission's notice of investigation and hearing is presented in app. A.

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Introduction

The purpose of this study is to examine the industrial policies of other countries and to determine which ones affect trade patterns by targeting selected industries. The study is being conducted in three phases. The first phase of the study concentrates on Japanese industrial targeting practices. It also introduces all three phases, by defining targeting, analyzing targeting techniques and their effects, and examining the relationship of targeting to present U.S. legislation. The second phase of the study will examine the targeting practices of European Community countries, and the final phase will examine the targeting practices of other selected countries. Reports on the last two phases are expected to be completed in the spring and fall of 1984.

The study defines industrial targeting as coordinated government actions that direct productive resources to give domestic producers in selected industries a competitive advantage. There are four elements to this definition: (1) targeting is done by governments; (2) productive resources are directed; (3) industrial policies are targeted only when applied to specific industries and not uniformly to all industries; and, (4) these government actions provide domestic producers a competitive advantage. Targeting techniques include the selective use of home-market protection, tax policies, antitrust exemptions, science and technology assistance, and financial assistance. These subjects are discussed further in the sections entitled "Definition of Industrial Targeting" and "Targeting Techniques."

The overall effectiveness of targeting is very difficult to quantify and assess. Evidence to support the claim that industrial targeting benefits the targeting country has been inconclusive. Such evidence generally consists of a selection of successful industries in successful countries, assertions that their success is due to targeting, and conclusions that the country's success is due to the targeting of these industries. A useful test of the overall success of targeting as an industrial policy might be to compare countries that practice targeting extensively with countries that target little, to see if there is any discernible difference in their overall growth rates after controlling for other factors that could explain such differences. However, this would be a difficult task, and it is impossible to completely discount all other factors. Where rigorous attempts have been made to make these kinds of comparisons, they have failed to demonstrate any overall benefit from targeting. That is, although it is known that targeting can change the mix of industries within a country, no one has clearly demonstrated that targeting adds to the general economic welfare of a country.

The major problem in assessing the effectiveness of targeting is that what would have happened in the absence of targeting cannot be determined. This determination is difficult because the effects of targeting are not limited to the selected industries: a measure that increases the exports of one domestic industry tends to decrease the exports of other domestic industries because it increases the supply of foreign currencies and thus affects the exchange rate. Any resulting change in the exchange rate would make other exporting industries and import competing industries less competitive. If the targeting takes the form of import protection, prices of imports are raised to domestic consumers and to domestic producers who use those imported inputs in their production process. Channeling funds to research and development or to export subsidies keeps those funds from being used for other purposes. In every case, a benefit provided to the targeted industry imposes costs on other sectors of the economy. The section, "Effects of Targeting on the Economy of the Targeted Country," describes the debate over industrial targeting and presents some evidence on its effects.

The effect of targeting on the targeted industry is easier to assess than the effect of targeting on the targeting country. Targeting will tend to increase the growth of output in a growing industry and will tend to slow or even reverse the decline in output of a declining industry. However, when many countries have targeted the same industry, such as steel, the result has been world overcapacity in that industry. This can occur in any industry, including new high-technology industries such as computers, robots, biotechnology, and semiconductors. There is a growing list of countries that are now targeting the new high-technology industries, and there are already signs that, in some industries, targeting has resulted in the growth of productive capacity in excess of the growth in total demand. The result has been that increased production in targeting countries has displaced U.S. sales in those countries, in third markets, and even in the United States. In the future, as the new high-tech industries become mature industries, one would expect targeting to result in world overcapacity, just as there is today in steel. The effects of targeting are discussed more thoroughly in later sections titled "Effects of Targeting on Targeted Firms" and "Effects of Targeting on U.S. Industries."

Possible legal responses by U.S. industry to targeting by other countries are presently limited. Suggested responses have included the antitrust laws and certain trade statutes, including section 301. Actions against foreign cartels are limited because of the involvement of foreign governments: there have never been any significant antitrust cases in which private plaintiffs have prevailed against foreign cartels involving foreign government participation.

Current import relief statutes are also limited in scope for responding to targeting practices. The two fair trade statutes discussed in this report are section 232 of the Trade Expansion Act of 1962 and section 201 of the Trade Act of 1974. The national security authority in section 232 is not vulnerable to challenge in the GATT, but targeted products are not necessarily related to national security. Under section 201, which sets forth U.S. procedures for invoking "escape clause" relief under article XIX of the GATT, relief can only be granted when increasing imports are a substantial cause of serious injury. Serious injury has been interpreted in the normative sense of high unemployment, lost sales, operating losses, and other relevant factors. Thus, section 201 investigations have only been associated with serious injury to depressed industries. Past Commission interpretations of this statute have not indicated whether section 201 recognizes economic losses to growing industries because they cannot achieve their full export growth potential or maintain profit levels high enough to permit reinvesting.

The unfair trade statutes discussed in this study include the countervailing duty and antidumping laws, section 337 of the Tariff Act, and section 301 of the Trade Act. Some targeting practices have already been found to violate U.S. countervailing duty laws. However, subsidies that do not result in exports to the United States during the same period cannot be countervailed. Aid given to high-technology industries, for example, might not affect exports to the United States until well after the aid has stopped. Targeting does not necessarily result in price discrimination or sales below cost, and therefore, antidumping laws are generally inapplicable. Using section 337 against industrial targeting might require that an investigation be brought against a foreign government, thereby raising questions of sovereignty. Also, a 337 case against targeting could be challenged because it violates the national treatment provision in the GATT, since there is no domestic analog to targeting in U.S. law.

Testimony at the Commission's hearing emphasized the role of the protected home market as an essential component of targeting practices. Because section 301 was designed to enforce U.S. access to foreign markets, it seems to offer an alternative for dealing with this aspect of industrial targeting. Section 301 allows for retaliation against the foreign government, but retaliation results in relief to the domestic industry only if the foreign government stops protecting its home market. A draft bill to amend section 301 prepared by the Coalition for International Trade Equity addresses criticisms of the current law. An analysis of this draft bill is provided in the section titled "The Relationship of Targeting to U.S. Legislation."

A thorough discussion of Japan's industrial targeting practices is provided in this report. Also, Japan's targeting practices in selected industries are reviewed. Highlights of the investigation of Japan's targeting practices are provided in the summary, which immediately follows. Appendices deal with subjects of more specialized interest, such as the comparison of U.S. and Japanese antitrust laws in appendix E. Other appendices provide a methodology for calculating the subsidy component of certain targeting practices and actual calculations of certain subsidies.

Summary

o <u>Japan's industrial targeting has benefited certain industries and has not been a significant factor in the performance of other industries</u>.

Some of the industries that the Japanese Government has targeted have become strong international competitors, particularly the steel, electronics, machinery, and automobile industries. These four industries have come to dominate Japan's export sales, accounting for over 80 percent of its total exports in 1981. However, market forces have significantly benefited these industries. Targeting seems to have had only a small role in some of these successes. For instance, expanding and open world markets, rapidly rising domestic income, and relatively cheap and abundant raw materials were the norm until the early 1970's. The oil crises of the 1970's were major factors in boosting Japan's exports of automobiles and electrical goods. Some targeted industries have remained weak competitors. The role of targeting in the Japanese economy has declined as the Japanese Government has reduced its interference with the market.

o <u>Japan's industrial policy has gone through two distinct phases. From the end of World War II until 1965, Japan pursued a very aggressive targeting policy. Since the mid-1960's, Japan has relied less on direct intervention in the market</u>.

In the immediate postwar period, Japan, like the European countries, was given special consideration in its ability to fulfill certain of its international obligations. Until 1964, Japan controlled the import of goods, services, capital, and technology, and directed these resources to industries that held the most promise for growth. During the same period, Japan provided a variety of benefits to targeted industries, such as export promotion, tax incentives, direct subsidies, favored access to loans and foreign exchange, and a protected home market. Since the mid-1960's, Japan has liberalized its trade and investment controls, but certain nontariff barriers to trade remain. In recent years, Government-sponsored research projects have become an important targeting method.

o <u>Japan's targeting policies have favored different industries at different times.</u>

The electric power, coal-mining, shipping, iron and steel, machinery, electronics, petrochemical, automobile, aviation, and machine tool industries, among others, have benefited from targeting at one point or another during the postwar period. In recent years targeting has shifted more to high-technology industries, such as computers, numerically controlled machine tools, and robotics.

- The Ministry of International Trade and Industry evaluates a number of factors when deciding which industries to target. Both emerging and declining industries have been targeted.

Government policy favors industries that produce a high percentage of the final value of output, produce materials or components that are used in other major industries, or can realize economies of scale by increasing the size of their plants. In the past, Japan's Ministry of International Trade and Industry (MITI) has favored industries that produced goods for which demand grew faster than national income, such as automobiles and steel. Since 1970, industrial policy has placed growing emphasis on high-technology development.

- Details of the methods used to foster growth are contained in sector specific plans or "visions."

The "visions" project trends, such as production, demand, and prices in the global and domestic markets and the resources, such as funding and equipment, needed to achieve growth targets. Visions were drawn up for at least 10 industries in the past decade, including aluminum ingot, polyethylene, vinyl chloride resin, iron and steel, synthetic fiber, cotton yarn, pulp and paper, watches, clocks, color television sets, and information industries (such as computers). The actual implementation of the plans is left to the private sector. Elements of the plans, such as projections of the financing needs of an industry, do not commmit Government or private funds to achieve the visions goals. However, MITI does have some influence over funding provided by Government financial institutions.

- Japan has utilized a variety of tools to target particular industries, including home-market protection, financial assistance, tax incentives, cooperative R&D programs, and antitrust exemptions.

The importance of particular targeting tools should not be viewed in isolation. It is important to consider the magnitude of the benefits bestowed upon a particular industry by targeting, along with the timing and sequence of such benefits. The combination of certain targeting tools has had a direct, positive effect on certain industries. Other industries have not benefited significantly from it.

HOME-MARKET PROTECTION

- Home-market protection was once an important targeting tool. However, by the mid-1960's most of Japan's formal trade restrictions were being removed, and by the early 1970's, formal trade barriers were comparable with those in other industrialized countries.

Like most other countries, Japan currently employs tariffs and quotas on imports that protect the weakest, least competitive sectors of its economy, particularly the agricultural sector. Japan's average tariff level is now lower than that of either the United States or the European Community, as is the number of industrial items subject to quota restrictions. Tariffs on items such as autos, machine tools, semiconductors, computers, robots, and aircraft are comparable with those of the United States. Currently, the only Government involvement in technology licensing (beyond patents that it holds) is for national security reasons. Formal barriers to foreign direct investment

investment in Japan were substantially liberalized in 1973 for virtually all industries but computers, which was liberalized in 1975. Nevertheless, until recently foreign direct investment in Japan was generally limited to joint ventures.

- <u>Japan currently imports and exports more as a percent of national income than the United States. Unlike the United States, its exports of manufactured goods are greater than its imports</u>.

Japan's imports and exports as a share of national income are higher than those of the United States. The ratio of the value of Japan's imports to gross national product (GNP) was about 12.5 percent in 1980, compared with 8.4 percent for the United States. Exports represented 13.6 percent of Japan's GNP in 1980, compared with 9.8 percent for the United States. Japan's imports of manufactured goods remain low relative to GNP, however. In 1980, manufactured goods accounted for 21 percent of Japan's total imports, compared with 53 percent in the United States. The composition of Japan's trade reflects its skilled labor force, distance from major trading partners, and a lack of natural resources.

- <u>Japan's Government procurement remains substantially closed to foreigners</u>.

Since the Multilateral Trade Negotiations (MTN) Government Procurement Code went into effect in 1981, informal barriers have served to limit imports, such as long-time ties between Ministries and their domestic suppliers and product specifications that in some cases essentially exclude foreigners from the Government market.

- <u>The procurement practices of NTT have been a particular source of friction between the United States and Japan</u>.

The Government's telecommunications monopoly, Nippon Telephone & Telegraph (NTT), is the largest Japanese Government entity covered by the Government Procurement Code. Purchases of foreign equipment have totaled only 0.5 to 1.5 percent of NTT's $2 billion in annual orders over the past few years. However, NTT recently has made it easier for foreign companies to compete for contract awards. It is too early to tell whether these changes will result in increased sales by U.S. firms.

FINANCIAL MARKETS

- <u>Japan's financial regulations have had a major influence on capital stock growth</u>.

Government policy explicitly fostered high levels of investment, particularly by Japan's largest companies, by keeping interest rates low, directing money to the commercial banking system, limiting consumer credit, and restricting investment in foreign countries.

o The structure of Japan's capital markets gives the Government the ability to direct large sums of capital to specific sectors. However, the Government appears to have used this potential sparingly since the mid-1960's.

Japanese capital markets are heavily regulated and very segmented. Controls on interest rates were in effect for much of the postwar period, and limits on the types and returns on various financial instruments stunted the growth of equity markets until the early 1970's. Consequently Japanese firms rely on debt to finance most new investments. Government influence over lending to particular firms could be used to target industries, but generally has not been.

o Ongoing financial deregulation is eroding the Government's ability to direct funding to targeted sectors.

Substantial financial deregulation has taken place during the past decade, which has made the Japanese capital market a more market-determined one and opened it to greater foreign participation. In 1980, Japan's financial system underwent substantial changes. These changes have lessened Government control over financial transactions and thus limited its ability to direct funding to targeted industries.

o Japanese companies rely on debt to finance most new investment. Small- and medium-sized firms are much more dependent on debt than large enterprises.

In 1982, over 90 percent of new equipment investments were funded by loans rather than equity or bonds. Companies raised money through bank loans rather than through equity financing because the cost of raising capital through loans was relatively cheap, international transactions were virtually prohibited, and domestic equity markets were underdeveloped. Interest charges on debt, unlike dividends, are tax deductible. In 1981, fully 97 percent of external financing by small- and medium-sized businesses was derived from borrowing, compared with 68 percent for large firms during the same year.

o Government financial institutions accounted for less than 15 percent of loans to private industry in 1982.

Some 13 to 14 percent of corporate financing comes from Government financial institutions, which obtain their funds from deposits in the postal savings system. Most of the money directed through Government banks goes to fund local Governments, small business, and for construction of houses and infrastructure.

o Less than 30 percent of the loans extended by Government financial institutions were by those charged with implementing industrial policy in 1982.

Approximately 26 percent of the money under the control of the Government banks is directed to the Government's industrial policymaking banks, including the Export Import Bank of Japan, the Japan Development Bank, and the Small Business Finance Corporation.

o <u>Small businesses appear to have benefited most from the Japanese Government's lending to private industry</u>.

Small- and medium-sized firms are likely to derive relatively more benefit from Government loans than large firms because they rely more on debt and because they normally would not qualify for the low interest rates charged on such loans. In 1982, over 40 percent of Government loans to achieve policy purposes were extended to small- and medium-sized businesses.

o <u>The importance of Government lending has varied in different industries, but today's leading export industries do not appear to have benefited substantially from such loans</u>.

Such loans have been critical to the shipbuilding, electric power, coal, petroleum refining, and iron and steel industries, particularly in the 1950's and 1960's. They have accounted for less than 2 percent of all loans to the textile, machinery, electronics, automobile, computer, and machine tool industries in the 1970's and 1980's.

o <u>Lending by the Government's Japan Development Bank (JDB) accounts for up to 3 percent of total capital formation in some industries</u>.

JDB funding in the petroleum, nonferrous metals, shipping, transportation, aircraft, railway, power utility, and depressed industries, such as aluminum and petrochemicals, accounts for roughly 3 percent of private capital formation; in the energy, resource development, and technology promotion fields it accounts for 1 percent of total private capital formation.

o <u>Japanese Development Bank loans to high-technology sectors have resulted in relatively small subsidies</u>.

In 1981, interest savings on JDB loans were 0.3 percent of the value of production for the computer industry, and 0.02 percent for the robotics industry. Interest savings on JDB and Small Business Finance Corporation loans combined were 0.02 percent of the value of production for the machine tool industry.

TAX POLICIES

o <u>Tax policy was once a major targeting tool in Japan, but its importance has diminished</u>.

Targeted industries in Japan were given higher tax writeoffs than nontargeted industries. Large tax writeoffs were provided to the steel, automobile, electronics, and machinery industries until the early 1970's. For instance, in the 1950's, half of the cost of a new automobile factory could be written off in the first year of operation. Since the 1970's, the differences in tax rates between industrial sectors have declined, indicating that targeting of specific industries through tax policy has diminished. Estimated tax losses to the Government from special tax measures declined steadily as a share of total corporate income taxes from 1967 to 1978, and have fluctuated at around 2 to 3 percent since that time.

o <u>The Japanese tax code still favors specific industries and encourages private research and development</u>.

Among the products designated for special tax treatment in recent years were computers, robots, numerically controlled machine tools, forging machinery, foundry equipment, and computer-aided design and manufacturing equipment, as well as ships and commercial aircraft. The Japanese tax code does not require that Japanese products be purchased to use these accelerated depreciation provisions. However, machinery and equipment accounted for only one-fifth of the value of Japan's imports from the United States in 1982, and aircraft sales accounted for most of the value of these shipments. A 20-percent tax credit is given to a company for new research and development expenditures over and above the company's highest level of research and development expenditure since 1972. This tax credit is limited to 10 percent of the company's income tax liability.

o <u>Tax and other policies give substantial incentives to Japanese purchasers to buy products of targeted industries</u>.

The Japanese Government has encouraged the sale of products of targeted industries by giving tax incentives to their purchasers. For example, purchasers of robots and oceangoing vessels are both allowed to take accelerated depreciation. In 1981, tax savings due to accelerated depreciation were equal to approximately 6.2 percent of the value of a robot and 7.2 percent of the value of an oceangoing vessel. Since 1981 the accelerated depreciation allowed on robots has decreased from 13 to 10 percent. Purchasers of these products also often receive Government loans at favorable terms, even for non-Japanese products.

SCIENCE AND TECHNOLOGY POLICIES

o <u>Grants and subsidies for research and development have been important in many industries.</u>

Grants and subsidies for research and development (R&D) have been particularly important to the shipbuilding, aircraft, railcar, machine tool, computer, and semiconductor industries. The Government accounted for between 6 and 28 percent of total R&D expenditures in those industries in the late 1970's. Today, Japan's policy is to encourage R&D in high-risk fields that have large, potentially economy-wide payoffs, such as new materials and fifth-generation computers.

o <u>The Japanese government spends less as a share of income to fund R&D than the United States</u>.

Despite Japan's desire to encourage the development of technology, it has spent less as a share of the GNP for R&D than most OECD countries, including the United States. Also in contrast with those countries, the vast majority of R&D is conducted and funded by private firms in Japan. The share of this R&D accounted for by Government expenditure (excluding military) was 1.4 trillion yen in Japan, or 27 percent of income; in the United States, the Government spent the equivalent of 3.6 trillion yen, or 33 percent. Less than

1 percent of Japan's research and development expenditures are for defense purposes compared with 20 percent in the United States. (The ratio of defense spending to GNP in Japan was less than 1 percent compared with 6 percent in the United States in 1982.)

- Cooperative research and development projects are important and are generally allowed under Japanese law.

The Japanese Fair Trade Commission appears to believe that as long as the major producers of a given product can all participate if they choose, joint research and development projects will not serve to restrain trade or limit competition. In the 1970's, Fujitsu and Hitachi jointly developed a mainframe computer, as did NEC and Toshiba, and Oki and Mitsubishi. These computers were developed under the aegis of a Government-sponsored research and development project and are marketed today in both Japan and the United States.

- Although cooperative research and development projects do not include all the firms in the industry, a firm that is not included still can succeed in the industry and can participate in future projects.

The first phase of the fourth generation computer development project involved four firms; the second phase involves eight firms. One of the firms not participating in the (Very Large Scale Integration) aspect of this project--which succeeded in developing the 64K RAM semiconductor chip--has become a major supplier of this device and is now participating in the second phase.

- While cooperative research and development projects may propel Japanese companies to greater levels of competence in high-technology industries, there is little evidence that such projects have ended competition between the firms in an industry.

For example, in the machine tool industry, data on market shares of the leading Japanese machine tool manufacturers indicate that the industry is very competitive. The leading Japanese producer of machining centers in 1981 was not among the top 10 producers of machining centers in Japan in 1975. Indeed, the top 10 Japanese machine tool producers in 1975, which together accounted for 81 percent of production in that year, were producing only 46 percent of all machining centers 6 years later.

- NTT research is also important, particularly in the telecommunications and computer industries.

A significant portion of NTT's research activities are carried out jointly with members of the NTT "family," particularly members of the NEC, Fujitsu, Hitachi, and Oki groups. This has strategic implications for the industry, since joint development activities are a major conduit for the transfer of NTT's technology to the private sector. NTT was pivotal in the development of fiber optic cable in Japan, as well as in development of large-scale integrated circuits, including the 256K RAM chip.

- A recently begun effort to create Silicon Valley-type communities in rural regions may be of substantial benefit to foreign high-technology firms.

As part of the program, the local governments in Japan are encouraging foreign high-technology firms to locate there. Three U.S. high-technology firms recently opened factories in these regions. By opening up investment opportunities in the Japanese market, the program may give U.S. firms a better chance at succeeding in the Japanese market and at the same time substantially lessen home-market protection in Japan. Because the companies would have both manufacturing and research facilities in Japan, they should also be eligible to participate in Government-sponsored joint research and development projects. To date, no foreign firms have participated in Government-sponsored research projects.

ANTITRUST POLICY

- Japanese antitrust law differs from U.S. law in several respects.

Japanese law takes a permissive attitude towards joint research and development. Private antitrust suits are rare in Japan, whereas they are relatively common in the United States. Furthermore, the Japanese Government is much more likely than the U.S. Government to give industries exemptions to the antitrust laws. These exemptions allow industries to carry out joint actions that ordinarily are illegal under Japanese law.

- Based on recent trends in the administration of the antitrust laws, Japan seems to be moving to a stricter antitrust policy.

The number of formal exemptions to the Japanese antitrust laws has been steadily declining. Furthermore, Japanese Government ministries used to take actions that had the effect of granting informal exemptions to these laws. Government ministries have become less likely to take actions that contravene the antitrust laws.

- Most legal cartels in Japan are permitted as part of a policy to encourage small- and medium-sized business.

Of the 505 legal cartels that existed in Japan in 1982, 290 were small- and medium-sized business cartels. Another 122 of these legal cartels were environmental hygiene cartels, which also are limited to small- and medium-sized businesses.

- The Japanese Government frequently allows industries to form export cartels.

The export cartels' share of total Japanese exports has been much higher in Japan than in other countries. At the beginning of 1983, there were 52 Japanese export cartels. Thirty-one of these cartels were established to restrict export sales to avoid trade friction with an importing country; 6 handle trade with communist countries; and 15 set minimum-quality standards for exports.

TARGETING PRACTICES IN SPECIFIC INDUSTRIES

o Aircraft and aerospace

The Japanese civil aircraft industry has been targeted for much of the postwar period. Despite the industry's special status and direct Government support--through research and development grants and preferential loans--the industry has had few commercial successes. Unlike some other targeted industries, import protection has never been used in this sector. Indeed, special tax measures and preferential loans have generally served to defray the costs of purchasing aircraft from foreign companies. A consortium of Japanese aircraft producers began a project in 1981 to develop commuter aircraft, with the help of 25 billion yen in loans from MITI. The Science and Technology Agency also recently completed a long-term "vision" for the aerospace industry.

Although Japanese aircraft and aerospace producers compete effectively in only a few product lines, such as business aircraft and parts for aircraft and spacecraft, their products have earned a reputation for high quality and reliability. The Japanese industry, which uses technology and manufacturing skills developed through licensed production, co-production, and now independent manufacturing, is presently considered on a par with comparable U.S. and European counterparts in the commuter airplane product line. However, the United States remains the leading aircraft and aerospace producer, dominating both the U.S. domestic market and international markets.

o Aluminum

Despite Japanese Government efforts, the Japanese aluminum industry is still structurally depressed. The Japanese aluminum industry is at a serious disadvantage because of Japan's high electricity costs. The Government has tried to help this industry through a variety of measures including import restraints and antitrust exemptions. Nonetheless, this industry's capacity is falling and Japanese aluminum imports are rising.

Although Japan has never been a major producer of aluminum, its share of the international aluminum market increased during the period 1954-82, though not at the expense of U.S. firms. The United States and Japan generally do not compete in the same markets; Japan supplies Australia and Asia, whereas the United States supplies principally North America, South America and Europe. Generally speaking, U.S. and Japanese aluminum producers compete on equal terms with regard to servicing, product quality, and marketing, although the U.S. producers enjoy access to lower cost energy supplies and established relationships with their customers.

o Automobiles

The Japanese Government took a number of steps to target the automobile industry, including protecting the home market and encouraging consolidation. Some of these targeting policies undoubtedly directly benefited Japan's auto makers. For instance, imports of automobiles were under strict quota limits until the mid-1960's, prohibitive tariffs were in effect until the mid-1970's, and restrictions on foreign direct investment were in effect until the early 1970's. Since that time, procedures for inspecting automobiles by Japan's customs officials have been a factor in keeping foreign auto shipments to Japan at extremely low levels. Nevertheless, firms in the Japanese automobile industry seem to have followed a course dictated by their own interests--a course often different from that suggested by MITI. Indeed, the experience of the automobile industry provides the most convincing example of the countervailing power of firms in Japan's economy, even in the early postwar period.

During the last two decades, Japan has become a major producer and exporter of motor vehicles. Production of both automobiles and trucks increased every year during the period 1958-81, except for a slight decrease in 1973-74. Prior to 1980, the United States was the world's dominant producer of motor vehicles. However, Japan has surpassed U.S. production levels since that year. Since U.S. manufacturers have established production facilities in most major motor-vehicle markets, and production for these plants is not considered U.S. production, international production levels for U.S. manufacturers is higher. Thus it is difficult to compare U.S. and Japanese production levels on a worldwide operations basis.

o Computers

Targeting has been instrumental in the development of the computer industry in Japan. The Japanese Government has used grants and subsidized loans for research and development, special tax measures, import protection, government involvement in technology licensing, technical support, and a government-funded computer leasing company to help the industry. Government-sponsored research was a major factor in setting up the Japanese computer industry in 1958 and has remained important since that time. A number of important products have resulted from Government-sponsored research projects, including several successfully marketed mainframe computers. Research by NTT has also been important. Currently, a number of joint R&D projects involving products such as fourth and fifth Generation computers are being sponsored by the Japanese Government.

o Drugs and related products

The Japanese Government apparently has not made a concerted effort to support the pharmaceutical industry, and that industry remains a small factor in the U.S. market. From 1977 to 1982, U.S. imports of drugs and related products from Japan never exceeded 0.6 percent of U.S. consumption. In the 1970's, the Government financed only about 0.3 percent of this industry's research and development and gave it little other aid. Government-sponsored research projects have concentrated on the biotechnology sector.

Reportedly, the Japanese Government has been encouraging Japanese pharmaceutical producers to become more aggressive in marketing their products in foreign markets by lowering the price of Japanese drugs. At the same time, foreign companies have been encouraged to market their drugs in Japan in order to increase competition. In addition, Japanese firms have formed joint ventures and licensing agreements with numerous established multinational drug firms to gain inexpensive access to world markets and international marketing experience.

o <u>Iron and steel mill products</u>

Japan's steel industry has become the world's largest. Japan encouraged the steel industry through a variety of methods, including financial assistance and antitrust exemptions. However, Government financial assistance seems to have resulted in very small benefits to the industry. Furthermore, whereas MITI formed an administrative guidance cartel to coordinate investment by Japan's major steel producers, MITI's efforts in this cartel apparently were aimed at restricting the growth of capacity.

During the 1960's Japan established itself internationally as a reliable supplier of quality steel products at competitive prices. Growth in the industry was rapid during the period 1961-77; however in 1978, it came to a standstill. Japan's annual share of world steel exports increased from about 1 percent in the 1950's to about 22 percent during the period 1977-81. In contrast, the annual share of U.S. steel exports fell from an average of about 15 percent in the early 1950's, to less than 2 percent during the period 1977-81.

o <u>Machine tools</u>

The Japanese machine tool industry has benefited from a series of targeting efforts since the mid-1950's. During the 1950's and 1960's, the Government used several practices to promote the machine tool industry, including home-market protection, cartels, special tax measures, and export assistance. Import restrictions were in effect during the early part of the postwar period, and exporters received tax and other benefits. Starting in the 1950's, only machinery that could not be produced domestically could be imported. Since the 1970's, the Government has relied less on those measures and more on research and development assistance for firms producing numerically controlled (NC) machine tools, robots, and flexible manufacturing systems.

The Japanese share of total world exports of machine tools increased during the period 1963-82, particularly from 1977 to 1982. According to the U.S. International Trade Commission's report <u>Competitive Assessment of the U.S. Metalworking Machine Tool Industry</u>, (USITC Publication 1428, September 1983; investigation 332-149) Japan's share of total world exports increased from 9.5 percent in 1977 to 13.4 percent in 1982. Most of the increased share can be attributed to Japanese sales of standard-type, low-priced machine tools. Japanese producers also benefit from their ability to steadily generate capital in such a cyclical industry, which allows them to maintain a highly skilled workforce and to make medium- and long-term investments in plant and equipment.

o Robotics

The Japanese Government has used loans, tax incentives, and a Government-funded leasing company to encourage the robotics industry. The robotics industry will also benefit from several of the R&D efforts now underway. For instance, advances in software technology and semiconductors should have important implications for the robotics industry. A project aimed at integrating computer controlled machinery, such as robots, with other mechanical components and lasers, will expand their potential uses in industrial processes. The Japanese robotics industry is now the world's largest.

o Synthetic fibers

Japanese Government efforts to aid the synthetic fiber industry have been directed at helping it cope with a lack of international competitiveness and have not helped it gain a large share of the U.S. market. From 1977 to 1982, U.S. imports of synthetic fibers from Japan were never more than 0.8 percent of consumption. The Japanese synthetic fiber industry faces higher raw material costs than its major international competitors. Therefore, the Japanese Government has designated synthetic fibers as a structurally depressed industry, qualifying it for financial assistance and an antitrust exemption.

Japan's production of noncellulosic fibers totaled only 0.1 billion pounds in 1958 and increased annually until 1982, when it reached approximately 3 billion pounds. Prior to the mid-1970's, the Japanese producers had an advantage of lower labor costs relative to their U.S. counterparts; however, when raw material costs (particularly petrochemical costs) rose in the 1970's, U.S. producers, who had an adequate supply of petroleum, were able to offset the Japanese labor advantage. On balance, Japan and the United States appear to be equal competitors.

o Semiconductors

The Japanese Government has targeted the semiconductor industry since the early 1970's. It did so primarily because of its desire to build up Japan's computer industry, although advances in semiconductors will have important effects on the consumer electronic, robot, and machine tools industries. High tariffs, restrictive quotas, and investment restrictions protected the Japanese semiconductor market from imports, while Government-funded research projects resulted in significant breakthroughs in semiconductor technology, for instance, the 64K RAM semiconductor chip. NTT has also been pivotal in the industry's development.

The Japanese semiconductor industry is characterized by a strong technological base which is focused in the production of semiconductors for computer applications and consumer electronics (particularly in RAM chips). The Japanese industry accounted for 25 to 30 percent of the value of world semiconductor shipments in 1981. In contrast, the U.S. industry is characterized by strong technological leadership in all semiconductor product lines and accounted for more than 60 percent of the value of world semiconductor shipments in 1981.

o <u>Telecommunications apparatus</u>

Targeting has helped the Japanese telecommunications apparatus industry in its domestic market, but its share of the U.S. market is declining. In 1977, U.S. imports of telecommunications apparatus from Japan were 8.0 percent of U.S. consumption, by 1982 this share had fallen to 5.4 percent. The Japanese Government has assisted its telecommunications industry primarily through closed government procurement by NTT, the country's telecommunications monopoly and research and development assistance. Japan is the largest exporter of telecommunications equipment in the world. In 1981, it exported $9.8 billion worth of equipment, more than twice as much as did the United States. The United States was the most important market for those products.

Though Japanese producers of telecommunications apparatus compete effectively in certain product areas, such as consumer type radios and TVs, the United States remains the dominant producer of almost all product types described in this industry.

Definition of Industrial Targeting

Industrial targeting, as used in this study means coordinated government actions taken to direct productive resources to help domestic producers in selected industries become more competitive. These government actions can be incentives or restrictions, such as subsidies, tax incentives, import barriers, or other market distorting actions. There are four elements to this definition: (1) government action; (2) productive resources are directed; (3) only selected industries are targeted; and (4) the purpose is to increase the competitiveness of domestic producers in these industries. The study is mainly concerned with the foreign targeting of industries which compete with U.S. firms. This definition is quite broad and includes defensive targeting where the goal is to gain sales in the domestic market, as well as export targeting, where the goal is to gain sales in foreign markets. Nevertheless, the definition restricts the types of actions that are labeled as industrial targeting.

The first element in the definition restricts targeting to Government actions. Strategies of individual firms, such as investment and marketing strategies, are not included. For example, a conglomerate may finance research on production in a particular industry out of its revenues in another industry. However, unless this strategy is at least encouraged by some form of government action, it is not industrial targeting, although the results might be the same. The important difference between the two is that targeted firms benefit from government actions, whereas other firms only reap the rewards or suffer the consequences of their own actions.

The second element of the definition requires that productive resources be directed. Examples of government actions that direct resources are preferential tax treatment; government subsidies (either outright or in implicit forms such as loan guarantees or favorable terms on loans to finance investment, research and development, or export sales); special legal treatment (such as exemption from antitrust laws); government procurement preferences; and restrictions on imports. In some cases, a government statement of policy can cause resources to be directed to domestic producers in selected industries. For example, if a government announces its intention to underwrite losses of its local producers in a selected industry, competing producers in other countries may be discouraged from investing in the industry, but local producers in the industry are encouraged to invest more, even though no actual government payments may occur. The government announcement removes the risk to domestic firms, but in so doing, increases the risk to its foreign competitors.

The third element requires that only selected industries be directly affected. This element is important for distinguishing industrial targeting from more general industrial policies. However, there can be considerable latitude in the meaning of "selected industries." For example, one could consider exchange-rate manipulation by the government as targeting all industries that compete with internationally traded goods. Similarly, a broad program of export-financing subsidies could be considered targeting of all export industries. Here we use "selected industries" in a narrower sense than all traded goods industries or all export industries. For example, although most government export financing programs exist ostensibly to benefit all exporting industries, export loans tend to be concentrated in certain sectors. This element of the definition helps one to distinguish whether such a program qualifies as targeting or as a broader industrial policy, but it does not provide an absolute rule for making this distinction.

The fourth element requires that the purpose of targeting be to give domestic producers in the selected industries a competitive advantage. This element of our definition restricts our study to presumably "predatory" actions, where the goal of targeting is to increase domestic output in selected industries at the expense of their foreign competitors. Both defensive targeting and export targeting can be predatory, and predation might be consistent with a wide range of ultimate goals of industrial targeting. Ultimate goals of targeting can be to increase domestic employment opportunities, to improve the productivity of domestic labor, or to enhance overall domestic economic development and growth. Other goals include self-sufficiency in agriculture, raw materials or energy, or a strong national defense. These other goals usually are reached by increasing the international competitiveness of domestic producers in selected industries.

This element of the definition does not include government policies to increase production in sectors where there is too little private investment due to external factors--that is, where private investors cannot capture all of the benefits that come from their investments. These sectors include public goods such as education, the development of infrastructure to aid economic development (for example, roads, communication networks, public water, and sewage networks), medical research, and pollution control. Government action to direct productive resources into these sectors is not directly oriented toward increasing domestic output in selected industries at the expense of competing foreign producers.

The criteria used to select industries for targeting are determined in large measure by the ultimate goals of the targeting, but they also depend on such factors as the level of economic development and the structure of production in the targeting country. Developing countries often adopt strategies of import-substitution or export-led growth to encourage domestic industrialization and general economic development. These countries often target industries with technologies that are fairly well established, because the technology can be more easily transferred and assimilated in the local economy. For example, both Mexico and Brazil have expended considerable resources to develop and maintain their domestic auto and steel industries.

Developed countries often target high-technology industries in order to benefit from the rapid growth in demand and productivity in these industries, but they also target industries where the technology is more established in order to avoid adjustment costs caused by reductions in demand or by the growth of competing output abroad. For example, the European Community appears to have targeted the steel industry in order to reduce the adjustment costs caused by world over production and recent declines in demand. 1/

1/ See the report by the Labor-Industry Coalition for International Trade, International Trade, Industrial Policies, and the Future of American Industry, April 1983.

There are numerous other criteria for targeting. Several major oil-exporting countries encourage local petrochemical production in order to obtain more of the value-added associated with "downstream" processing of crude oil. 1/ At one time, Japanese targeting was aimed primarily at income-elastic goods (goods for which demand tends to grow faster than income) in order to obtain benefits of the growth of demand in these sectors attendant with expected increases in world income. 2/

Targeting Techniques

Targeting techniques can be grouped into five categories: home-market protection, tax benefits, antitrust exemptions, science and technology assistance, and financial assistance. Some targeting techniques may logically be placed in more than one category. For example, certain tax benefits are used in home-market protection. Each of these five categories contains a wide variety of techniques designed to improve the international competitiveness of industries. This section describes these five categories and gives examples of targeting techniques in each category. Table 1 lists the major alleged targeting techniques.

Home-market protection.--Home-market protection places foreign firms at a competitive disadvantage in the domestic market. Such protection usually takes the form of tariffs or nontariff barriers to trade. 3/ Nontariff barriers to trade consist mainly of quotas, but they include many other policies that favor domestic producers, such as discriminatory government procurement practices. 4/

For example, the Japanese Government-owned telecommunications monopoly, NTT, has generally favored Japanese manufacturers when buying equipment. 5/ Government-owned telecommunication monopolies in the European Community also generally follow this policy. 6/ Governments sometimes assist domestic producers in an industry by encouraging domestic purchasers to buy its

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1/ See the study by the U.S. International Trade Commission, The Probable Impact on the U.S. Petrochemical Industry of the Expanding Petrochemical Industries in the Conventional-Energy-Rich Nations: Final Report on Investigation No. 332-137 . . ., USITC Publication 1370, April 1983.

2/ Ministry of International Trade and Industry, The Vision of MITI Policies in 1980's, Provisional Translation, March 1980.

3/ Home-market protection sometimes involves restraints on foreign investment. Such restraints can be used to protect indigenous firms from competition from domestic subsidiaries of foreign firms.

4/ For a detailed review of nontariff barriers found in international trade see U.S. Tariff Commission, "Trade Barriers," report on investigations Nos. 332-66 and 332-67, April 1974, pt. 2.

5/ Japan is a signatory of the MTN government procurement code, but purchases accounted for less than 2 percent of its total purchases in 1982.

6/ Labor-Industry Coalition for International Trade, op. cit., pp. 83 and 84. NTT recently increased its purchases of foreign equipment.

Table 1.--Targeting techniques, by categories

Category	Technique
Home-market protection.	Restraints on foreign investment.
	Tariffs.
	Quotas.
	Discriminatory government procurement.
	Other nontariff barriers.
Tax policies.	Special depreciation rules.
	Exemption for export earnings.
	Tax deferral for export earnings.
	Grants.
Antitrust exemptions.	Mergers.
	Price fixing cartels. 1/
	Rationalization cartels. 2/
	Export cartels. 3/
	Joint research and development.
	Restrictions against competition.
Science and technology assistance.	Support for research and development.
	Control over technology imports.
	Requiring technology sharing as a condition for exporting to or investing in the country (performance requirements).
	Assistance in acquiring foreign technology.
	Training.
Financial assistance.	Loans at preferential terms.
	Loan guarantees.
	Export financing.
	Preferential access to investment funds
	Preferential access to foreign exchange
	Nationalization.

1/ Price-fixing cartels involve agreements concerning prices the firms charge in the domestic market.

2/ Rationalization cartels involve agreements concerning product lines firms will produce or the facilities they will operate.

3/ Export cartels involve agreements concerning export markets.

Source: Compiled by the staff of the U.S. International Trade Commission on the basis of a review of available literature.

products. For example, both Japan and the United Kingdom offer industries a number of incentives to buy robots from domestic producers. 1/

Brazil used import restraints to develop its aircraft industry. After 1975, Brazil prohibited the import of small aircraft. Since then, it has become a significant exporter of small aircraft to the United States. 2/ Brazil is using the same technique with the computer industry; in 1977, Brazil prohibited imports of small computers. 3/

Tax benefits.--Foreign governments may encourage the development of an industry by providing it with tax advantages not available to other industries. For example, the Japanese Government allows accelerated depreciation of plant and equipment for certain industries. Industries that have significantly benefited from these provisions include steel and machinery. 4/

Tax exemptions for export earnings also are sometimes used in targeting. For example, the Brazilian Ministry of Finance sometimes promotes exports of an industry by exempting export profits of domestic firms in the industry from the corporate income tax. 5/

Antitrust exemptions.--Antitrust exemptions allow firms in an industry to take joint actions that would be illegal if undertaken by most firms. Examples of these joint actions include mergers, joint research and development, and agreements to fix prices, allocate market share, and assign products.

Antitrust exemptions may increase profits of domestic producers in an industry, but they usually reduce the short-run price competitiveness of these producers. For example, if firms are allowed to fix prices and allocate market shares, they can raise their prices and reduce their output below free competition levels. This allows them to increase their profits. 6/ The

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1/ The Japanese incentives to purchase robots are described in Paul Aron, "Robots Revisited," in Office of Technology Assessment, Social Impacts of Robotics, Washington, D.C., February 1982, p. 42. The United Kingdom's incentives are described in U.S. Department of Commerce, "Foreign Industrial Targeting Practices," mimeo, Feb. 28, 1983, pp. 13-15.

2/ Eugene Sarver, "U.S., Brazilian Aircraft Industry Interests on a Collision Course," Journal of Commerce, June 28, 1982, p. 9.

3/ Labor Industry Coalition For International Trade, op. cit., p. 50.

4/ J. Pechman and K. Kaizuka, "Taxation," in H. Patrick and H. Rosovsky, Asia's New Giant, Washington, D.C., The Brookings Institution, 1976, pp. 356-358 and 372. Tax benefits may be particularly important to Japanese targeting. Pechman and Kaizuka note that to a greater extent than most governments the Japanese Government relies on tax incentives to accomplish national goals.

5/ Banco de Brazil, Summary of the Investment Legislation in Brazil, 1982, p. 98. This exemption will expire in 1985.

6/ A well-known example is the agreement by the oil-exporting countries to raise oil prices by restricting output.

increased profits might increase investment in the industry, but because maintaining higher prices requires limiting output, the parties to the agreement will try to limit such investment. New investment that results in increased output will tend to cause the agreement to fail. If new investment is made but not used, there will be wasteful excess capacity.

In some cases, however, antitrust exemptions may increase the international competitiveness of domestic firms by reducing their costs. Mergers may also allow firms to realize increasing economies of scale. For example, the Japanese Government, has often encouraged firms to merge so they could reduce costs by increasing the size of their plants. 1/ Also, the Japanese government has occasionally allowed firms in an industry to agree to limit the number of different products each firm produces. By limiting their product lines, firms may be able to reduce the unit costs of their remaining products. 2/

The Japanese Government frequently allows industries to form export cartels. 3/ Firms in an industry usually form an export cartel solely to raise prices charged to foreign purchasers. 4/ To increase its prices, the cartel typically reduces shipments to the foreign markets. A cartel might take this action primarily to increase its profits on export sales or to avoid having a foreign government impose import restraints. If exports are to be limited, exporters usually prefer to form a cartel and be responsible for limiting exports themselves rather than have limits imposed on them in the form of tariffs. By limiting exports themselves, exporters can often earn monopoly profits.

Science and technology assistance.--Governments sometimes attempt to give domestic firms in an industry a competitive advantage by subsidizing their research and development efforts. This research and development may be conducted by the government itself, by private researchers, or jointly by government and private researchers. For example, the Japanese government joined with five Japanese semiconductor firms and NTT in the very large-scale

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1/ R. E. Caves and M. Uekusa, Industrial Organization in Japan, Washington, D.C., Brookings Institution, 1976, ch. 8. Caves and Uekusa present statistical evidence suggesting that MITI's encouragement of large-scale plants did not effectively lower targeted industries' costs. The actual effects of Japanese antitrust exemptions are discussed later in this report.

2/ Ibid.

3/ Most industrialized nations allow export cartels, but export cartels' share of total exports has been much higher in Japan than in other countries. Mitsuo Matsushita, "Export Control and Export Cartels in Japan," Harvard International Law Journal, 20(1), winter 1979, pp. 114 and 115. In 1981, there were 63 legally authorized export cartels in Japan. OECD, "Annual Reports on Competition Policy," October 1981, No. 2, p. 43.

4/ For a discussion of the reasons for forming export cartels see A. Jacquemin, T. Nambu, and I. Dewez, "A Dynamic Analysis of Export Cartels: The Japanese Case," The Economic Journal, vol. 91, September 1981, pp. 685-696. Eleanor M. Hadley notes that Japanese export cartels often are motivated by the U.S. government's desire to restrict imports from Japan. Antitrust in Japan, Princeton, N.J., Princeton University press, 1970, pp. 387-389.

integration (VLSI) Development Association. 1/ This association funded and coordinated VLSI research. Scientists and engineers from both Government and industry took part in the effort.

Science and technology policies often involve acquiring technology from abroad. For example, the Japanese Government at one time had to approve all agreements for Japanese firms to import foreign technology. In this way, the Japanese Government seems to have used Japan's market power to get more favorable terms from foreign firms than its technology-importing industries could have gotten on their own. 2/

Governments sometimes do not allow foreign firms to sell to or invest in their country unless they share their technology with domestic firms. The Republic of Korea (Korea), for example, requires foreign firms to share technology as a condition for selling computers in that country. 3/

Financial assistance.--These targeting techniques increase the access of firms to investment funds or to foreign exchange or enable firms to get investment funds or foreign exchange at better terms than would otherwise have been possible. For example, the government can provide loans to firms below market interest rates, as Japan has provided low-interest loans through the Japan Development Bank to domestic producers in favored industries. 4/

Instead of actually lending money to firms, the government might guarantee repayment to the firms' private lenders. Government loan guarantees can substantially reduce the interest rate that a firm pays on a loan by protecting the lender against default.

Governments sometimes also assist in financing foreign purchases of exports of targeted industries. By financing these exports at below-market interest rates, a country can give domestic producers in the industry a significant competitive advantage. Most industrialized nations have export-financing facilities that provide both direct loans and loan guarantees. 5/ Export financing, however, is targeting only if exports of certain industries are given preferential treatment.

1/ This association is described in Verner, Liipfert, Bernhard, and McPherson, "The Effect of Government Targeting on World Semiconductor Competition," report for the Semiconductor Industry Association, Washington, D.C., 1983, app. A.

2/ The Japanese Government's control over technology imports has decreased since the 1950's. General Accounting Office, "Industrial Policy: Japan's Flexible Approach," Washington, D.C., June 23, 1982, pp. 37, 38, and 44. Caves and Ueksa, op. cit., p. 152, feel that the Japanese Government substantially reduced the price its firms paid for imported technology.

3/ Labor Industry Coalition For International Trade, op. cit., p. 52.

4/ General Accounting Office, op. cit., pp. 30-34.

5/ See Organization for Economic Cooperation and Development, The Export Credit Financing Systems in OECD Member Countries, Paris 1982. The effects of preferential export financing on the cost of purchasing capital goods are estimated in U.S. International Trade Commission, Economic Impact of Foreign Export Credit Subsidies on Certain U.S. Industries: Report to the President on Investigation No. 332-144 . . ., USITC Publication 1340, January 1983, pp. 161-167.

Financial assistance can be given by guaranteeing a firm's access to credit or foreign exchange. Governments sometimes intervene in their domestic financial markets to artificially reduce interest rates. Under these circumstances, firms commonly cannot borrow all the investment funds they want at market interest rates. Governments can then help targeted industries by guaranteeing their access to scarce investment funds. Guaranteed access to investment funds may be extremely valuable to these firms even if they pay the same interest rates as other borrowers. The Japanese Government has used this technique. 1/ Sometimes governments also impose controls on foreign exchange so domestic firms cannot get all the foreign exchange they want at the market rate. The government can guarantee access to foreign exchange to producers in selected industries. The ability to control the supply of foreign exchange available to firms once played an important role in Japan's industrial policy. However, the Japanese Government no longer allocates foreign exchange to firms. 2/

1/ General Accounting Office, op. cit. A government's artificial lowering of the interest rate in and of itself is not a targeting technique, because it is not designed to shift resources to specific industries.

2/ Ibid., p. 46.

Effects of Targeting on the Economy of the Targeting Country

To determine what targeting has achieved, one must attempt to determine what would have occurred in the absence of the targeting. This counterfactual state cannot be observed; it can only be estimated. Thus, one can never determine the effects of targeting beyond dispute, regardless of the completeness and accuracy of the factual data. The difficulties in making such a determination are well illustrated by the current debate over the relative importance of Government industrial policies in Japan's postwar industrial development. Some authors argue that government policies are the most important factor in explaining Japan's high postwar economic growth rate, 1/ whereas others claim that market forces are the main reasons for this growth. 2/ A balanced view of this debate seems to be given by Richard Caves and Masu Uekusa. 3/ Regarding the effects of the operations of Japan's MITI (the Japanese ministry most commonly associated with Japan's industrial policy), they state:

> Only scant evidence is available on the effects of MITI's custodial efforts on economic welfare. There is no doubt that the ministry's policies have engendered some allocative inefficiency by strengthening collusion and some technical inefficiency by distorting incentives for additions to capacity and diverting rivalry into nonprice channels. Furthermore, our statistical evidence lends support to the doubts expressed by others over the gains flowing from MITI's preoccupation with large scale plants. On the other hand, there are probable gains that might be substantial. MITI has beaten down substantially the price that Japan pays for technology imports. Some of its efforts at standardization and rationalization have surely lowered real costs. Indeed, in oligopolistic industries with partial collusion it is logically possible that firms become inefficiently diversified, so that an imposed rationalization limiting the items each firm produced could potentially attain scale economies without giving away a significant increase in monopolistic restriction. The favorable and unfavorable possibilities arising from ministerial guidance are strong enough to leave the net evaluation in doubt.

1/ See, for example, James C. Abegglen, ed. Business Strategies for Japan (Tokyo: Sophia University, 1970); Eugene J. Kaplan, Japan the Government-Business Relationship (Washington, D.C.: USGPO, 1972); Cyril E. Black, et al., Modernization of Japan and Russia (New York: Free Press, 1975); Andrea Bottho, Japan: An Economic Survey, 1953-1973 (London: Oxford University Press, 1975); and Chalmers Johnson, MITI and the Japanese Miracle (Stanford Calif.: Stanford University Press, 1982)

2/ See, for example, Hugh Patrick and Henry Rosovsky, "Japan's Economic Performance: An Overview," in Patrick and Rosovsky, op. cit., and Philip H. Tresize, with the collaboration of Yukio Suzuki, "Politics, Government, and Economic Growth in Japan," in Patrick and Rosovsky, eds. op. cit.

3/ Richard E. Caves and Masu Uekusa, op. cit., p. 152.

Lawrence Krause and Sueo Sekiguchi acknowledged the intractable nature of separating the roles of these factors. 1/ Quantitative studies of the causes of Japan's high growth rate generally have concentrated on the traditional economic variables and do not directly address the question of the effects of Government policies. 2/

A similar debate is being conducted over the effectiveness of targeting for import-substitution and export-led growth, two strategies often used by developing countries to accelerate their economic development. Although both stategies have proponents, neither is strongly endorsed by persuasive evidence from historic experience. Donald B. Keesing presents a good discussion of the favorable and unfavorable views on targeting for industrial development. 3/ Whether such policies will achieve their ends depends on the validity of the "infant industry" argument. According to this argument, if a new domestic industry is to survive and grow in the presence of established competing foreign production, it must initially be protected or subsidized, even though the domestic economy may have a natural comparative advantage in the industry once it becomes established. On theoretical grounds, the infant industry argument has been neither established nor refuted. Keesing notes "Lack of agreement on this subject is based in part on a lack of research and of persuasive evidence, one way or another." 4/ He also notes that "Expert views begin to converge, however, on the point that whatever may be the justification of protection in early development, the case for protection becomes weaker and the case for shifting policy away from protection gains strength as development moves forward." 5/ Anne Krueger and Baran Tuncer recently tested the infant industry argument empirically, using data for Turkey. 6/ They state, "What can be concluded is that, at least in the Turkish case, protection did not elicit the sort of growth in output per unit of input on which infant industry proponents base their claim for protection." 7/

There is also debate, which is even further from being settled by factual evidence, over whether developed countries should target specific industries with newly developing technologies. This targeting strategy, called "picking the winners," is followed by Japan and several European countries. It was endorsed by Lawrence Klein, 8/ but it is viewed with skepticism by some other

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1/ Lawrence Krause and Sueo Sekiguchi, "Japan and the World Economy," in Patrick and Rosovsky, op. cit.

2/ See Edward F. Denison and William K. Chung, <u>How Japan's Economy Grew So Fast</u> (Washington, D.C.: The Brookings Institution, 1976), and Mieko Nishimizu and Charles R. Hulten, "The Sources of Japanese Economic Growth: 1955-71," <u>The Review of Economics and Statistics</u> vol. 60, August 1978, pp. 351-361.

3/ Donald B. Keesing, <u>Trade Policy for Developing Countries</u>, World Bank Staff Working Paper No. 353, August 1979.

4/ Ibid., p. 52.

5/ Ibid., p. 53.

6/ Anne O. Krueger and Baran Tuncer, "An Empirical Test of the Infant Industry Argument," <u>The American Economic Review</u>, December 1982, pp. 1142-1152.

7/ Ibid., p. 1149.

8/ Lawrence R. Klein, "International Aspects of Industrial Policy," in Michael L. Wachter and Susan M. Wachter, eds., <u>Toward a New Industrial Policy</u>? (Philadelphia: University of Pennsylvania Press, 1981), pp. 361-377.

economists. 1/ To be successfully applied, this strategy not only requires information on existing technology and other production characteristics, it also requires forecasting of future technological developments.

If domestic producers in the selected "winning" industries lack the necessary scale or technology to compete successfully with foreign producers, the infant industry argument is used to justify government intervention. J. C. Abegglan and A. Atori provide a good statement of this argument for Japanese targeting of semiconductors, computers, and telecommunications equipment. They state: Protection has been provided those industries that are in need of protection because of their newness and their fragility as emerging industries.

> Thus protection is negotiated for the semiconductor and computer industries, and telecommunications . . . . The impact on technology level is again direct. Sectors of high value-added, and high technology, with high growth potential, are afforded as much protection as can be arranged. This allows a nurturing of technology in the domestic market until competitive scale and sophistication are achieved. 2/

These debates indicate that evidence on the overall success of previous targeting actions is inconclusive. This lack of evidence is not easily rectified. In many cases, it is even very difficult to measure the economic gain that firms in an industry receive as a result of being targeted. These difficulties are discussed in the next section. Another difficulty in determining the domestic economic effects of targeting is that these effects are not limited to firms in the targeted industries. First, someone must pay for the economic advantage accorded to targeted industries. Domestic consumers and producers that use imported inputs in their production process generally pay for measures that encourage domestic output through restrictions on imports because they must pay higher prices for the protected good. For example, a tariff on steel imports can raise production costs for domestic car manufacturers. Subsidies or tax breaks presumably come at the expense of all domestic taxpayers and producers, as well as consumers. Second, if the targeting successfully affects the trade balance of the selected industries, the resulting pressure on exchange rates tends to automatically render other industries less competitive internationally, since it is impossible for a country to improve its comparative advantage in all of its traded goods simultaneously. 3/ An increase in comparative advantage in one sector must be accompanied by a loss in comparative advantage elsewhere. Thus, in order to provide a complete picture of the effects of targeting actions on all

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1/ See George C. Eads, "The Political Experience in Allocating Investment: Lessons from the United States and Elsewhere," in Wachter and Wachter, eds., op. cit, pp. 453-483; William Nordhaus "Picking Winners: Who Wins?" Paper prepared for the National Academy of Sciences Panel on Advanced Technology Competition and the Industrialized Allies, Feb. 9, 1982; and George H. Borts, Journal of Economic Literature, December 1982, pp. 1600-1602.

2/ J. C. Abegglan and A. Atori, "Japanese Technology Today," an advertisement placed by 16 Japanese firms (including Toshiba, Matsushita, Sony, and TDK) in Scientific American, October 1980, as reported in The Effect of Government Targeting on World Semiconductor Competition, Semiconductor Industry Association, January 1983, p. 83.

3/ See, for example, Kindleberger, International Economics, Richard D. Irwin, Inc., Illinois, 1968, ch. 2.

industries, a general equilibrium approach is necessary. Several such studies exist, but their results are tentative, largely due to a lack of data and the complexity of such models. 1/

This is an area where further research and improved data collection are needed. However, these studies show that when selected industries are targeted, it causes nontargeted domestic industries to become less competitive internationally.

1/ U.S. Department of Labor, Alan V. Deardorff, and Robert M. Stern, "The Effects of Domestic Tax/Subsidies and Import Tariffs on the Structure of Protection in the United States, United Kingdom, and Japan," report prepared for the Bureau of International Labor Affairs, U.S. Department of Labor, February 1982; and J. R. Pigott and J. Whalley, Economic Effects of U.K. Tax/Subsidy Policies: A General Equilibrium Appraisal, 1981.

Effects of Targeting on Targeted Firms

The measure of benefit a firm receives from targeting is the subsidy equivalent of the targeting, or the cash payment that would be equal to the value of the targeting to the firm. Targeting may benefit a firm by reducing its costs, by increasing the price it receives for its output, or by simply subsidizing its output. For example, exemption from antitrust laws may allow a firm both to increase the price it charges for its output and to reduce its costs.

To determine the effects of targeting, one usually needs data on the marginal subsidy equivalent, as well as on the total subsidy. The marginal subsidy equivalent is the cash value of the subsidy a firm receives from producing an additional unit of output. Marginal subsidy equivalents better reflect the incentive the subsidy gives a firm to increase its output. Unfortunately, marginal subsidy equivalents are usually more difficult to measure than total subsidies. It is particularly difficult to determine marginal subsidy equivalents when a firm's capital goods or research and development are subsidized, because these subsidies are not easily allocated to incremental units of output. It is even difficult to allocate the benefits of these subsidies to output in any short-run period. 1/

Often, the nature of the subsidy is such that accurate measurement of its effects are virtually impossible. The following example illustrates some of the difficulties encountered in determining the economic gain to targeted firms caused by a single targeting practice that appears to provide them a clear subsidy. In a recent report, the Hudson Institute argues that the Japanese Government keeps the interest rate received by domestic savers artificially low, and that it rations these funds to investors in selected industries. 2/ This policy appears to provide a clear subsidy to the selected industries.

However, it is very difficult to measure this subsidy. First, a policy of making available low-interest loans to investors can be considered a subsidy, although no more so than, for example, a tax structure that taxes capital income at a lower rate than labor income. Therefore, such a broad definition of subsidy would be of little practical use in formulating a U.S. response to targeting practices of foreign governments; subsidies have to be defined more narrowly as a payment to a targeted industry or group of industries. But there are substantial difficulties in determining whether the Japanese investment policies in our example qualify as a subsidy under this narrower definition. To make such a determination, one would need to know how the funds would have been allocated in the absence of the Government rationing, as well as the effect of Government policies on interest rates. This is clearly a difficult task.

1/ App. B discusses possible methods for measuring subsidy equivalents. The Commerce Department has a procedure it uses for allocating such benefits in its investigations of unfair foreign trade practices in countervailing duty cases, and this procedure is also discussed in app. B. App. C estimates subsidy equivalents for certain targeting techniques used by the Japanese Government.

2/ Jimmy W. Wheeler, Merit E. Janow, and Thomas Pepper (with contributions by Midori Yamamoto), Japanese Industrial Development Policies in the 1980's: Implications for U.S. Trade and Investment, report prepared for the Department of State, by the Hudson Institute, October 1982.

Subsidies provided by other forms of targeting, such as special legal treatment, are often even more difficult to quantify. For example, a 1978 Japanese law provides special antitrust exemptions for rationalization cartels when such action is deemed necessary for advancing technology, improving quality, or increasing the efficiency of domestic products in specific machinery and information industries. 1/ This special legal treatment provides a subsidy to eligible Japanese producers at the expense of their customers. However, it is usually very difficult to quantify the value of the subsidy. Furthermore, as we discussed in the previous section, there are some important distinctions to be made between subsidies supplied by exemption from antitrust laws and other forms of subsidy when determining the effects of the subsidies. Monopoly power allows firms to raise their prices by reducing output below its free competition level. Although the monopoly gives benefiting firms greater profits, it does so only to the extent that it allows them to become less price competitive. The competitiveness of the firms can be increased only if the monopoly allows them to make considerable cost savings through scale economies or by joining firms with excess capacity in a declining industry so the least efficient facilites can be retired, leaving only the most efficient facilities operating at full capacity.

As our examples illustrate, measuring a subsidy can indeed be a difficult exercise. But there are further problems in even defining what a subsidy is. This problem was noted in the Hudson Institute's report. It states " . . . the difficulties in defining what is 'fair' and 'unfair,' and what Government support measures translate into competitive advantage, are much greater than the relatively narrow but still seemingly intractable questions that led to the impasse on the definition of subsidies during the Tokyo Round of GATT negotiations." 2/

In addition to the problems encountered in measuring direct subsidies, there is also the problem of measuring the indirect effects on a firm of subsidies that are primarily directed toward other firms. These indirect effects were discussed in the previous section, where we concluded that a general equilibrium approach was necessary to determine all of the effects of targeting by a foreign government on the competitiveness of producers in any given industry.

1/ See the report by Cravath, Swaine, and Moore (Attorneys for Cincinnati Milacron), "Computer-Aided Manufacturing: The Japanese Challenge," submitted to the U.S. International Trade Commission in investigation No. 332-149, December 1982.

2/ Op. cit., p. 9.

Effects of Foreign Targeting on U.S. Industries 1/

After determining which industries are targeted by foreign governments and estimating the amount of the economic benefit bestowed on the foreign producers in those industries, it remains to determine the effects on competing U.S. producers. The primary effect, of course, is to reduce the international competitiveness of these U.S. producers. If targeting takes the form of protection in the foreign market, U.S. producers will lose export opportunities. If the targeting takes the form of encouragement to export, U.S. producers will lose sales opportunities in export markets in third countries or in domestic U.S. markets. In either case, successful foreign targeting will reduce output and employment in competing U.S. industries from what they would otherwise have been. However, it is problematical whether such targeting will have any effect on aggregate employment and output in the United States, particularly in the longer run, because exchange-rate adjustments will tend to prevent targeting of specific industries from affecting the overall U.S. trade balance. 2/

It is important to determine whether the targeting actively disrupts the competing U.S. industry causing layoffs, or whether it merely keeps it from expanding as fast as it otherwise might have. The first case results in adjustment costs for U.S. workers, and for other factors of production in the industry that cannot be immediately and costlessly shifted to an alternative use. These adjustment costs must be weighed against any gain to U.S. residents from the availability of cheaper foreign output. In some cases, U.S. residents may experience a net economic gain from the foreign subsidy, although the gain is extremely unlikely to be distributed in such a manner that it compensates those who must bear the adjustment costs. Disruptive targeting is most common in industries where the technology has become established and either world supply expands too rapidly or world demand declines. Attempts by foreign governments to maintain steel production in the face of recent declines in world demand are good examples of disruptive targeting. This strategy by foreign governments tended to cause greater reductions in U.S. employment and output of steel and to increase adjustment costs for U.S. workers in the industry.

In the second case, where targeting prevents U.S. output from expanding as rapidly as it otherwise would have, the concern is that U.S. producers, and thus U.S. labor and other factors of production, may be excluded from potentially lucrative markets with good growth potential. 3/ Although little, if any, adjustment cost is imposed on U.S. industries as a result of this second type of targeting, this type of targeting could cause the United States to lose its technological lead, and thus its international competitiveness, across a wide range of industries. These effects would occur as follows.

1/ A discussion of how the Commission defines a domestic industry for the purposes of the different import relief statutes is found in app. D.

2/ In the short run, the effect of targeting on employment depends on the labor content of the output of the targeted industry relative to other industries that might be harmed by the targeting.

3/ Of course, targeting that initially prevents U.S. output from expanding may later reduce U.S. output. For example, targeting that displaces U.S. output of the more technologically advanced products in an industry may later cause an absolute decline in U.S. output as the products left to U.S. producers become outmoded. Such targeting falls under the rubric of disruptive targeting.

Foreign targeting of high-technology industries would reduce the short-run profitability of domestic production in these industries. This would keep domestic output in these industries at low levels and discourage domestic expenditures for investment and research in the industries. Thus, domestic technology would stagnate, and domestic producers would be excluded from future gains in profitability and productivity in the industries as technology advances abroad. The development of the economic theory of international technological competition is in its infancy. A number of economists think that foreign targeting of high-technology industries is unlikely to be a serious problem. William Branson notes that such targeting will not cause the United States to become less competitive overall in international trade, due to the automatic reaction of exchange rates. 1/ William Nordhaus places a very low priority on an oversight mechanism to protect against targeting of high-technology industries. 2/ However, other economists point out that by subsidizing certain research-intensive industries, foreign governments may enable them to increase their share of particularly profitable world markets. As a result, these governments can increase domestic welfare at the cost of other countries. Subsidies used for this purpose may include direct subsidies for exports or research and development or indirect subsidies through home-market protection. Because home-market protection encourages an industry to do more research, it may increase not only the industry's share of domestic markets, but also its share of export markets. 3/

There are few quantitative studies of the effects of particular foreign government targeting actions on U.S. trade flows. 4/ The paucity of such studies is due largely to a lack of necessary data. We have already indicated the difficulties in determining the effects of targeting on competitiveness of targeted foreign producers, or even in determining the economic value of the targeting to these producers. It is necessary to quantify these effects before one can proceed to quantify the effects of targeting on U.S. trade flows. This is another area where more data collection and new research designs are needed.

Regardless of the difficulties in determining the effects of foreign government targeting on U.S. firms, U.S. producers that compete with targeted foreign producers may have a legitimate complaint if one accepts the premise that trade should be governed by natural comparative advantage as determined by market forces. This is a basic axiom of U.S. trade law. The next section discusses the U.S. law and its adequacy for dealing with the effects of foreign targeting.

1/ William Branson "Industrial Policy and U.S. International Trade," in Wachter and Wachter eds. op. cit.

2/ William Nordhaus states: "The need for a new oversight mechanism to watch for abuses is fairly low on a priority list of international problems, perhaps right above a commission to prevent getting eaten by piranha fish in bathtubs." Op. cit., p. 9.

3/ B. J. Spencer and J. A. Brander, "International R&D Rivalry and Industrial Strategy," The Review of Economic Studies, (forthcoming), and Paul Krugman, "New Theories of Trade Among Industrial Countries," The American Economic Review Papers and Proceedings, May 1983, pp. 343 and 347.

4/ One exception is a study by Don Rousslang, "The Effects of Performance Requirements on U.S. Auto Trade with Brazil and Mexico," Bureau of International Labor Affairs, U.S. Department of Labor, mimeo, November 1982.

The Relationship of Targeting to U.S. Legislation

This section discusses responses to targeting using U.S. antitrust laws, different import-relief laws, and other trade statutes. Amendments to the trade laws proposed by interested parties participating in the Commission's investigation are discussed as well. 1/

Antitrust laws

The Sherman Act applies to a foreign cartel which fixes prices for the U.S. import market. 2/ If the foreign cartel is directed by a foreign government, however, there may be no antitrust liability. The involvement of a foreign government will result in doctrines of judicial abstention being raised; i.e., the sovereign compulsion defense and the act of state doctrine. In addition, the doctrine of comity encourages courts to use a weighing or balancing test to determine relative U.S. and foreign interests. 3/

In addition to the considerations and the serious problems concerned with extraterritorial discovery, there is also a problem with the degree of execution immunity for foreign governments (as opposed to their agencies "engaged in commercial activity") in the Foreign Sovereign Immunities Act. 4/ In brief, there have not been any significant antitrust cases in which private

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1/ The discussion neither proposes legislation nor endorses any of the proposals mentioned.

2/ In 1975, the Department of Justice brought civil and criminal actions against a Korean export cartel. United States v. Korean Hair Goods Ass'n of America, 1976-1 Trade Cas. ¶ 60,773 (S.D.N.Y. 1976) (consent decree). Similarly, in 1979, Justice challenged the participation of a French firm in a European plan to regulate exports to the United States in a civil suit. United States v. Societe Nationale des Poudres et Explosifs, 1981-2 Trade Cas. ¶ 64,221 (D.N.J. 1981).

Assistant Attorney General Baxter has stated that the Department of Justice is willing to prosecute foreign export cartels whether or not they had been approved by their home governments. William F. Baxter, Remarks Before the American Bar Association, International Law Section (Sept. 29, 1981).

3/ See Timberlane Lumber Co. v. Bank of America, 549 F.2d 597 (9th Cir. 1976); Mannington Mills v. Congoleum Corp., 595 F.2d 1287 (3rd Cir. 1979). No court has yet used a ". . . balancing test to dismiss or cutback a U.S. antitrust case . . ." Davidow, Extraterritorial Antitrust and the Concept of Comity, 15 J. World Trade L. 500, 507 (1981).

As the ninth circuit noted in Timberlane, private antitrust suits are more likely to raise comity issues than Government suits, because the cases have not been screened by the executive branch for foreign policy problems. 549 F.2d 597, 613.

4/ Antitrust judgments against foreign sovereigns can be executed only against their property in the United States that "is or was used for the commercial activity against which the claim is based . . ." 28 U.S.C. 1610(a)(2) (1976).

plaintiffs have prevailed against foreign cartels involving foreign government participation. 1/

Import-relief statutes

The import-relief laws of the United States generally reflect provisions of the General Agreement on Tariffs and Trade. 2/ These statutory provisions distinguish between fair import competition and unfair import competition. 3/ Although amendments which changed this approach could provide administrative advantages and opportunities for superior relief to injured domestic producers, they could disturb the relationship of the current provisions to those in the GATT, which represent some degree of international consensus. 4/

Fair-trade statutes

Section 232 of the Trade Expansion Act of 1962 and section 201 of the Trade Act of 1974 are discussed in this section. Section 406 of the Trade Act, which also deals with the effects of fairly traded imports, is not discussed, since it concerns only imports from Communist countries.

There is an advantage and there are disadvantages from using the national security authority in section 232 to counteract targeting. The advantage of import restrictions taken under the authority of section 232 is that such actions are not as vulnerable to being challenged in the GATT as are actions taken for other reasons.

1/ In International Ass'n of Machinists & Aerospace Workers v. OPEC, 477 F. Supp. 553 (D.C. Cal. 1982), for example, the district court did not distinguish between Governmental determination of production levels and the coordination of marketing strategies.

2/ These provisions were sponsored by U.S. negotiators during the planning of the International Trade Organization and the framing of the GATT.

3/ An excellently reasoned critique of the fair/unfair classification is found in Lowenfeld, "Fair Or Unfair Trade: Does It Matter?," 13 Cornell Int'l Law J. 205 (1980).

4/ The fair-trade statutes under which import restrictions can be imposed are sec. 201 of the Trade Act of 1974, which permits the United States to invoke art. XIX of the GATT, and sec. 232 of the Trade Expansion Act of 1962, which authorizes import restrictions for national security reasons. Art. XXI of the GATT contains exceptions for national security.

The unfair-trade statutes under which import restrictions can be imposed are secs. 303 and 701 of the Tariff Act of 1930 (countervailing duty investigations), sec. 731 of the Tariff Act (antidumping investigations), and sec. 337 of the Tariff Act (unfair practices in the import trade). The countervailing and antidumping duty statutes generally implement the provisions of art. VI of the GATT and specifically implement the codes on antidumping and subsidy proceedings which were negotiated during the Multilateral Trade Negotiations under the aegis of the GATT in 1979. Sec. 337 generally implements the provisions of art. XX, par. (d), of the GATT.

There are three disadvantages, however. First, many products that could be targeted are not related to national security. Second, autarky is rarely achievable with any product. Using autarky as a national security goal would deluge the Government with petitions for import relief for products which have no industrial significance for the national security. The third disadvantage is that any other GATT member could similarly restrict U.S. exports on national security grounds.

Section 201 of the Trade Act

Section 201 is the U.S. legislation that sets forth the procedures and conditions for invoking the so-called "escape clause" in article XIX of the GATT. Since the late 1940's, the GATT has been a forum for multilateral agreements reducing the national tariffs and other trade barriers of member signatories. Article XIX allows a signatory country to "escape" from these negotiated concessions when a domestic industry is injured or threatened with injury by imports subject to the concessions. The legislative purpose of section 201 "includes such objectives as facilitating the orderly transfer of resources to alternative uses and other means of adjustment to new conditions of competition." 1/ Section 201 directs the Commission to conduct investigations to determine whether a product is being imported into the United States in such increased quantities as to be a substantial cause of serious injury, or threat thereof, to the domestic industry producing an article like or directly competitive with the imported article. If the Commission makes an affirmative injury determination under section 201, it must recommend an appropriate remedy to the President. The President makes the final remedy decision.

A major problem with the use of section 201 to counteract targeting is that article XIX and section 201 are premised on most-favored-nation (MFN) treatment, which requires the Commission to investigate imports from all sources. 2/ Although trading partners have suggested changing article XIX actions to country-specific proceedings, the United States has rejected "selectivity" in favor of the MFN application. 3/

Traditionally, section 201 investigations have been associated with serious injury to depressed industries, not emerging industries. 4/ To date, there has never been a section 201 investigation involving a growing high-technology industry. Another limitation of section 201 is that injury from imported products can occur long after targeting practices have taken place and at a time when they may no longer be necessary. 5/ The benefits the targeted foreign industry received in the past may improve its competitive position in world markets, even if it is no longer receiving government

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1/ Section 201(a)(1).

2/ A most-favored-nation application of trade restrictions and the art. XIX requirement to compensate GATT member-signatories may be avoided by the President's negotiating bilateral agreements with exporting nations. This authority is provided for in sec. 203(a)(4) of the Trade Act of 1974.

3/ See Lowenfeld, op. cit.

4/ Testimony on Behalf of The Semiconductor Industry Association, transcript of the hearing, investigation No. 332-162, Foreign Industries Targeting and Its Effects on U.S. Industries (June 15, 1983), p. 180.

5/ In this section, the effects of targeting alleged by domestic producers are being taken at face value. There is no attempt to distinguish the effects of targeting from other competitive factors.

assistance. A domestic industry may be totally unaware of targeting practices, and learn of them only after they have ended when imports of targeted goods increase.

To be effective, an investigation would have to be initiated at a time when there are very few, if any, imports. Analysis of the likely effects would require speculation rather than a standard of "real and imminent." The present injury concepts embodied in section 201 would compel negative findings in cases brought at such an early stage because imports, even if increasing, probably would not be of sufficient magnitude to be a substantial cause of serious injury or threat. In the absence of significant imports, it would be difficult for the Commission to do more than speculate about any threat of serious injury in the future. A further complicating consideration is that U.S. policy and article XIX contemplate that compensation be given to adversely affected trading partners when an escape action is taken. It is questionable whether compensation is appropriate or desirable when remedying a targeting practice. Unless it were redrafted drastically, section 201 could not be used effectively to protect domestic industry from the consequences of foreign targeting practices without harming consumers and exporters. Also, action taken under this section does not insure that the domestic industry becomes competitive.

Unfair trade statutes

The countervailing duty laws.--The countervailing duty laws apply to Government assistance to industry that amounts to subsidy practices. For example, low-interest loans could be considered countervailable subsidies if they were not available generally and if there were a reasonable basis to conclude that the credit would not have been available in the absence of government intervention. Similarly, export credits may be countervailable subsidies. In the case of government support for industry research and development, the current U.S. practice is to consider subsidies paid to stimulate production or exportation as countervailable, but not generic research.

Under GATT article VI, a countervailable subsidy is one that has been granted, either directly or indirectly, on the manufacture, production, or export of a product, including any special subsidy for the transportation of the product. Article XI, paragraphs 2 and 3, of the Code on Subsidies/ Countervailing Duty Measures, specifically refers to government financing of research and development programs, although not in the context of countervailing duty proceedings. Research and development subsidies that are not related to the manufacture, production, or export of a product are not prohibited.

In a countervailing duty investigation concerning Certain Optic Liquid Level Sensing Systems from Canada, 1/ the Government expenditures were used to

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1/ 13 Cust. B. & Dec. 27 (1979). In a subsequent Commission investigation reviewing the need for the continuation of the countervailing duty order, the Commission determined that an industry in the United States would not be materially injured or threatened with material injury, nor would the establishment of an industry in the United States be materially retarded by reason of imports of optic liquid level sensing systems from Canada, if the order were to be revoked. Determination of the Commission in Investigation No. 104-TAA-2 . . ., USITC Publication 1164, July 1981.

develop a prototype and to adapt the prototype for production. Activities that come close to the initiation of manufacture are related to the GATT provisions; activities that are remote from production and manufacture of a product would present more difficulty for justifying the imposition of countervailing duties. Amendment of the U.S. law to reach upstream subsidies 1/ is a possible reaction. 2/ This might also necessitate amending the like-product requirement of the law that limits the standing of petitioning domestic producers to those making products comparable in terms of characteristics and uses with those being imported.

Witnesses complaining of foreign targeting cited indirect subsidies consisting of practices such as protecting a home market through government intervention, the waiver of applicable antitrust laws, and the exercise of national preference in procurement. Quantifying the benefits of these practices to individual foreign manufacturers would be virtually impossible using current standards for administering the countervailing duty law. Under the countervailing duty statutes, the Commerce Department does not attempt to measure the effects of subsidy practices within an industry. Rather, it attempts to value the benefit received by subsidized foreign manufacturers according to accounting principles. The types of government practices complained of at the Commission's hearing are not readily measurable in such a manner. The requirement in the statute requiring substantial evidence on the record for the Department's subsidy calculations could result in attempts to quantify such phenomena being overturned as capricious.

Another issue involving the administration of the countervailing duty statute is the possibility of exporters assisting importers to avoid the impact of paying countervailing duties. Although the regulations implementing the antidumping provisions of the law provide for the possibility of duty avoidance through reimbursement, 3/ there is no such provision for countervailing duties. Also, because targeting involves the actions of both governments and private companies, it might be necessary for the Department of Commerce to investigate for private subsidies in any annual review investigation of countervailing duty rates where targeting practices were present.

Another difficulty with countervailing duty investigations, which would require an injury analysis, concerns the timing of both the proceeding and any relief. Most probably material injury from imports of products of targeted foreign industries will occur long after the targeting practices are necessary. This means as the targeting practices are ongoing there will be no imports against which to assess countervailing duties. Furthermore, a threat

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1/ When a government subsidizes a primary product like coal, which is used by an industry to produce a later-staged product like steel which is then exported, the subsidy to the coal may be considered as a subsidy to the steel producers also.

2/ In the case of Japanese government funds spent as "seed money" for research and development in semiconductor research, the amount is negligible compared with the volume of trade. A countervailing duty order capturing this amount would not be meaningful to United States producers. See testimony on behalf of the Semiconductor Industry Association, transcript of the hearing, pp. 180-181, June 15, 1983.

3/ 19 C.F.R. 353.55 (1982).

of material injury determination would lack a rationale for a real and imminent threat. 1/ Nevertheless, domestic producers observing the foreign activity could well choose to alter their investment in that product area in response to the foreign targeting. Should this reaction take place, there might not be any industry to protect by the time the imports arrived.

Inasmuch as the standards and requirements of the countervailing duty law applicable to signatories of the Subsidies/Countervailing Duty Measures Code are taken from the Code, any amendments to the law run the risk of challenge in a dispute resolution process of the Committee of Signatories to the Code. 2/

The antidumping law.--The antidumping law is designed to offset differences between higher foreign prices and prices to the United States when the imports cause injury to U.S. producers of comparable products. Similarly, injurious imports sold below the cost of production are covered by the law. Resorting to the antidumping provisions of the Tariff Act of 1930 would involve the same problems with the material injury test as with the countervailing duty laws. For those products with a higher home-market price than U.S. price, exporters could maintain injurious import levels at the low export prices by lowering the reference price the Department of Commerce chose for price comparisons. In product markets where the foreign industry could afford a lower return on the product in the home market, this would be a likely result.

With many products it is common to "forward price" against lower future costs. As production increases, labor, administration, sales, and marketing costs decline on a unit basis as a result of both economies of scale and "the experience curve." 3/ The theory of the experience curve is that costs can

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1/ Alberta Gas Chemical Co., Ltd. v. United States, 515 F. Supp 780 (C.I.T. 1981). In reviewing a Commission determination that the United States methanol-producing industry is likely to be injured, the U.S. Court of International Trade required a showing of real and imminent threat of future injury. Assuming that the Commission were to make an affirmative decision on the basis of the threat of injury, sec. 751 of the Tariff Act anticipates that persons subject to a countervailing duty order may petition for a review investigation after 2 years from the publication date of the affirmative determination.

2/ The United States could attempt to renegotiate the Code to include targeting practices not otherwise considered countervailable subsidies in a revised code (art. 19., par. 7) or withdraw from the agreement (art. 19, par. 8). Another alternative is to draft an amendment to the law to permit the United States to revoke any countervailing duty order (See the June 14, 1983, submission of Verner, Liipfert, Bernhard and McPherson suggesting amendments to the antidumping and countervailing duty laws, p. 9) the GATT determines is inconsistent with U.S. obligations. (Art. 19, par. 7.) The adoption of such a provision, however, could result in encouraging a Code challenge.

3/ The experience-curve pricing strategy was developed by the Boston Consulting Group from a study of the production of television set components in the 1960's. Boston Consulting Group, Perspectives on Experience (1972).

fall at a predictable rate as cumulative production volume increases. The implication of the theory is that to build cumulative volume and become a low-cost producer, a firm must win a large market share. 1/ This encourages pricing below present costs, but above anticipated costs, at a projected larger volume. 2/ If increased market share is successfully captured, costs will "catch up" with prices. 3/

The antidumping provisions of the Tariff Act provide that, if sales in the home market of the exporter are below cost, they will not be considered by the Department of Commerce in calculating the foreign-market value. 4/ If the remaining sales in that market are inadequate to be used as a basis of comparison with export sales to the United States, Commerce is authorized to select another export market for reference pricing or to construct the value of the merchandise in the home market of the exporter. 5/ It is very likely that Japanese products like semiconductors and computer equipment may be sold below current cost in anticipation of future cost declines. 6/ Japanese firms attempt to produce in large volumes to cut costs and gain a large market share and are aware of experience-curve pricing strategies. 7/

The Department of Commerce regulations require petitioners for antidumping relief that allege sales below the cost of production to furnish information concerning the costs of producing the product in the exporter's home market if the information is available to them. If not, they may furnish

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1/ Porter, "Manager's Journal: Experience Curve," The Wall Street Journal, Oct. 22, 1979, p. 30. See also Porter, Competitive Strategy (1980); and, Abell and Hammond, Strategic Market Planning ch. 3, 1979.

2/ The experience-curve strategy has been used by such firms as Texas Instruments (hand-held calculators), Black & Decker (power tools), Briggs & Stratton (small engines), Emerson Electric (electric motors, chain saws, and air conditioners), and Du Pont (chemicals). Porter, Manager's Journal. The concept is far from universally embraced. One economist stated that "much of that work [i.e., literature concerning the experience curve] incorrectly entangles changes in input prices, technological change, and all kinds of exogenous factors yielding a spurious correlation between unit costs and cumulative output." Joskow, ed., Roundtable on Predatory Practices, in Salop, Strategy, Predation, and Antitrust Analysis, Bureau of Competition, Federal Trade Commission, 1981, p. 706.

3/ Porter, Manager's Journal. This may also result from economies of scale alone. As Rowe puts it, ". . . prices--which influence sales, hence, production volume, which in turn governs the efficiency of the firm's plant utilization--may determine the unit cost of the ultimate output . . ." Price Discrimination Under the Robinson-Patman Act, 1962, p. 31.

4/ Sec. 773(b) of the Tariff Act.

5/ Ibid.

6/ J. Anderson, "Is the Japanese Government Really Being Unfair to U.S. Industry," The Washington Post, June 23, 1983, sec. A, p. 23. Also, see the testimony On Behalf of the Semiconductor Industry Association, transcript of the hearing, June 15, 1983, p. 181.

7/ B. Henderson, Henderson On Corporate Strategy, 1979, p. 174; July 14, 1983, interview with a consultant in the Tokyo office of a U.S.-based strategic planning consulting firm.

information on U.S. costs and adjust these costs with publicly available information concerning cost differences in the foreign markets. 1/

Among the proposed amendments to the antidumping law submitted to the Commission during the course of this investigation is a provision that would amend the constructed-value section to add to a foreign producer's costs the costs of any research and development assistance it received by participating in a cooperative research and development program with the government. 2/ Generally, the only government actions that are dealt with in the antidumping context involve exports from nonmarket economies where there is no price system from which to calculate a reference price. 3/ Government assistance for private companies is provided for in the Subsidies/Countervailing Measures Code. 4/

With respect to injurious imports from targeted foreign industries, there is a presumption that the possibilities for combining dual pricing or below- cost sales, a protected home market, subsidies, and other forms of foreign government intervention will have a synergistic effect. The antidumping provisions of the law will not reach anything other than the margin of sales at less than fair value calculated by Commerce. This is consistent with the International Antidumping Code, to which the United States is a signatory. 5/

Section 337 of the Tariff Act

Section 337 concerns "unfair methods of competition and unfair acts in the importation of articles into the United States. . . ." Subsection (b) of the act requires the Commission to refer matters ". . . based in part on alleged acts and effects which are within the purview . . ." of the countervailing duty laws or the antidumping law to the Department of Commerce to determine whether action should be taken under those statutes. Cases filed with the Commission under section 337 based solely on allegations of subsidized or dumped imports are not to be pursued under section 337.

1/ 19 CFR 353.36.

2/ June 14, 1983, submission of Verner, Liipfert Bernhard and McPherson.

3/ See, U.S. Department of the Treasury, Application of Anti-dumping Act to Controlled Economy Countries, Background Paper, 1976.

4/ Enactment of the proposal invites a challenge to its consistency with the antidumping code. The United States could attempt to renegotiate the antidumping code to include a similar provision in an amended code, (art. 16, par. 8) or withdraw from the present code. (art. 16, par. 9) Another alternative is companion legislation permitting the United States to modify any order based on the provision in the event that it were disapproved by the GATT (See supra, note 2, page 38). However, adoption of the last course of action could influence the likelihood of a challenge.

5/ The International Antidumping Code provides that--Agreement on Implementation of Article VI of the General Agreement on Tariffs and Trade, art. 16.

> No specific action against dumping of exports from another Party can be taken except in accordance with the provisions of the General Agreement, as interpreted by this Agreement.

Witnesses at the Commission's June 15, 1983, hearing testified that section 337 was an ". . . attractive avenue for obtaining relief because the unfair trade practices associated with the targeted industrial policies of some of our trading partners have been held, in other contexts, to violate the United States antitrust laws and therefore are likely to be within the scope of section 337." 1/ The practices which were argued to be within the scope of section 337 are (1) below-cost pricing in one market coupled with higher prices in another market; (2) the development of excess capacity in conjunction with below-cost pricing; (3) government supports for industry 2/ analogous to a producer being supported by its parent corporation to enable it to price at predatory levels; (4) government closing of the home market to imports which is analagous to a group boycott; and (5) the combination of these practices as analagous to a conspiracy to monopolize the U.S. market for the goods targeted the foreign country.

The first two practices would be covered by section 337(b), which may require their referral to the Department of Commerce for a determination whether an antidumping proceeding is appropriate. The third practice would also be covered by section 337(b), which requires its referral to the Department of Commerce for a determination whether a countervailing duty proceeding is appropriate. The fourth practice, closing the home market, would raise the act of state defense. Regulation of imports is the kind of conduct performed by governments, not private parties. 3/ Finally, the combination of practices could require bringing a case against the foreign government as well as foreign exporters. 4/ This could involve breaches of article 19 of the Subsidies Code and article 16 of the Antidumping Code, as well as raising the act of state defense. 5/

There is an additional problem to using section 337 for remedying foreign targeting. Without a domestic analog in U.S. law, the United States could be challenged in the GATT for a violation of the national treatment provision if section 337 relief were imposed for targeting practices of foreign governments. 6/

1/ Testimony of Paul D. Cullen and Jeffrey W. King, Collier, Shannon, Rill, and Scott.

2/ In individual cases, the foreign government's relationship to the foreign producers may be "commercial" within the meaning of the Foreign Sovereign Immunities Act.

3/ Bokkelen v. Grumman Aerospace Corp., 432 F. Supp. 329, 334 (E.D.N.Y. 1977).

4/ Cf. United States v. Sisal Sales Corp., 274 U.S. 268 (1927).

5/ Art. 19, par. 1, of the Subsidies/Countervailing Measures Code provides that--

> No specific action against the subsidy of another signatory can be taken except in accordance with the provisions of the General Agreement, as interpreted by this Agreement.

Art. 16 of the Antidumping Code has a similar provision. See, supra, note 2, page 44. The act of state defense is referred to in note 2, page 49.

6/ GATT, art. III. The Canadian Government had challenged United States action against imports of automobile spring assemblies on the grounds that relief under section 337 was not consistent with the national treatment provision of the GATT. The GATT panel upheld the United States action. United States Imports of Certain Automotive Spring Assemblies. GATT Document L/5333 (June 11, 1982) (Restricted).

Section 301 of the Trade Act

Testimony at the Commission's hearing emphasized the role of the protected home market as an essential component of targeting practices. 1/ Section 301 was designed to enforce U.S. access to foreign markets. The advantage of using section 301 against targeting is that steps may be taken while the targeting practices are in place, but before injury to U.S. firms occurs in the market place. 2/ Section 301 enables a threat of U.S. retaliation to be directed against the targeted product or products or services other than those being targeted by the offending country. 3/

Section 301, however, has not been used often. Under the present law, the President has complete discretion; the law has no investigative mechanism and no provision that encourages foreign governments to negotiate a resolution to the issue in the event that an investigation were to be initiated. 4/ Finally, a U.S. response under section 301 that is outside the GATT framework and is unilaterally imposed, might be challenged in the GATT. 5/

A draft bill to amend section 301, prepared for the Coalition for International Trade Equity, 6/ addresses each of these criticisms. First, in their proposal the United States Trade Representative, rather than the President, would be the official responsible for administering the statute. In cases in which the United States Trade Representative determines that industrial targeting exists 7/ and the U.S. International Trade Commission determines that material injury or the threat of material injury to a United States industry exists by reason of sales or likely sales in the United States or other foreign [i.e., third] markets of the merchandise subject to

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1/ Testimony on behalf of the Semiconductor Industry Association, transcript of the hearing, p. 177, testimony of Paul D. Cullen, transcript of the hearing, p. 131.

2/ If the United States were to insist on access for particular U.S. products in foreign markets in which they were targeted, the market access for imports could undermine the targeting program.

3/ The purpose of the law, however, is not to impose retaliatory measures, but rather to negotiate a settlement with the foreign country.

4/ See June 28, 1983, submission of Verner, Liipfert, Bernhard, and McPherson, Revisions of Section 301 to Offset the Adverse Effects of Industrial Targeting, p. 1.

5/ The GATT dispute system was designed to legitimize retaliation when a panel determined it to be appropriate, art. XXIII. Taking matters into one's own hands without GATT authorization puts the retaliating country in violation of the GATT.

6/ Submission from the law firm of Verner, Liipfert, Bernard, and McPherson, June 28, 1983.

7/ The proposal defines the term "industrial targeting" as "a government provision directing resources to a particular industry to create international competitive advantage."

investigation, 1/ the decision of the United States Trade Representative 2/ in targeting cases would not be reviewable by the President. Although the USTR is not independent of the President, the change would be significant. Section 301 cases now force the President to weigh the merits of a particular case involving an industry sector consisting of producers of a product or suppliers of a service against the foreign-relations consequences of trade disputes escalating to other areas. 3/ If the discretion to issue remedial orders is removed, the foreign government must either negotiate a solution to the controversy or live with the remedial order (as with the current administration of the countervailing duty statutes). In addition to orders affecting trade with the foreign government, the United States Trade Representative would be authorized to recommend domestic legislation to the Congress.

The draft also proposes that the Commission conduct material-injury investigations in both the U.S. market and third markets where U.S. exports are competing or will compete with products of the foreign targeted industry. 4/ The draft would require both preliminary and final material-injury investigations. The standard for the preliminary investigation would be the "reasonable indication" standard found in title VII of the Tariff Act. The standard for the final investigation, presumably, would be the determination of material injury or the threat thereof.

1/ The material-injury test was modeled after that for antidumping and countervailing duty investigations provided for in title VII of the Tariff Act of 1930. There are significant differences, however. These will be discussed below.

2/ The United States Trade Representative will be authorized to determine, on the basis of the best evidence available to him, whether action by the United States is appropriate--

> to enforce the rights of the United States under any trade agreement; or
> to respond to any act, policy or practice of a foreign country or instrumentality that
> (A) is inconsistent with the provisions of, or otherwise denies benefits to the United States under any trade agreement, or
> (B) is unjustifiable, unreasonable, or discriminatory and burdens or restricts United States Commerce. . . .

This authority is now delegated to the President in sec. 301 of the Trade Act of 1974.

3/ See Testimony On Behalf of Houdaille Industries, Inc., transcript of the hearing, June 15, 1983, p. 29; see also Stuart Auerbach, "Trade Battle with Japan Shows Policy Confusion," The Washington Post. Aug. 15, 1983, p. A-1. The complaints of U.S. industries concerning foreign trade have traditionally been subordinated to "high foreign policy" issues. Cooper, "Trade Policy is Foreign Policy," 9 Foreign Policy, winter 1972-73, p. 18.

4/ The Commission is also authorized to investigate discriminatory policies against U.S. exports in foreign markets under sec. 338 of the Tariff Act of 1930. No investigations have been conducted under this section since World War II. The provision was originally enacted in the Tariff Act of 1922. Its legislative history indicates that the Congress was concerned that U.S. exports not be subjected to tariff rates which were higher than other countries' exports. The language of the law is sufficiently broad to be applied to discriminatory situations not involving tariff rates.

The differences between the material-injury determination in the proposed amendment of section 301 and the present determination in the Trade Act are underscored.

The Commission shall determine whether--

(A) an industry in the United States-- 1/

(i) is materially injured, or

(ii) is threatened with material injury:

(B) the establishment <u>or growth of</u> an industry in the United States is materially retarded, by reason of sales <u>or likely sales</u> in the United States <u>or other foreign markets</u> of merchandise which is the subject of the investigation. <u>One factor to be considered shall be whether the sales of a competitive United States product or products are substantially reduced, or threatened with substantial reduction, in the United States or other foreign markets</u>. 2/

The draft language would require a different kind of Commission investigation than those conducted in antidumping and countervailing duty proceedings in two instances. The Commission's current practice under title VII of the Tariff Act is to create a statistical profile of the domestic consumption of the product under investigation. This is done with a questionnaire survey. The typical Commission determination is rationalized in terms of relative average price differences between domestically produced products and the dumped or subsidized products, changes in market share, and explanations from customers of domestic producers for switching their orders to the imports subject to investigation. This dependence on statistical surveying may not be possible in foreign markets because of both the administrative difficulties and the lack of motivation for foreign buyers to participate in such an investigation. 3/ Presumably, data would be furnished to the Commission by the domestic producers and by the exporters of the targeted merchandise in response to a "best information available"

1/ The term "industry" is used here as it is defined in secs. 771(4)(A) and 771(10) of the Tariff Act. A discussion of how the Commission determines domestic industry in import relief statutes is found in app. D.

2/ Submission from Verner, Liipfert, Bernhard and McPherson, dated June 28, 1983, p. 4 of the draft amendments to sec. 301.

3/ Art. 12 of the International Antidumping Code provides for an importing country to take antidumping measures against imports which are materially injuring the exports of another Code signatory. The same provision exists in art. VI of the GATT. Such measures have been imposed only once. Dale, Anti-Dumping Law in a Liberal Trade Order (1980), p. 87. The lack of use of the provision indicates that importing nations have no interest in raising costs to their importers for the benefit of another country's producers.

provision in the proposed amendment, 1/ which would permit the Commission to base its determination on any available information in the event that foreign parties choose not to cooperate with the investigation.

The second circumstance in which the Commission would not be capable of basing an investigation on consumption statistics would be where the product competition was in a developmental rather than a marketing phase. This would be typical of targeting situations in new technologies. The Commission would be unable to aggregate statistical information on production, shipments, and sales in these cases. Rather, it would have to study the product development strategies of foreign and domestic companies. The Commission has relied on statistical analyses both to promote transparency in its investigations and to avoid speculation about potential future developments. 2/ In investigations focusing on new-product development, however, the Commission would have to rely on interviews and company-generated documents. The focus of the investigations could be on the different market strategies of the different domestic and targeted foreign producers, the anticipated life cycles for the products in the planned market entries, and the relationship of the product under investigation to other products being produced by petitioning firms. 3/ The determination of material injury or threat thereof may ultimately depend on the Commission's evaluation of competing marketing strategies and how far from market introduction the rivals appear to be.

1/ The provision is based on sec. 776(b) of the Tariff Act which applies to antidumping and countervailing duty proceedings.

2/ The conservativeness of this institutional approach is apparent in the very few determinations of threat of material injury since title VII of the Tariff Act became law. The difficulty of distinguishing between speculation and informed judgment in title VII cases is discussed in Greenwald, "U.S. Antidumping and Countervailing Duty Laws: Material Injury," Federal Bar News & Journal, vol. 29, Jan. 1982, pp. 38 and 39.

3/ An excellent introduction to the value of the product life cycle concept to planning new product introduction is found in Levitt, Exploit the Product Life Cycle, Harvard Business Review (Nov.-Dec. 1965), at 81. The product portfolio concept assumes that a firm will rely on internally financing new product development from established products, which need not be in the same or similar markets. See Abell and Hammond, Strategic Market Planning (chapter 4) (1979). The portfolio concept would help evaluate the significance of a competitive threat by a given foreign technology. Compare, Certain Amplifier Assemblies and Parts Thereof From Japan: Determination of the Commission in Investigation No. 731-TA-48 (Final) . . ., USITC Publication 1266, July 1982.

Japanese Industrial Policy

Introduction

This section will discuss Japan's industrial policies and how they may affect particular industries. It begins with a brief overview of the goals of Japan's policies, the methods used to implement them, and the current debate on the impact of targeting. Next is a brief history of Japan's industrial policy as well as an overview of the main Government agencies charged with its formulation. Following is a detailed examination of particular targeting tools used by Japan in the postwar period. Finally, case studies on some of the industries that have been targeted by Japan are given.

For the past 50 years, Japan has used broad industrial policy measures to shape the structure of its economy and to direct productive resources toward certain industrial, technological, and social goals. The objectives of its industrial policy have changed considerably over time as has the degree of direct Government intervention in the marketplace.

Goals.--From the mid-1920's to the start of World War II, Japan actively encouraged the growth of industries that would help the country build economic and military prowess. After the war, Japan again employed an activist industrial policy, this time aimed at rebuilding key industries and at helping the country catch up with the West. In the immediate postwar period, Japan controlled the import of goods, services, capital, and technology, and directed these resources to industries that held the most promise for growth--the steel, electronics, machinery, and chemical industries.

During the 1950's and 1960's, Japan grew at a faster rate than France, the United Kingdom, and West Germany in terms of income and industrial output. By the early 1970's, Japan had caught up with those European countries in some economic measures. The Government set out to remedy problems caused by rapid economic growth, such as pollution and urban sprawl, and to encourage the development of high technology industries. This change in emphasis represented, among other things, a response to new problems that faced Japan's economy. Two external developments--the abandonment of the Bretton Woods system of fixed exchange rates in 1971 and the oil shock of 1973--led the government to encourage resource conservation and to phase out industries, like textiles and aluminum, that were rendered uncompetitive in the global marketplace by the appreciation of the yen and the rise in petroleum prices. Government policy since the mid-1970's has been less interventionist than in the past, and direct controls on capital, technology, and investment have been gradually removed.

Methods.--Japan has used a variety of tools to target particular industries, including import restrictions, export promotion efforts, tax incentives, cartels, direct subsidies, and restrictions on foreign investment. Until the late 1960's, the Government also acted as an intermediary in contracts with foreigners to purchase technology and raw materials from abroad, which may have resulted in lower prices and greater concessions by the foreign companies involved. A number of cooperative programs with industry were undertaken to improve quality and productivity, to set standards, and to encourage cooperation among firms. In the past 10 years, the Government has initiated cooperative R&D programs with industry, often with direct Government funding and risk-free loans, to propel private Japanese companies toward higher levels of competence in the high technology industries.

When it became an article 8 country in the IMF 1/ in 1964, Japan committed itself to liberalize its trade and investment controls, gradually removing barriers to the free flow of goods and capital across its border. Since that time, Japan has relied less and less on interference in the marketplace through tariffs, quotas, import licensing, and foreign exchange controls. Today, Japan's formal import regime for virtually all manufactured products is at least as liberal as that maintained by other industrialized countries, and its capital markets have been opened considerably over the past several years. Despite the fact that some of its industries face severe structural declines (as in the case of aluminum), in the past decade Japan has not generally imposed new quantitative restrictions on imports or raised tariffs to help its industries adjust. 2/

Nevertheless, the methods used by Japan to achieve its industrial policy goals retain some of the characteristics of those used 25 and even 50 years ago: Japan's capital markets are still more closed to foreign participation than those of other industrial countries; 3/ until very recently, foreign direct investment in existing companies in Japan was generally limited to joint ventures or sales--particularly in the manufacturing sector; 4/ tax incentives continue to be used to encourage production and consumption of favored articles; nontariff barriers to imports remain; and, official control over licensing and other manufacturing decisions has given way to "administrative guidance" to producers themselves and informal persuasion by banks and other financial institutions. 5/ This form of targeting is, however, much less common today than it was in the past.

Impact.--The importance of industrial targeting in the success of Japan's industries is widely debated. Some claim that industrial targeting has had

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1/ An art. 8 country cannot use balance of payments problems as a justification for trade restrictions.

2/ During the mid-1970's the Japanese Government persuaded China and South Korea to restrict their exports of silk to Japan in order to protect its declining silk industry. The Government was also considering restricting imports of aluminum ingot in the late 1970's, but did not.

3/ Wheeler, et al, state: "While international forces have greatly reduced the insulation of the Japanese capital markets, the formal structure of those markets remains highly regulated, segmented, and therefore, inflexible." In Jimmy W. Wheeler, Merit E. Janow, and Thomas Pepper, Japanese Industrial Development Policies in the 1980's, the Hudson Institute, 1982, p. 48.

4/ According to a 1983 McKinsey & Co. study, foreign manufacturers have three options for participating in the Japanese market: (1) licensing technology; (2) joint ventures; and, (3) direct investment. Technology licensing is the most important form of foreign participation in Japan and joint ventures is the second most important. McKinsey & Co., Japan Business: Obstacles and Opportunities, Washington, D.C., 1983, p. 102-104.

5/ For instance, Yamazaki Machinery, the Japanese leader in flexible manufacturing systems, originally did not want to participate in the Government-sponsored research and development project to develop flexible manfacturing systems using lasers. It ultimately participated in the project only as a result of direct pressure from its bank. See Statement of Gary R. Saxonhouse, submitted in Commission Investigation No. 332-162, June 1983, p. 27.

comparatively litte effect, relative to other factors in the marketplace, on the competitiveness of Japanese producers and that Government policy prescriptions "are little more than homilies." 1/ What intervention does take place, these analysts argue, is in favor of the least competitive sectors of Japan's economy, such as agriculture and declining manufacturing industries. 2/ They asssert that Japan's macroeconomic policies have had a much greater influence on its growth than targeting has. These policies favor high levels of savinfs and investment, reduce investors' risk, and generally provide a favorable climate for growth. 3/

Others analysts go even further by suggesting that Japan's industrial policy is essentially an effort to substitute Government direction for market allocation of capital and diffussion of technology. Indeed, they argue that Japan's system may actually be less effective in directing resources to new industries than the more market-determined U.S. system. They claim that, despite the fact that Japan's financial system takes its cues from the Government--by watching Government loans and sponsorship of research projects in promising new areas--it still may not provide as many resources to high-risk, innovative firms as U.S. equity markets. 4/

1/ Phillip H. Trezise, "Industrial Policy is Not the Major Reason for Japan's Success," The Brookings Review, spring 1983, p. 15. Also see, for example Borts, op. cit., Eads, op. cit., and Nordhaus, op. cit.

2/ For instance, Yukio Noguchi states "These theses (about the government-business relationship in Japan) are essentially the same in that they emphasize the close relationship between government and private business and the existence of a deliberate conspiracy to control the economy. My basic point is that neither the close relationship nor the deliberate conspiracy alleged by these views exists in Japan. . . . (Moreover,) in decisions where political pressure is effective, it works in favor of rural areas and low productivity sectors, such as agriculture, small business firms, or declining industries." Yukio Noguchi, "The Government Business Relationship in Japan" in Policy and Trade Issues of the Japanese Economy, Kozo Yamamura, (ed.), University of Washington Press, 1982, p. 124.

3/ Jimmy W. Wheeler, Merit E. Janow, and Thomas Pepper, op. cit.

4/ See the statement of Gary R. Saxonhouse before the U.S. International Trade Commission, June 15, 1983, p. 39. He argues "what effective elements of industrial policy exist in Japan are an effort to overcome the distortions that might result from the long-time absence of well-developed capital markets. . . . If Japan's high-profile, but mostly informal industrial policy, is necessitated by the character of the Japanese financial system, ongoing financial deregulation may further undermine its utility." Capital is more concentrated in Japan than in the United States, and most financing of companies is done indirectly, through bank loans, rather than through equity markets. Government loans to an industry may serve as a signal to private lenders, but such an interaction may be a substitute for American-style equity markets, which, Saxonhouse claims, have been successful in concentrating resources in risky, but promising new areas of research or commercialization in the United States.

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On the other side of the targeting debate are those who believe that extensive Government intervention in Japan's economy is the main reason for the success of its leading export industries, including steel and autos. 1/ Recently, some have asserted that while direct funding of industrial research by the Government is often relatively low, it is aimed at particular industries at crucial moments and thus affords the firms in those industries important advantages not otherwise available in the free market. It is this precise, well-orchestrated Government aid that is most frequently cited as the primary concern of U.S. competitors regarding Japanese industrial targeting, particularly in rapidly growing, high-technology industries where sustained and high levels of investment can be a key element in maintaining a competitive advantage. 2/

Historical overview

Japan has employed industrial policy measures for at least the past fifty years. Although the degree of Government intervention in the market has changed considerably during that time, many of the policies pursued by Japan in the postwar period have their roots in practices that were used before World War II.

From the 1930's to the start of World War II, the Japanese Government actively promoted private manufacturing and commercial activities considered vital to the national interest. 3/ A series of industry promotion laws was passed during this period, covering the oil, automobile, steel, machine tool,

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4/ For instance, despite the designation of biotechnology as a priority area by the Japanese Government, very little private funding has flowed to this industry. The Japanese Government may actually develop its interest in an emerging industry in response to the direction of American equity and venture capital markets. To take the example of biotechnology again, Japanese interest in that sector was first sparked in 1980 after the successful public offering of Genentech, a U.S. firm. (pp. 12-19) Saxonhouse also suggests that Government-sponsored R&D projects are designed to stimulate the flow of technological information within Japan. Government-sponsored R&D projects may act to lower the barriers to interfirm transfer of information and talent, such as Japan's permanent employment system and the practice of providing advanced training within the firm, rather than in universities.

1/ See for example, Abegglen, op. cit., Black, op. cit., Bottho, op. cit., Johnson, op. cit., Kaplan, op. cit., Klein, op. cit.

2/ Semiconductor Industry Association, Effects of Foreign Industrial Targeting on World Semiconductor Competition, 1983. Some economists argue that targeting research intensive industries will allow foreign producers to increase their share of particularly profitable world markets in the future. See, for example, Spencer and Brander, op. cit., and Krugman, op. cit. Harold Malmgren suggests that for most foreign high technology industries, protected home markets are not sufficient in scale to support world class production, and that a share of the U.S. market is essential for their success. Malmgren, "American Counterattack on Targeting?", Mimeo, April 1983, p. 21.

3/ From 1868 to 1877, the Japanese Government managed mines and ran factories in the machinery, shipbuilding, textiles, and chemicals industries, often using technology and production techniques imported from abroad. These plants were transferred over to the private sector after 1877.

aircraft, shipbuilding, light metal, and essential machinery industries. Each law provided for limits on entry into the industry, tax exemptions, subsidies, and protection from imports, as well as Government involvement in designating product lines in those industries. 1/ These laws were designed to build a strong military and to transform the economy to an advanced industrial one. 2/ Because Japan's manufacturers depended on imported raw materials, the Government could effectively influence industrial output by directing scarce foreign exchange to priority sectors and limiting nonessential imports during this period. 3/ The Government sought to upgrade standards in small businesses and used its industrial testing laboratory, as well as government sponsored training activities, equipment leasing, and technological guidance, to do so. Trade associations were formed to provide financial aid to small companies and to help find cooperative solutions to industry problems.

Japan has used many of the same targeting tools in the postwar period. At the end of the World War II, Japan faced high unemployment, shortages of food and energy, a GNP that had dropped to pre-World War I levels, and widespread destruction of its industrial base. To solve these problems, the Japanese Government embarked upon an ambitious campaign to help rebuild the war-torn economy. Its industrial and economic policies were designed to raise the country's international competitiveness in certain manufacturing industries. The Government used its policy tools to shape the underlying determinants of comparative advantage--labor skills, technological level and diffusion, industrial structure, and capital accumulation. 4/ Japan tried to promote innovation and efficiency by encouraging the rapid introduction of advanced technologies into all manufacturing industries. For example, in

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1/ In 1925, the Ministry of Commerce and Industry (now MITI) established a Commercial and Industrial Council, which included business, Government, and academic leaders. The Council proposed ways to improve efficiency, secure industrial financing for key industries, and encourage consumption of domestic goods. Government policy after 1925 encouraged mergers in the paper, steel, and chemical industries. Acquisition and allocation of resources was taken over by the government in 1937 during the Sino-Japanese War. A resources "budget" was formulated each year which covered 400 products and involved allocation of resources to key (generally military) enterprises. In 1939, the Government began to allocate machinery, equipment, and manpower to key industries. Nonessential industries were forced to sacrifice for the favored industries. For instance, the textile industry lost nearly two-thirds of its production capacity, because its machinery was directed to military uses. Based on information contained in Nihon Keizai Shimbun, Series on Industrial Policy, Oct. 4-Nov. 29, 1982.

2/ Chalmers Johnson, MITI and the Japanese Miracle, Harvard University Press, 1982, p. 133.

3/ Wheeler, Pepper, Janow, op. cit., p. 50.

4/ Miyohei Shinohara, Industrial Growth, Trade, and Dynamic Patterns in the Japanese Economy, Tokyo: University of Tokyo Press, 1982, , p. 24.

1952, special tax exemptions which increased manufacturing productivity were allowed for imports of equipment and technology. 1/

Zysman and Cohen explain one of the concepts that guided Japan's postwar reconstruction efforts as follows:

> In order to promote growth, critical sectors--those that by their links to other industries can affect the entire economy--were treated as a form of industrial infrastructure, and treated as the equivalent of roads and bridges in other countries. 2/

The Japanese Government played an active role in promoting cooperation among firms, such as joint purchases of raw materials, standardization of products, and improved quality control. MITI encouraged export industries, such as the camera, textile, and sewing machine industries, and protected the newly emerging industries of the period, such as automobiles, shipbuilding, and electronics. 3/

Different industries have been favored by Japan's industrial policies at different times in the postwar period. From 1951 to 1954, Japan concentrated on economic reconstruction and the building of basic industries: electric power, coal mining, ocean shipping, and iron and steel. From 1955 to 1972, the Government promoted various industries including steel, machinery, electronics, synthetic fibers, chemicals, fertilizers, shipping, automobiles, and cotton spinning.

Japan achieved rapid economic growth and changed its industrial structure from 1952 to 1972 both as a result of these policies and of favorable global economic conditions, such as readily available advanced technology from abroad, cheap and abundant raw materials and energy, and an expanding and open world market. 4/ During this period, Japan's real GNP increased nearly tenfold; the structure of its industrial production shifted from light consumer goods, to basic industry, to heavy industry, and finally to high-value added, high-technology industries; and its productivity increased markedly.

1/ Zysman and Cohen argue that Japanese policymakers framed their policies in the belief that "Government policy can gradually turn a competitive disadvantage into enduring comparative advantage because government policy affects the gradual accumulation of physical and human capacity that underlies production technologies." John Zysman and Stephen S. Cohen, "Double or Nothing: Open Trade and Competitive Industry," Foreign Affairs, summer 1983, p. 1118.

2/ Ibid., p. 1119.

3/ Statement of H. William Tanaka on behalf of the Electronic Industries Association of Japan, in Commission investigation No. 332-162, June 28, 1983, p. 4.

4/ Murakami argues that during the period of rapid economic growth, Japanese firms in major industries were able to exploit decreasing average cost structures, because the long-run risks they faced were quite reduced compared with those of most other industrialized countries. The long-run risks were

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Japan has made notable progress in increasing its labor productivity in manufacturing over the past 15 years. Its labor productivity relative to the United States, is shown in table 2. From 1967 to 1980, Japanese labor productivity rose faster than U.S. labor productivity in 10 of the 12 manufacturing industries shown; the exceptions were apparel and leather products. Whereas in 1967, Japanese labor productivity was 34 percent of U.S. labor productivity, in 1980 Japanese labor productivity was 72 percent of U.S. labor productivity.

From 1952 to 1972, growth was the main goal of the economic policy in Japan. The break with fixed exchange rates in 1971 1/ and the oil shocks of

Table 2.--Index of Japanese levels of manufacturing productivity compared with that of the United States, 1967, 1973, and 1980 1/

(United States=100)

Industry	1967	1973	1980
Iron and steel	49	91	152
Automobiles	20	49	101
Electrical machinery	20	55	95
Chemicals	39	67	89
Instruments	22	34	86
General machinery	34	53	78
Textiles	42	58	74
Leather and products	64	58	50
Pulp and paper	43	59	48
Printing and publishing	42	50	46
Food	24	40	44
Apparel	44	45	39
Total manufacturing	34	53	72

1/ Labor-hour base.

Source: Estimates by the staff of the U.S. International Trade Commission based on Japan Productivity Center, cited in Keizai Koho Center, Japan 1982, Tokyo, p. 63.

(Continued)

4/ lower because Japan could import technology already developed and tested abroad; its financial system spread long-term risks among firms, households, and Government; its labor was more flexible; and finally, its growth was investment led, implying that demand for capital goods and intermediate goods were both high. Yasuke Murakami, "Toward a Socioinstitutional Explanation of Japan's Economic Performance," in Yamamura, op. cit., pp. 8 and 9.

1/ Under the fixed rate exchange system in effect until 1971, the exports of a new industry had no direct short-term effect on the price at which existing industries exported their output. Under the floating exchange rate system adopted in 1971, however, the foreign-exchange earnings of highly productive, new industries exert upward pressure on the yen, which then reduces the price competitivess of older, less productive industries.

the 1970's created new problems and called for the adoption of new economic policy goals. Although its growth rate is still higher than that of any other advanced industrial country, the growth rates of which also halved after 1973, Wheeler, Pepper, and Janow, find that "in relative terms, Japan's economy experienced a more severe slowdown after 1973 than the average of such countries." 1/ Since 1973, Japan's GNP growth has dropped to one-half of that prevailing during 1952-72, and growth in industrial production fell by more than 75 percent. The export growth rate dropped by more than 44 percent and import growth fell by more than 90 percent. These trends mean that, since 1973, exports have accounted for an even higher percentage of industrial output and GNP; imports have declined relative to GNP.

The rank by value of total production of different manufacturing industries in Japan has changed since the first oil crisis in 1973. Since then, the precision and electrical equipment industries have grown at a much faster rate than all the other major manufacturing industries, as shown in table 3.

Table 3.--Rank, by value of total production, of manufacturing industries in Japan, and average annual growth in production, 1973-1981

Post-oil crisis rank 1/	Industry	Pre-oil crisis rank 2/	Average growth rate
			---Percent---
1	Precision machinery	9	19.1
2	Electrical machinery	1	9.7
3	Shipping equipment	2	3.6
4	Chemicals	7	3.4
5	General machinery	4	3.0
6	Average mining industries	10	2.9
7	Foods	4	1.4
8	Nonferrous metals	8	1.0
9	Pulp and paper	12	.4
10	Iron and steel	6	.1
11	Ceramics	11	.2
12	Metal products	5	.8
13	Oil and coal	3	-1.4
14	Textiles	13	-1.5
15	Mining	16	-2.0
16	Lumber and lumber products	15	-3.5

1/ Rank during 1973-81 based on value of total production.
2/ Rank during 1960-72 based on value of total production.

Source: "Change in Lead Role Due to Oil Crisis," Nihon Keizai Shimbun, Oct. 19, 1982, p. 14.

1/ Wheeler, Pepper, Janow, op. cit., p. 3.

Japan adjusted to the second oil shock by sharply increasing the volume of its exports and reducing the volume of imports. 1/ Since the second oil crisis 1978, private domestic demand has stagnated, but exports have increased sharply. 2/ The increase in exports was due primarily to sharp rises in Japan's shipments of machinery, including both autos and appliances; these exports rose by over 59 percent in value from October-December 1978 to April-June of 1981. Exports of machinery accounted for nearly two-thirds of Japan's total exports in 1981 (table 4). During that period, the United States

Table 4.--Changes in Japan's export pattern, by industries, 1970, 1975, and 1981

Industry	1970	1975	1981
Machinery------percent--	46.3	53.9	65.8
Industrial machinery------do----	10.4	12.1	14.9
Electrical machinery------do----	14.8	12.4	18.3
Transportation machinery------do----	17.8	26.1	27.1
Automobiles------do----	6.9	11.1	17.4
Precision instruments------do----	3.3	3.3	5.5
Metals------do----	19.7	22.4	14.7
Steel------do----	14.7	18.3	11.0
Chemicals------do----	6.4	7.0	4.5
Textiles------do----	12.5	6.7	4.7
All others------do----	15.2	10.0	10.3
Total------do----	100.0	100.0	100.0
Total exports------million dollars----	19,318	55,753	129,807

Source: MITI, White Paper on International Trade, 1982. Shares indicate the percent of total exports (in value terms) accounted for by that sector.

1/ The value of Japan's exports rose by 49 percent in the 3 years ended December 1981, and the volume rose by over 30 percent. The price of its imports rose by nearly two-thirds, due entirely to increases in petroleum prices, and the volume fell by 0.2 percent.

2/ In contrast with the situation in the first oil crisis, in the second Japan's wage earners bore the brunt of economic adjustment. During 1978-81, real wages (nominal wages less the rise in consumer prices) rose by less than 2 percent. From July-December 1979 to January-March 1981, real wages actually declined. Kobayashi claims "Japan counterbalanced the worsening terms of trade by bringing down the people's living standard. In a country like Japan which has to depend on trade for survival, elevation of the standard of living results in increased imports. The lowering of real wages played a significant role in curbing imports and stablizing commodity prices. Minoru Kobayashi, the Industrial Bank of Japan, The Japanese Economy in the World, March 1983, p. 55.

became a more important market for Japanese machinery. 1/ Although a variety of targeting techniques have been used to encourage Japan's machinery industries, market forces seem to have played a major role in the growth of these exports. In particular, exports of automobiles and electrical machinery grew rapidly because higher energy costs led to greater demand for fuel-efficient cars and appliances.

Japan's industrial policies have changed to reflect these new conditions. Since 1970, industrial policy has placed growing emphasis on high-technology development--benefiting the computer, electrical machinery, precision-instrument, machine tool, and robotics industries--and on social needs, such as housing and pollution control. 2/ Since the early 1970's, regional interests have been pressing for a broader distribution of employment opportunities. Targeted industries have been the major beneficiaries of recent regional development programs aimed at creating Silicon Valley-type communities in Japan's rural regions.

At the same time, Japan is trying to promote adjustment in declining industries by anticipating problems in those sectors and by working with the private sector to reach long-term solutions when problems arise. This policy has been particularly important since the mid-1970's, as Japan's basic industries faced growing competition from the less developed countries, mainly due to labor costs. 3/ Limits on exports for some of Japan's major industrial products, such as steel, automobiles, televisions, and machine tools, have become increasingly common in major industrial countries in the past 5 years.

1/ Kobayashi, op. cit., pp. 52-61. A similar increase in machinery exports was also seen after the first oil crisis.

2/ In its "Vision for the 1970's," MITI specifically mentioned the following industries: computers, aircraft, industrial robots, atomic-power-related industries, large-scale integrated circuits, fine chemicals, ocean development, office communication equipment, numerically controlled machine tools, pollution prevention machinery, information management services, high-quality printing, automated warehousing, high-quality furniture and clothing, electronic musical instruments, education-related industries, software, and systems engineering. Its vision for the 1980's cites many of the same industries as important, with perhaps more stress on quality of life, energy, and pollution control than in the previous "vision." Other industries mentioned include genetic engineering, cancer treatment, and photosynthesis for food production; new metals, ceramics and textiles; new and alternative energy sources, coal liquefication and gasification; additional work on computer software; microcomputers, semiconductors, aviation and systemizing of manufacturing processes through the combination of electronics and information-processing technology with machinery-related technology. Shinohara, op. cit., p. 32; MITI, Vision of MITI Policies in the 1980's, March 1980.

3/ In 1980, the annual earnings of manufacturing workers in Japan were higher than those in 7 of the top 11 OECD countries, including the United States. Meanwhile, social expenditures, such as social security taxes, have rapidly increased in the past decade. OECD, The Tax/Benefit Position of a Typical Worker in OECD Member Countries, 1980.

Japan's industrial policies in the 1970's and 1980's have encouraged energy-conservative, nonpolluting industries that use skilled labor, particularly the high technology industries. As Japan gets closer to the leading edge of technology, Government research and development activities have increasingly focused on pure research that has economywide applications--for instance, the development of new materials and advanced integrated circuits.

Japan's new focus on labor-saving technology and higher-value-added manufacturing reflects its desire to continue growing despite supply and export constraints. By progressively increasing its level of value added in manufacturing, and by focusing on products in which demand rises faster than income, Japan can maintain production in the face of slow domestic and global income growth.

Japanese Government involvement in the development of high technology industries also is premised on the belief that the market mechanism will not insure an adequate supply of and demand for technology, and will not offer sufficient returns to those who develop new technologies. 1/ For example, on April 19, 1983, Minister of International Trade and Industry Sadanori Yamanaka argued that

> The main thrust of Japanese efforts to develop such technologies rests with the private sector, . . . the government role is restricted to those areas where . . . the long lead times, enormous funding requirements, and high-risk nature of the work make it impossible to expect the private sector to undertake the necessary research.

Japan has also based its involvement in some industries, notably computers, on the "infant industry" argument. 2/

Today, Japan's industrial targeting appears to be the most influential in newly emerging and declining industries. In many of those industries, such as computers and aluminum refining, the United States is currently the world's technological leader or most efficient supplier.

1/ For example, in Organization for Economic Cooperation and Development, The Industrial Policy of Japan, Paris, 1972, p. 21, the Vice Minister of International Trade and Industry, Y. Ojimi states: "it is almost impossible to expect that optimimum supply arrangements will be established by means of the ordinary price mechanism when the demand is so enormous and complicated, or when it is of a social or of a nonrecurring nature. Consequently, Government guidance will be needed. . . . Examples of new areas in which the price mechanism alone is inadequate are . . . large-scale resource development and technological development, in which it is difficult to absorb enough risk capital by way of market distribution of capital; and the area of intangible goods, such as the research and development industry and the information industry, where the mechanism of rational determination of prices is weak. Here there is a need for study of planned demand-supply systems in which the role of government will replace or partially revise the price mechanism."

2/ Ibid., p. 27.

Successful industries are likely to be more independent of government policy influence; their high profitability and well-developed international markets have relieved them from dependence on government "carrots," such as favored tax and loan treatment, and from vulnerability to government "sticks," such as denial of building permits. However, some industries have continuously benefited from Government policies. The computer industry, for example, has benefited from a series of Government targeting efforts in products such as peripherals, central processing units, and advanced integrated circuits.

Industrial policy formulation

General economic policy in Japan is formulated by the Economic Planning Agency (EPA); industrial policy by MITI; and monetary and fiscal policy, by the Ministry of Finance (MOF) and the Bank of Japan (BOJ), Japan's central bank.

The Economic Planning Agency.--The EPA is an agency within the Prime Minister's office, and its Director has cabinet rank. The EPA sets macroeconomic growth goals for the economy--including growth in trade, GNP, production, prices, consumption, and Government income and expenditures--in economic plans which generally cover a 5-year period. These plans have been likened to the Economic Report of the President in the United States because they provide a policy framework for the future, as well as data on the direction of the economy, that can be used by private firms and policymakers in their decisionmaking. The plans are broad and nonbinding. The issuance of an economic plan by the EPA does not imply that Government resources will be allocated to achieve the stated goals; they do not formally determine budget allocations or Government capital formation. 1/ Rather, they are a vehicle to promote discussion of national economic goals and on the direction of the economy in the future.

Japan has formulated nine economic plans in the postwar period. The objectives of these plans have included modernizing production facilities, promoting heavy industries, reducing dependence on imports, promoting exports, improving infrastructure, rectifying the dual structure of the economy, modernizing low-productivity sectors (e.g., the agriculture and distribution sectors), stabilizing prices, and promoting social development.

The Ministry of International Trade and Industry.--MITI has principal responsibility for formulating Japan's industrial policy and ensuring its success. Along with its responsibilities for the conduct of industrial policy, MITI is responsible for trade policy, environmental regulation, regulating distribution systems, patent policy, energy and natural resource policy, regulation of electric power and gas utilities, small business, and regional development. Since the mid-1960's, MITI officials have increasingly influenced business decisions on production and investment through consultation and administrative guidance, and they are generally not authorized to compel compliance with their wishes (except in a few narrowly defined instances). 2/ In 1982, MITI's total budget was 791.2 billion yen, or roughly $3.6 billion, representing 1.5 percent of the total General Account budget in the year.

1/ Trezise, op. cit., p. 15.

2/ Indeed, MITI failed in its attempts to consolidate auto companies in the 1960's and computer companies in the 1970's.

The Industrial Structure Division of MITI's Industrial Policy Bureau has prime responsibility for the formulation of industrial policy. The process begins with deliberations by MITI's Industrial Structure Council, an advisory body to the Industrial Structure Division, which is composed of representatives from Government, industry, labor, consumer groups, and academia. The Council, which was created in 1961, formulates MITI's long-range plans, or "visions." 1/

Three economywide visions have been issued in the postwar period, covering the 1960's, 1970's, and 1980's. They set forth the basic goals of industrial policy in the coming decade and the criteria to be used in selecting industries to be fostered by the Government. MITI's visions are different from EPA's economic plans, because they identify specific industrial sectors to be targeted for growth and may include production targets by industry. Like EPA plans, they are nonbinding and do not authorize commitments of Government resources.

The Industrial Structure Council also publishes annual reports on problems facing the Japanese economy and particular industries. The annual report provides important information on the prospects and problems for growth in industries. It often serves as a centerpiece for industrial policy. The annual reports include careful studies of cost structures of important industries, at different scales of production, along with similar information for foreign countries. 2/ MITI and EPA have often projected different economic growth rates and thus predicted different problems in industrial development.

Industrial policy has been used to encourage growth or adjustment in specific industrial sectors. MITI analyzes a variety of factors when attempting to pick which industry sectors it will target, 3/ such as:

(a) Value added.--Government policy favors industries that produce a high percentage of the final value of output. Computers, telecommunications equipment, aerospace, and medical electronics are all examples of industries where purchased components are a relatively small share of the product's selling price;

(b) Feeder effects.--The Government encourages those industries that produce materials or components--such as composite materials, fine ceramics, biotechnology, and microelectronics--that are used by major existing industries (for instance, the chemical, machinery, automobile, computer, and consumer electronics industries);

(c) Economies of scale.--If expansion of plant scale is likely to increase the efficiency of the industry, Government policy may act to encourage investment in that industry;

1/ There are no representatives from the Japanese Fair Trade Commission (JFTC) on these councils or their subcommittees. MITI officials often prepare preliminary drafts of those visions.

2/ Statement of H. William Tanaka on behalf of the Electronics Industries Association of Japan, p. 4.

3/ See the statement by Vice Minister for International Trade and Industry, Y. Ojimi of MITI in OECD, The Industrial Policy of Japan, Paris, 1972, p. 15.

(d) Importance to the economy.--Consideration is given to industries whose output is essential to the economy, such as petroleum products or nuclear power.

Iron and steel, aircraft, automobiles, electric power, petrochemicals, nonferrous metals, machinery, electronics, and shipbuilding are among the industries that have been targeted by the Japanese Government at one time or another. In recent years targeting has shifted more to high technology industries, such as computers, numerically controlled machine tools, robots, and semiconductors.

Details on the methods to be used to foster growth in the selected industries are worked out in the industry subcommittees of the Industrial Structure Council. These subcommittees formulate sector specific plans or visions. 1/ The visions project trends in the global and domestic markets (such as production, demand, and prices) and the resources needed (such as funding and equipment) to achieve growth targets.

Visions were drawn up by MITI for at least 10 industries or industrial sectors in the past decade, including: aluminum ingot; aluminum refining; basic raw-materials industries 2/ clocks and watches; housing; information industries (including computers); petrochemicals (including polyethylene, vinyl chloride resin, and chemical fertilizers); iron and steel; soda ash; apparel and textiles (including synthetic fiber and cotton yarn); pulp and paper; and, color television sets. Most of the industries for which visions were formulated were considered structurally depressed at the time the visions were drawn up, and thus they were not being targeted for further rapid growth. Other Ministries may also produce industry specific visions. For instance, the Science and Technology Agency completed a vision for the aerospace industry in mid-1983. Visions are currently being drawn up for the textile and distribution industries.

The actual implementation of the plans outlined in the visions is left to the private sector, and projections of the financing needs for an industry do not commit Government or private funds to achieve the vision's goals. MITI does have some influence on Government financing: the Industrial Finance Division of the Industrial Policy Bureau of MITI makes recommendations on which businesses and projects should be given low-interest loans through the Ministry of Finance's Fiscal Investment and Loan Program (FILP), discussed below.

1/ Other Ministries are responsible for the development and monitoring of certain industries. For instance, the Ministry of Posts and Telecommunications supervises Nippon Telephone and Telegraph and the telecommunications industry; the Ministry of Transport is responsible for the shipping and rail industries (both production and services); and the Ministry of Health and Welfare oversees the pharmaceutical industry.

2/ One vision was produced for all basic raw-materials industries in late 1982. The industries covered include the petrochemical, aluminum, chemical fertilizer, open hearth furnace steelmaking, and manmade fiber industries--all considered depressed industries in Japan. Separate visions for each have also been developed for each industry.

MITI's budget accounted for only 1.6 percent of the total Japanese Government budget in 1983. A breakdown of MITI's spending shows that the bulk of that spending goes to small businesses. (Small- and medium-sized businesses accounted for over 45 percent of the value of total Japanese manufacturing output in 1982.) MITI has committed funds in varying amounts, through grants and other means, in pursuit of industrial policy goals over the past 25 years. As illustrated in table 5, these expenditures have accounted for 51 to 92 percent of the total MITI budget, with the bulk of those funds oing to small- and medium-sized businesses 1/ and energy development programs. In the past 10 years, over 20 percent of MITI's budget has been used for technology development.

Table 5.--MITI spending on industrial targeting, resource development, and infrastructive development programs as a share of total budget expenditures of MITI, by activities, selected years, 1952-79 1/

(In percent)

Activity	1952	1955	1960	1965	1970	1975	1979
Trade promotion and cooperation	12	12	14	10	12	6	3
Medium and small enterprise programs	29	13	14	24	39	35	32
Promotion of technology	8	14	14	16	24	23	20
Resource and infrastructure development	2	3	10	14	-	9	-
Energy development	-	-	16	24	13	8	33
Improvement in environment and quality of life	-	-	-	-	-	7	4
Total	2/ 51	42	68	88	88	88	92

1/ Does not include direct investment in industry and general administrative expenditures, which accounted for most of the differences between the total and 100.0 percent.

2/ An additional 5 percent of MITI's budget was spent on the bicycle and automobile industry.

Source: Submission by Bradley M. Richardson, Commission Investigation No. 332-162, June 1983, p. A-1, based on information in MITI, Yearbook, various issues.

The Ministry of Finance.--The Ministry of Finance influences industrial policy in several important ways. Through its control of financial institutions, including the Government's own financial organs, it can indirectly and directly affect capital flows to particular industries. As the broker in Japan's budget battles, it exerts considerable influence over government spending to meet industrial policy goals. As part of its responsibility for tax policy, the Ministry of Finance referees negotiations on which activities will be encouraged by special tax measures and what products will qualify as meeting these goals.

1/ For the manufacturing industry, small- and medium-sized businesses are defined as firms with fewer than 300 persons employed or with less than 100 million yen in capital.

The Japanese Government budget consists of two parts: the General Account budget, consisting of funds obtained through taxes, payments to the Treasury, and Government bonds; and the Fiscal Investment and Loan Program (FILP), a capital budget, consisting of funds obtained through the postal savings system and from the pension funds for use in meeting specific economic and social goals (table 6). Together, the two budgets have directed a sizable and increasing proportion of the total Japanese GNP through Government channels. In 1980, Government (including regional government) accounted for 34 percent of the GNP. The Government's share of gross domestic capital formation has ranged from 20 to 30 percent in the postwar period. The bulk of these investments are used to fund public works, like roads and bridges. 1/ Direct government funding is not a significant factor in other industries. Saxonhouse notes that a survey of 13 manufacturing sectors in 1977 and 1978 showed that only one industry--food processing--received direct grants and subsidies greater than 0.1 percent of the gross domestic product originating in that sector. 2/

Table 6.--The general account and Fiscal Investment and Loan Program (FILP) budgets, fiscal years 1978-82

Item	1978	1979	1980	1981	1982
General account budget-billion yen-	34,295	38,600	42,589	46,788	49,681
FILP--------------------do----------	14,888	16,833	18,180	19,490	20,289
Ratio of the FILP budget to the general account budget--percent--	43	44	43	42	41

Since 1955, the majority of the General Account budget has been used to fund local governments, social security, and public works. Industry-related expenditures (including agriculture) accounted for between 6.0 percent of Government expenditures in 1955 to 11.6 percent in 1975. One-third of these expenditures went to agriculture in 1975. About 5 to 7 percent of the General Account budget was thus left to be spent on manufacturing and service industries. Small businesses received the bulk of those funds. 3/

The FILP gives lending and investment authority to a host of government lending institutions including the Japan Development Bank (JDB) and the Small Business Finance Corporation (SBFC). Some 14 percent of corporate financing came from these Government financial institutions in 1982. Most of the money directed through the FILP goes to fund local governments, small business, and construction of houses and infrastructure. Approximately 26 percent of the FILP budget is directed to industrial policymaking banks, including the Export-Import Bank of Japan (JEXIM), the JDB, and the SBFC. These Government financial institutions have Government-business-academic advisory committees

1/ Trezise, op. cit., p. 15.
2/ It received grants and subsidies totaling 0.6 percent of the GDP originating in that sector. Saxonhouse statement, op. cit., p. 5.
3/ Noguchi, op. cit., p. 129.

that shape the sectoral allocation of loans, and in this context, the financial needs of promising new industries play an important role. 1/

In addition to the General Account, there were 38 Special Account budgets as of 1981. Each Special Account is established by law and has its own revenue sources, which may include General Account funds. Transfers from these accounts are used for various purposes, including pollution abatement, energy exploration and conservation measures, and development of infrastructure. 2/

Targeting tools

Japan has used a variety of techniques to implement its industrial policies and target industries, including--

(a) home-market protection through foreign-exchange allocation, tariffs and quotas on goods, restrictions on direct investment by foreigners, "buy Japan" policies, and closed Government procurement;

(b) tax policy through tax deferrals or exemptions, which encouraged production and consumption of favored products, expansion of plant scale through mergers and joint ventures, and exports;

(c) financial assistance through direct grants, indirect subsidies through low-interest or risk-free loans, and favored access to foreign-exchange and bank financing;

(d) antitrust exemptions, which have allowed formal cartels, import and export consortia, and joint research and development associations; and

(e) science and technology policies aimed at developing advanced technologies and promoting the wide diffusion of such technology. Currently, cooperative R&D projects, those jointly financed by government and industry, are Japan's most visible science and technology targeting tools.

Home-market protection.--Home-market protection was an important targeting technique until the mid-1960's. Such actions took the form of complete import controls through foreign-exchange allocation until the

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1/ Saxonhouse statement, p. 13.

2/ The proceeds from Japan's gambling, motorcycle and bicycle racing funds were transferred to a foundation which used the bulk of these funds to support hospitals and schools. Some of the foundation's funds were directed to various industry associations. The associations use these funds to finance specific projects for research, rationalization, and export promotion. These funds are separate from the General Account and FILP budgets. The Japanese machine tool industry trade association, the Japan Machine Tool Builders' Association, received no more than $500,000 a year from this source, which it used to translate machine tool brochures for international expositions. (Based on information in Magaziner and Reich, op. cit., p. 292, and in Saxonhouse, op. cit., p. 8, derived from information contained in "Machine Tool Charges Against the U.S. Split U.S. Industry's Officials," The Wall Street Journal, Mar. 29, 1983.)

mid-1960's; "buy Japan" policies, which prohibited the import of given items unless a comparable product was unavailable from Japanese firms until the early 1970's; quotas on many products until the early 1970's; high tariffs on some items until 1973; limits on direct foreign investment in Japan until 1973; and closed Government procurement until 1981. By the mid-1960's, most of Japan's formal trade restrictions were being removed, and by the early 1970's, formal trade barriers were comparable with those in other industrialized countries.

Japan has not used formal trade restrictions to protect many of its successful industries, such as consumer electronics, automobiles, steel, and machine tools, for some time. Some industries were protected until the late 1970's; the computer industry, for example, was protected by tariffs, quotas, and investment restrictions until 1976. Since that time, Japan's trading partners have complained about a variety of nontariff barriers to trade (e.g., the lengthy and rigorous inspection of foreign goods at port and the procedures necessary to obtain certification that foreign goods meet Japanese standards). Recent actions by the Japanese Government have improved certain customs procedures and standards certification requirements. Despite these changes, Japan continues to import fewer manufactured goods (relative to its GNP) than any other industrialized country. 1/

Formal barriers to trade.--One of the most powerful mechanisms used by Japan to regulate trade and to protect the home market in the postwar period was the allocation of foreign exchange for import purchases. The Foreign Exchange and Foreign Trade Control Law was enacted in 1950 and provided the Government with the means to control the types and volume of goods and technology that were imported and to direct foreign exchange to industries and activities considered vital to the economy. 2/ Foreign exchange allocation was used to support the value of the yen in international currency markets in the face of great demand for imported products and limited foreign exchange earnings from export sales. 3/ When Japan moved into a trade surplus in 1965, foreign exchange rationing diminished in importance.

1/ Saxonhouse claims that "If the Japanese experience is properly normalized for Japan's capital stock, labor force, geographic position, and material resource endowment, there is little left to be explained by industrial policy . . ., or for that matter by trade barriers." See Saxonhouse statement, op. cit., p. 36.

2/ This was achieved by the use of a foreign-exchange budget, which was formulated each year by the Ministry of Finance. The budget established the type and volume of goods to be imported, the source of those imports, and the currency of payment. Following approval of the foreign-exchange budget, MITI issued a list of approved import items. Importers were then required to obtain import licenses and to post deposits equal to a certain percentage of the value of the proposed imports. The percentage was determined by MITI. The system was intended to discourage speculation in imported merchandise, but by raising the margin, it could also be used to suppress demand for imports. Failure to import the goods resulted in forefeiture of the deposit unless legitimate cause could be demonstrated. General Accounting Office, Industrial Policy . . ., pp. 33-35.

3/ Katsuro Sakoh, "Industrial Policy, Trade, and Economic Growth: The Japanese Experience," remarks before the CATO Institute's Conference, "International Trade: Free Markets or Protectionism?" Washington, D.C., Sept. 9-10, 1983, p. 25.

In the 1950's, Japan also used link trading to control imports. Under this system, exporters of designated commodities were authorized to import various types of goods. Because foreign exchange and import restrictions were in effect, imported goods commanded high prices in the domestic market and provided the favored exporters with added revenues. Since the amount of goods allowed to be imported depended on the quantity of goods exported, the link system provided an incentive to increase exports. The link trading system was abandoned in 1954 because of foreign objections. Exporters were also permitted to retain a percentage of the foreign exchange generated from their exports, which could be used, for example, to finance overseas marketing efforts or to purchase other import goods. This practice declined in significance when foreign exchange became more readily available in the late 1950's.

Throughout the 1950's and early 1960's, only industrial machinery which could not be produced in Japan, such as gears, bearings, and valves, and larger equipment, such as paper machines, steel rolling mills, and machine tools, could be imported. 1/ This system was abandoned in the mid-1960's.

In 1960, the Government adopted a plan aimed at liberalizing 80 percent of imports within 3 years; items were liberalized on a product-by-product basis through placement on automatic import license approval list. 2/ By 1964, 93 percent of Japan's imports were on an automatic approval basis. 3/ The Government, however, was careful to protect industries considered central to Japan's future economic development by applying special license review for products such as consumer electronics, heavy electrical machinery, and automotive imports.

In 1963, the Japanese Cabinet adopted measures to encourage the use of domestic manufactured products. These measures remained in effect until September 1972. Administrative guidance was used to encourage Japanese firms to purchase domestically produced products. Fortunately, such guidance was not always followed. For instance, MITI tried unsuccessfully to persuade Sony to rely on domestically produced vacuum tubes instead of imported transistors for its consumer electronic products. 4/ Sony's transistor radios have since become world-renowned. In 1964, Japan replaced its foreign-exchange allocation system with a system of quantitative quotas on imports.

1/ Raymond Ahearn, "Industrial Policy: Background and Evaluation of Foreign Experience," CRS Report 81-85, p. 19.

2/ However, Japanese Government policy when import and investment controls were to be lifted was specifically geared to increasing the competitiveness of Japanese manufacturers, thus limiting the chance of import success. These policy actions included promotion of mergers to increase the viability of firms in the automobile industry; financial support for plant expansions to increase economies of scale in the steel industry; and licensing agreements which kept many of the most advanced international competitors out of the market for a certain period after import liberalization, as in semiconductors. OECD, The Industrial Policy of Japan, Paris, 1972, op. cit., p. 17.

3/ Shinohara, op. cit., p. 27.

4/ Magaziner and Hout, op. cit., pp. 53-54.

Like most other countries, Japan currently employs tariffs and quotas on imports that protect the weakest, least competitive sectors of Japan's economy, particularly agriculture. Japan's average tariff level is now lower than that of either the United States or the European Community, as is the number of industrial items subject to quota restrictions.

Japan's share of imports and exports in national income is higher than that of the United States. The ratio of the value of Japan's imports to GNP was about 12.5 percent in 1980, compared with 8.4 percent for the United States and 17.7 percent in France. Exports represented 13.6 percent of Japan's GNP in 1980, compared with 9.8 percent for the United States and 20.6 percent in France. 1/

As is shown in the following table, the number of Japan's import quota restrictions declined rapidly during the 10 years from 1962-72. This number has remained at about 30 since that time. In April 1964, Japan had 174 items subject to quota restrictions; by October 1969, the number had been reduced to 118 (table 7). Japan removed quotas on steel in 1961 and on color televisions in 1964. In 1965, quotas on imported passenger cars were removed. By October 1971, the number of items under quota was reduced to 40; machine tools, printing machines, film, and typewriters were among the items removed from the quota list that year. Today, Japan retains formal import quotas on 27 items including 22 on agricultural products, livestock, leather, and related products.

Table 7.--The number of Japanese quota restrictions, 1962-83

Period	GATT residual import quota restrictions
April 1962	466
April 1963	197
April 1964	136
October 1965	122
May 1966	126
October 1968	121
October 1969	118
September 1970	90
April 1972	33
April 1973	32
November 1973	31
October 1974	30
December 1975-present	27

Source: Bradley M. Richardson, op. cit., p. A-11, based on MITI data.

Japan's tariffs have also been lowered significantly. In 1958, one-fifth of the items in Japan's tariff schedule were duty free, with raw materials the most likely to receive duty-free treatment. The remaining items were subject to duty rates ranging from 5 to 50 percent ad valorem. Lower rates normally

1/ Bank of Japan, Comparative International Statistics, 1982.

were applied to such items as drugs, foodstuffs, and raw materials; higher rates applied to manufactured goods. During the 1950's and 1960's, the Government periodically granted temporary exemptions from or reductions in duties on imported products that were needed for reconstruction, such as raw materials and industrial machinery.

At the conclusion of the Kennedy round in 1971, Japan's average tariff rate fell to about 6 percent. Its average tariff level for mining and manufactured products was 9.9 percent as a result of the Kennedy round tariff cuts (compared with 8.2 percent in the United States and 9.7 percent in the European Community (EC)). As a result of the Tokyo round tariff negotiations, Japan's average tariff on manufactured goods will be about 5.5 percent by 1987, compared with 6 percent for the United States and 7 percent for the EC. 1/ Hence, full implementation of the Tokyo round tariff reduction agreements in 1987 will leave Japan with a trade weighted average tariff level lower than that of the United States and the EC.

Japan's tariffs have declined markedly during 1963-83, as indicated by the average tariff rate for all imports and dutiable imports, shown in table 8.

Table 8.--Japan's average duty rates, 1/ 1963-81

(Percent ad valorem)

Year	All imports	Dutiable imports
1963	7.3%	20.9%.
1964	7.7%	19.6%.
1965	7.3%	20.1%.
1966	7.1%	20.5%.
1967	7.3%	19.5%.
1968	7.1%	18.7%.
1969	7.1%	18.1%.
1970	6.9%	17.0%.
1971	6.6%	14.5%.
1972	6.3%	13.8%.
1973	5.0%	10.2%.
1974	2.7%	5.3%
1975	2.9%	5.4%.
1976	3.8%	6.0%.
1977	3.3%	6.8%.
1978	4.1%	7.3%.
1979	3.1%	5.4%.
1980	2.5%	4.3%.
1981	2.5%	4.3%.

1/ Average tariff rates are calculated using tariff revenue as a share of total imports and as a share of dutiable imports.

Source: Bradley M. Richardson, op cit., p. A-12. Based on Ministry of Finance Data.

1/ Gary R. Saxonhouse, "Evolving Comparative Advantage and Japan's Import of Manufactures," in Kozo Yamamura, ed., op. cit., p. 247 (based on MITI and MOF data).

During the past 15 years, tariffs on some items have been reduced dramatically. Lower tariffs generally were tied to increased Japanese production capability in certain products, such as in autos and machine tools. For instance, the tariff on small cars was 40 percent in 1968; by November 1972, it had dropped to 6.4 percent; in 1980, the tariff fell to zero. Until 1975, protective tariffs and quotas applied to imported computers and integrated circuits. As a result of the Tokyo round, tariffs on these items are now comparable with U.S. rates and lower than EC rates. Japan eliminated its tariff on imported machine tools on April 1, 1983. High tariffs remain on some items, particularly agricultural products.

Japan's tariff rates on certain industrial products are shown in table 9; changes occurred in the tariff schedule in years listed.

Table 9.--Japanese rates of duty, by specified items and by specified years, 1968 to 1983

(Percent ad valorem)

Item and year	Rate of duty
Computer mainframes:	
1972	13.5%.
1978	10.5%.
1980	9.8%.
1981	9.1%.
1982	7.0%.
1983	4.9%.
Computer peripherals:	
1972	22,5%.
1978	17.5%.
1982	10.3%.
1983	6.0%.
Automobiles:	
1968	40.0%.
1972	6.4%.
1980	-
Color television receivers:	
1972	4.0%.
1983	-
Steel coil:	
1972	7.5%.
1978	5.0%.
1982	4.9%.
Synthetic textiles:	
1972	10.0%.
1973	8.0%.
Machine tools:	
1972	6.5 to 15.0%.
1980	4.7 to 7.9%.
1982	4.0 to 7.5%.
1983	-

Source: Submission by Bradley M. Richardson, op. cit.

Japan's current tariffs on certain products are compared with those of the United States and the EC in table 10. As can be seen in the table, Japan's tariff rates on most of the items shown are comparable with those of the United States.

Table 10.--Tariffs in Japan, the United States, and the European Community, by specified items, 1983

(Percent ad valorem)

Item	Japan	United States	European Community
Autos	-	2.8%	10.6% to 21.3%.
Parts of autos	-	1.3% to 16.3%	5.3% to 12.3%.
Trucks	-	4.0% to 25.0%	7.0% to 22.0%.
Computer mainframes	4.9%	4.7%	5.94%.
Computer peripherals	6.0%	4.7%	11.62%.
Parts for computers	4.9%	4.9%	5.3% to 8.9%.
Semiconductors	4.2%	4.2%	17.0%.
Optic cables	8.1%	9.3%	16.3%.
Machine tools	-	5.0% to 6.0%	2.0% to 9.0%.

Source: MITI.

Note.--Japan's tariffs are applied on the value of imports on a c.i.f. basis as are those in the European Community. In the United States, the value of imports is calculated on an f.a.s. basis, generally resulting in lower duties than would be paid under a c.i.f. basis.

Nontariff barriers.--The existence of various nontariff barriers to imports has been a source of friction between the United States and Japan. Demands for excessive documentation and rigid adherence to regulations by Japanese Customs officials has delayed entry of many products. Product-approval requirements have delayed entry of electronic and electrical goods, transportation machinery, machine tools, and pharmaceuticals in Japan. Emphasis on design rather than performance criteria in formulating standards has served to exclude some items. 1/ As a result of negotiations between the two sides, substantial progress has been made in removing Japan's nontariff barriers to trade, particularly in the standards and certification area. 2/ Nevertheless, Japan's imports of manufactured goods are low relative to its

1/ For a detailed treatment of Japan's trade barriers see: Report of the Japan-United States Economic Relations Group, January 1981; United States Trade Representative, Japanese Barriers to U.S. Trade and Recent Japanese Government Initiatives, November 1982; and USITC, Operation of the Trade Agreements Program, 1982.

2/ In May 1983, Japan established a new national product approval policy that provides foreign suppliers with treatment equal to that provided domestic suppliers. Some of the product areas covered by the revisions are electrical and electronic goods, agricultural and industrial chemicals, consumer products, processed foods, pressure vessels, cosmetics, pharmaceuticals, medical devices, and motor vehicles.

GNP, and the bulk of Japan's imports from the United States are of food and raw materials. Certain factors, such as distance from major suppliers of manufactured goods and its dearth of resources, explain why Japan's imports of manufactures are lower (relative to its GNP) than those of all other OECD countries.

Closed Government procurement.--There are 115 public corporations in Japan, with a combined budget totaling one-half of the Japanese Government's annual General Account budget. For years, these corporations followed explicit "buy Japan" policies, which excluded bids from foreign suppliers. Since the MTN Government Procurement Code went into effect in 1981, more informal barriers have served to limit imports, such as long-time ties between Ministries and their domestic suppliers. However, some progress in opening the Government market to foreigners has been made. 1/

The Government Procurement Code applies to purchases valued in excess of 150,000 Special Drawing Rights (equivalent to roughly $158,000 in 1983). Procurement within Japan's central Government is not conducted by a central purchasing agent, like the General Services Administration in the United States, and contracts are widely dispersed. Thus, a large part of tenders fall below the threshold for coverage under the Code.

Small- and medium-sized businesses receive special treatment under Japan's government procurement system. Each year, the Cabinet sets a target for procurement from small- and medium-sized businesses by all government entities. Targets are not set for individual government agencies, and the agencies are not obligated to purchase the target amount from small and medium sized businesses. Nevertheless, the goals have been substantially met in each of the past three years. In 1980, the goal was 36.5 perent, actual procurement from such firms was 36.3 percent of all procurment; in 1981, the goal was 36.8 percent, while actual procurement was 37.1 percent; and in 1982, the goal was 37.2 percent, and actual procurement was 37.0 percent. Associations of firms that are characterized as small- and medium-sized businesses are considered to be part of the small- and medium-sized business sector. For instance, a cooperative research and development association made up of such firms that develops a product can jointly submit a bid to supply the Government with that product; if the Government purchased the product from that association, it would be considered a purchase from a firm within the small- and medium-sized business sector.

The legislation that implemented the Code in the United States stipulates that producers from major industrial countries that do not provide adequate reciprocal opportunities to U.S. suppliers will be barred from U.S. procurement for covered contracts. U.S. suppliers have been dissatisfied with the relatively low value of Japanese purchases since the agreement has been in force.

The procurement practices of Nippon Telephone & Telegraph (NTT), Japan's telecommunication monopoly, have been a particular source of friction between the United States and Japan. NTT has developed a family of suppliers, dominated by Hitachi, Fujitsu, Nippon Electric Corporation, and Oki. About half of its purchases are from these Japanese telecommunications manufacturers.

1/ United States Trade Representative, op. cit., p. 62, The Economist, Aug. 6, 1983, p. 57.

On December 16, 1980, Japan agreed to place certain NTT procurement under the Government Procurement Code and to conduct other NTT procurement practices in a manner that would conform with code requirements. As part of the agreement, Japan included off-line telecommunications equipment such as data terminal equipment, off-line computers, PBX's, and facsimiles under code coverage.

Purchases of foreign equipment have totaled only about 1 percent of NTT's $3 billion in annual orders over the past few years, but since Japan's accession to the MTN Government Procurement Code, the level of orders from foreign suppliers has risen. Although only 4.4 billion yen, or roughly $20 million, in equipment orders were placed with foreign suppliers by NTT in fiscal year 1981, the figure more than doubled in fiscal year 1982 to some 11 billion yen, or roughly $44 million. Nearly all of NTT's foreign purchases were from U.S. suppliers.

The U.S. portion of NTT's $3 billion in annual purchases amounted to $15 million in 1981 and $40 million in 1982, 0.5 and 1.3 percent, respectively, of total NTT procurement in those years. Because of the low value of purchases by NTT from U.S. suppliers, the U.S. Government is considering not renewing the Government Procurement Agreement with Japan when it expires on December 31, 1983. 1/ Some U.S. interests claim that Japan has gotten much more out of the agreement than the United States has, because Japan sold 300 million dollars' worth of telecommunications equipment to the United States in 1981 and $900 million in 1982. However, only $20 million, or less than 2 percent, of that equipment was purchased by the U.S. Government. The remainder was purchased by private firms that are not covered by the Government Procurement Agreement. Therefore, cancellation of the Agreement would seem to have little effect on Japanese sales of telecommunications equipment to the United States. Furthermore, the U.S. market is expected to grow dramatically with the breakup of A.T. & T., which will permit independent phone companies as well as subscribers to buy telecommunications equipment in an open market. NTT is covered by the Government Procurement Agreement, but A.T. & T. is not, so U.S. telecommunications manufacturers appear to have a greater stake in seeing the Agreement continue beyond its expiration on December 31, 1983.

In the 2 years from January 1981 to February 1983, 33 foreign companies have become designated suppliers of certain equipment to NTT, including Northern Telecom, Rolm, ITT, Memorex, General Electric, and Motorola. However, such industry giants as A.T. & T., IBM and Western Electric, have yet to bid on major NTT contracts. 2/

On March 7, 1983, NTT said that it was taking further measures to open NTT procurement to foreigners by making the following policy changes: NTT will now (1) accept applications in English; (2) accept applications in its New York office; (3) extend the application period by 2 to 3 months for such big-ticket items as facsmile equipment, PABX's, modems, and terminal equipment; (4) be more flexible in formulating specifications for the products it wishes to procure; (5) open more procurement to foreign bidders by ordering several years' supplies of equipment (thus raising the value of the

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1/ Washington Post, Sept. 14, 1983.

2/ Prudential Bache Securities, "Japan's Telecommunications Industry--Present and Future", May 1983, p. 21. IBM reportedly sold about 1 million dollars' worth of equipmment to NTT in 1981.

procurement and bringing more of it under the scope of the Government Procurement Code); and (6) make procurement announcements simultaneously in Japan and the United States. It is too early to tell whether these changes will result in increased sales to NTT by American firms.

Administrative guidance and trade.--The Japanese Government has used administrative guidance to encourage private firms to take actions that it deems useful or necessary. Although such guidance is not compulsory, it has helped achieve a variety of industrial targeting purposes. At one time, guidance was used to temper competition and to encourage the purchase of domestically produced manufactured articles. More recently, guidance has been used to influence trade and to encourage companies to participate in joint R. & D. projects. Administrative guidance has been ineffectual in a number of instances. For instance, such guidance failed to limit entry in the automobile industry in the 1960's.

Administrative guidance is the practice of issuing instructions to companies within a ministry's jurisdiction. The instruction can range from directives to requests, warnings, suggestions, and encouragements. Administrative guidance is limited in that the companies being guided must fall under the ministry's legal jurisdiction, that the guidance not violate the law (including the Antimonopoly Law), and that the guidance not infringe on the prerogatives of other agencies.

From the early 1960's through the early 1970's, administrative guidance was mainly used to coordinate capital investments or to maintain prices at reasonable levels. For instance, after the first oil crisis in 1973, administrative guidance was used to restrain price increases for basic consumer goods, such as soap, detergent, and paper products. Today, most publicly known examples of administrative guidance have to do with trade. For example, in mid-1981, MITI apparently issued administrative guidance urging specialty steel producers to increase consumption of domestically produced ferrochromium. In late 1981, it was charged that MITI guidance was blocking imports of ammonia by chemical fertilizer manufacturers. MITI also used administrative guidance to restrict naptha imports in 1982. Guidance may be used to control exports, but such cases are likely to go unpublicized because of potential antitrust problems in the United States and West Germany.

Guidance may be given to increase domestic production of critical materials or components that are in short supply. For instance, MITI says that it issued administrative guidance to encourage firms to increase production of steel mill products, cement, polyvinyl chloride, and detergents in response to the hoarding and shortages that took place after the first oil crisis in 1973. In 1983, MITI apparently issued guidance to semiconductor manufacturers to increase their production of semiconductor chips in order to satisfy burgeoning demand by computer manufacturers. Demand for semiconductors has risen so fast in 1983 that manufacturers are having a hard time keeping up with it, thus slowing the production of computer industry, among others.

The Japanese Government claims that its administrative guidance to firms is intended to the give the Government and the firms involved flexibility in dealing with problems that the industry or the economy faces at any given moment. The Government also points out that such guidance does not exempt a company from antitrust scrutiny and does not have the force of law. Compliance with guidance is voluntary.

The Japanese Government claims that it usually restricts its guidance to those areas where action that is good for the industry and the country might not occur without Government intervention. For example, last year, the Government advised the machine tool and semiconductor industries to limit their shipments to the United States in order to avoid trade friction. In those instances, Government involvement ensured that no one firm would bear the burden of limiting its shipments and that action by one firm, for instance to increase its shipments or lower its prices, would not prompt the filing of trade complaints in the United States, which might result in trade restrictions on all Japanese producers.

Restrictions on foreign direct investment.--Restrictions on foreign direct investment--i.e., establishment of wholly or jointly owned foreign subsidiaries in Japan--also served to protect Japanese domestic producers from competition from foreign firms. These restrictions have been sharply reduced since 1973.

Entry of foreign firms in leading modern industries in postwar Japan was virtually prohibited. 1/ Instead, economic development through the acquisition of foreign technology was emphasized. The Foreign Investment Law of 1950 allowed the Japanese Government to regulate the flow of foreign capital and technology into Japan. The law set forth criteria, both positive and negative, for approving foreign investments. 2/ The effect of the law was to severely restrict foreign direct investment in Japan. Restrictions on virtually all foreign investment were in effect until 1967.

Changes in Japan's investment rules are spelled out in detail in appendix F. In 1967, Japan decided to allow automatic approval for up to 50 percent foreign ownership in 33 industries; in 17 industries, 100 percent foreign ownership (i.e., a wholly owned subsidiary) would be allowed. However, this liberalization only applied to newly established enterprises--in other words, joint ventures with existing Japanese companies were still prohibited--and thus did not constitute a major liberalization of investment. By the end of 1970, 524 industries were liberalized under similar conditions: in 447 industries, up to 50 percent foreign ownership would be automatically approved; in 77 industries, up to 100 percent foreign ownership would be automatically approved.

Since 1975, foreign direct investment in almost all industrial categories has been under an automatic approval system. All applications are approved routinely within a 90-day period. In 1980, amendments to the Foreign Exchange and Foreign Trade Control Law shifted foreign investment from an automatic approval to a prior notification system. Restrictions still apply to direct investments in agriculture (including fishery), mining, petroleum, and leather and leather goods. Foreign investment in 11 designated firms is also prohibited for national security reasons. In principle, investment outside

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1/ Yasuke Murakami, "Towards a Socioinstitutional . . .," in Yamamura, op. cit., p. 10.

2/ One of the positive criteria stipulated in the law was that the investment contribute to the development of important industries. On the negative side, approval could be withheld if the investment were perceived to adversely affect economic recovery. General Accounting Office, Industrial Policy. . . op. cit.

these areas is free from Government interference. Japan has reserved its right to limit individual investments for compelling national security or economic reasons, although it has never done so. By March 1981, over 1,200 foreign firms had invested in Japan, most of them in banking and commercial services. The value of U.S. investment in Japan since 1952 is shown in appendix F. The following tabulation shows total foreign and U.S. direct investment activity in Japan, as of March 31, 1981: 1/

	Number of establishments	
	Total	U.S.
Manufacturing	512	339
Commerce	545	197
Services	108	62
All other	59	23
Total	1,224	621

The United States accounted for over half of the number of total direct foreign investments in Japan in 1982. Over half of U.S. direct investment in Japan is in the manufacturing sector. Over 63 percent of the foreign direct investments in Japan were in ventures involving over 50 percent foreign ownership. The following tabulation shows foreign investment in Japan, by shares of ownership, as of March 31, 1980: 2/

Share of ownership	Number of establishments	Percent of total
Less than 50 percent	260	19.8
Fifty percent	358	27.2
50 to 95 percent	175	13.3
95 to less than 100 percent	32	2.4
100 percent	490	37.3
Total	1,315	100.0

Tax policy

At one time, tax policy was a major targeting tool in Japan. For instance, in the 1950's, half of the cost of a new automobile factory could be written off in the first year of operation. However, since the early 1970's the differences in tax rates between industrial sectors has actually declined, indicating that targeting of specific industries through tax policy has diminished in the past 12 years. In 1973, effective capital taxation ranged from a low of 34.7 percent on nonferrous metals to a high of 49 percent on electrical machinery. By contrast, U.S. net capital taxation ranged from a low of 19.7 percent on petroleum and related products to 131.2 percent on

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1/ MITI and the Ministry of Finance, as cited in Keizai Koho Center, Japan 1983, p. 49.
2/ Ibid.

electrical machinery and 144.7 percent on rubber products. 1/ Japan's average corporate tax rate is comparable with that in the United States as is shown in the following tabulation (in percent): 2/

	Federal taxes	Federal taxes plus State and local Taxes
	In percent	
Japan 1/	52.5	53.2
U.S.A. 2/	38.0	51.2
Germany 3/	49.7	56.5

1/ As of fiscal year ended Mar. 30, 1982. Effective tax rate after allowance for special depreciation measures.
2/ As of fiscal year ended Mar. 30, 1983.
3/ As of fiscal year ended Mar. 30, 1978.

A study by John Mutti compared the net benefits for users of capital in seven OECD countries during 1976. By calculating the corporate taxes on capital as a cost factor and the direct operating or capital subsidies as a reduction in costs, Mutti found that Japan and the United States both had low levels of benefits to the users of capital as a result of tax and subsidy policy. The same study found that the U.S. tax system tends to discourage employment by reducing real wages. Japan's tax system, on the other hand, encourages employment. 3/

Targeted industries in Japan were given higher tax writeoffs under three separate schemes providing rationalization allowances and export incentives. The net effect of these schemes--standard depreciation plus rationalization allowances, and the two export incentive measures--was to give growing industries (assuming growing industries were those with the highest profits, overseas sales, and investment) a tremendous cash-flow advantage. In some cases, companies could depreciate up to 52.5 percent of their equipment in 1 year. 4/ By 1976, all of these special tax provisions had been

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1/ Statement of Gary R. Saxonhouse, op. cit., p. 9.

2/ Keidanren, as cited in Keizai Koho Center, Japan 1982, Tokyo, Japan, 1982, p. 71.

3/ John Mutti, "Taxes, Subsidies, and Competitiveness Internationally," NAP Committee on Changing International Realities, Washington, D.C., 1982, pp. 13-15. The study found that the net capital benefit was 0.8 percent in the the United States and 1.4 percent in Japan, compared with 4.0 percent in France and 7.6 percent in the United Kingdom. The net labor benefit was -5.9 in the United States and 1.0 in Japan; all of the other OECD countries surveyed also had a negative net labor benefit, i.e., discouraged employment.

4/ General Accounting Office, Industrial Policy: Japan's Flexible Approach, Washington, D.C., p. 40.

abandoned. 1/ However, Japan continues to employ special tax measures to achieve particular policy goals. Favored tax treatment is used to encourage the growth and development of high-technology industries and the diffusion of technology.

For instance, Japan provides tax credits designed to encourage increases in private sector research and development. A 20-percent tax credit is given to a company for new research and development expenditures over and above the company's highest level of research and development expenditure since 1972. This tax credit is limited to 10 percent of the company's income tax liability. The credit is allowed on the difference between the current year and the previous year's research and development expenditures. The Ministry of Finance estimates that this tax credit results in an incentive of the equivalent of no more than $140 million annually. 2/ Special depreciation schedules are now in effect for some industries. 3/ Other tax benefits are described in the following paragraphs.

1/ The specifics of these measures were as follows:

Rationalization allowances: The Enterprise Rationalization Law of 1952 allowed an additional 25-percent depreciation in the first year for equipment designated by the Ministry of Finance. In 1971, the list of such industries was spinning, weaving, dying and finishing, fertilizers, petrochemicals, industrial sharpening equipment, pulp, fiber board, nonferrous metal refining, nonferrous metal rolling, electric wire and cable, wholesale and retail trade, steel, forging, casting, and nonferrous metal casting machinery, power metallurgy, atomic furnaces, construction machinery, industrial machinery, hydraulic machinery, bearings, electronics, automobiles and parts, aircraft, and agriculture. In General Accounting Office, U.S.-Japan Trade: Issues and Problems, ID-79-53, 1979, p. 179. The use of rationalization allowances provided under this law was suspended in 1976.

Export incentives: During the 1950's and early 1960's, additional depreciation deductions could be taken for strong export performance. Criticism from the GATT in 1964 forced Japan to change this system to a 5-year income deferral scheme. Between 1964 and 1972, two tax measures were used to encourage exports: basic accelerated depreciation and supplemental accelerated depreciation. The basic accelerated rate was computed on the proportion of exports to total sales multiplied by a stipulated percentage figure, which varied from 80 to 100 percent. The supplemental accelerated depreciation allowance rewarded incremental improvements in export performance; allowances were based on a comparison of export sales in the present and preceding accounting periods. The supplemental depreciation measure could allow an increase of between 30 and 60 percent over the deductions allow under basic accelerated depreciation. Basic and supplemental accelerated depreciation allowances for strong export performances were dropped in 1972 and 1971, respectively, in the face of large trade surpluses.

2/ Saxonhouse statement, op. cit., p. 10.

3/ These special schedules do not appear to be used to provide advantages to targeted industries. These special schedules appear to be designed to take into account the particular industry's equipment needs and uses, and are based on the actual life of the equipment used by the industry. For example, energy related industries have a special depreciation schedule for their machinery.

Accelerated depreciation.--The Japanese tax code allows accelerated depreciation for structures and equipment in a number of instances. Accelerated depreciation provisions serve several different purposes, such as encouraging small- and medium-sized businesses and increasing investment in underdeveloped areas. Accelerated depreciation also promotes research and development; expenditures of cooperative research associations may be fully depreciated in 1 year.

Accelerated depreciation is also used to encourage the purchase of specific types of machinery and equipment, and this use of accelerated depreciation is most likely to play a role in targeting. In addition to ordinary depreciation, firms that buy designated equipment may deduct a specified share of the equipment's cost from their taxes in the year in which they purchased the asset. The categories of equipment that qualify for such equipment are (1) pollution abatement equipment; (2) nonpolluting machinery; (3) energy-saving machinery; (4) materials recycling machinery; (5) certain water supply machinery; (6) oceangoing ships; (7) machinery which incorporates data analysis equipment either alone or in combination with industrial machinery--such as computers, robots, numerically controlled machine tools, forging machinery, foundry equipment, and computer-aided design/manufacturing equipment; and (8) commercial aircraft. A list of products that will be eligible for special depreciation under this scheme is drawn up each year and published in the Government's official gazette. The list is formulated by the Ministry of Finance after consultation with other Ministries. MITI often proposes equipment to be placed on this list and may lobby the Ministry of Finance to include particular items. Because this list is carefully reviewed each year, many items are deleted from the list after a few years as new products, which better meet Government policy goals, are added.

Accelerated depreciation gives substantial incentives to Japanese purchasers to buy designated equipment. For instance, purchasers of new, computerized, numerically controlled (NC) machine tools, computer-aided design equipment, remote computer terminals, and industrial robots received a bonus 13-percent depreciation allowance for the first year the machine tool or robot is in operation during 1980-82. 1/ The tax savings due to this provision were equal to approximately 6.2 percent of the equipment's value. 2/ This tax benefit is available on both imported and Japanese-produced equipment. Japan does not import very much machinery, however. Machinery and equipment accounted for 20 percent of the value of Japan's imports from the United States in 1982. Aircraft accounted for most of the value of these shipments.

Tax-free reserves.--Since 1964, tax-free reserves were allowed for up to 5 years to aid overseas market development and to foster overseas investment. Since 1972, large firms have been prohibited from using this provision. The steel and automobile industries were major users of this provision before that time. Certain high-technology sectors still receive special tax treatment through other tax-free reserves.

Computer makers in Japan can encourage potential customers to buy their products on a trial basis and set aside a reserve against expected revenue

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1/ Saxonhouse statement, op. cit., pp. 11 and 12. As with all accelerated depreciation provisions in the Japanese tax code, total depreciation could not exceed the equipment's acquisition cost. Robots were removed from the list of designated equipment in 1983.

2/ Savings due to accelerated depreciation are estimated in app. C of this report.

losses. The reserves are deducted from current tax liabilities. Another tax-free reserve is allowed for computer software producers. These firms may put up to 25 percent of their income from sales of software programs in a tax-free reserve for up to 4 years. Funds placed in this reserve may not exceed 50 percent of profits. 1/ These benefits result in an estimated annual subsidy to the Japanese computer industry of $25 million. 2/

Revenue losses attributable to special tax measures, as a share of total corporate tax revenues, declined steadily from 1967 to 1978, and has fluctuated at around 2 to 3 percent since that time (see table 11). Estimated tax losses from special tax measures as a share of total corporate income taxes ranged from 12 percent in 1956 3/ to 9 percent in 1972 and 3 percent in 1983, as shown in the following table.

Table 11.--Japanese actual corporate tax revenues, actual revenue losses due to special measures and relative reduction in revenue due to special measures, 1967-83

Year	Actual corporate tax revenues	Actual revenue losses due to special measures	Relative reduction in revenue due to special measures
	billion yen		Percent
1967	1,179	87	7.4
1968	1,477	103	6.9
1969	1,856	131	7.0
1970	2,420	179	7.4
1971	2,872	228	7.9
1972	2,592	233	9.0
1973	3,538	228	6.4
1974	4,928	267	5.4
1975	6,141	304	5.0
1976	4,608	234	5.1
1977	5,813	228	3.9
1978	7,262	192	2.6
1979	6,575	226	3.4
1980	8,504	187	2.2
1981	10,352	199	1.9
1982	11,951	220	1.8
1983	9,497	258	2.7

Source: Bradley M. Richardson, submission to the U.S. International Trade Commission in investigation No. 332-162, June 1983, p. A-10, based on Ministry of Finance data.

1/ Wheeler et al., op. cit., p. 142, and J. Gresser, "High Technology and Japanese Industrial Policy," report to the Subcommittee on Trade of the House Ways and Means Committee, Washington, D.C., Oct. 1, 1980, p. 25.

2/ Saxonhouse statement, op. cit., p. 11. Based upon Ministry of Finance, An Outline of Current Taxation, p. 188.

3/ Joseph A. Pechman and Keimei Kaizuka, "Taxation," Asia's New Giant, Hugh Patrick and Henry Rosovsky, eds., Washington, D.C., Brookings' Institution, 1976, p. 359. Based on Ministry of Finance data.

In fiscal year 1970, approximately 2.5 percent of Japan's total tax revenues was lost due to special provisions established on industrial policy grounds. Of this, 30 percent was used to promote structural reform or technological development, 42 percent was used to promote exports, 6 percent was used to foster resource development, and the remaining 12 percent was used for other purposes, including pollution control. 1/

Table 12 illustrates the tax losses due to special tax measures in Japan, by the activity to be encouraged, from 1967 to 1982. Over half of those tax losses were used to encourage savings and investment, and another 23 percent to underwrite health and welfare expenditures. The remaining 26 percent of tax losses were designed to encourage resource development, technology diffusion, and equipment modernization. Tax incentives aimed at encouraging savings and investment generally do not constitute targeting as defined in this report. Although these measures may have had important effects on Japan's growth, the practice is too broad to be considered targeting because it is not designed to shift resources to specific industries. 2/

Financial markets

The structure of Japan's capital markets gives the Government the ability to direct large sums of capital to specific sectors. The Government has control over a significant portion of the savings generated by Japanese individuals, which affords it substantial opportunities to target specific industrial sectors. However, the Government appears to have used this potential sparingly since the mid-1960's. Furthermore, ongoing financial deregulation is eroding the ability of the Government to direct funding to targeted sectors.

Financial regulation.--Japan's financial regulations have had a major influence on capital stock growth. 3/ Government policy explicitly fostered high levels of investment, particularly by Japan's largest companies, by pumping money into the commercial banking system, limiting consumer credit, keeping interest rates low, and restricting Japanese investment in foreign countries. Limits on the types and returns on various financial instruments stunted the growth of equity markets until the early 1970's. Consequently, Japanese firms have tended to rely on loans to fund most new investment. Government influence over lending could be used to target industries, but generally has not been.

Banking systems in most industrialized countries are highly regulated, and Japan's is no exception. But because of its heavy bias toward bank lending, the structure of Japan's capital markets has afforded the Government substantially more control over the supply and uses of money than exists in most other OECD countries.

1/ Organization for Economic Cooperation and Development, The Industrial Policy of Japan, Paris, 1972, p. 52.

2/ Government action to increase savings would normally lower consumer demand and increase the supply of funds available for investment. By increasing the supply of funds available for investment, this policy would tend to lower interest rates, thus encouraging investment generally. Because these policies are not aimed at specific industries, this policy does not constitute targeting as defined in this report.

3/ Saxonhouse statement, op. cit., p. 34.

Table 12.--Estimated tax losses attributable to Japan's special tax measures, selected periods, 1967-82

Activity encouraged	1967-72		1973-77		1978-82	
	Actual	Percent of total	Actual	Percent of total	Actual	Percent of total
	Million dollars		Million dollars		Million dollars	
Savings and investment	3,352	45	4,800	36	10,409	51
Environmental protection and regional development	615	8	2,450	18	3,282	4
Resource development	105	3	461	3	391	2
Overseas investment loss reserve 1/	109	1	323	2	318	2
Technology promotion and equipment modernization	1,035	14	1,781	13	2,673	13
Research expenses reserve	211	3	326	2	541	3
Overseas technical contracts	53	1	94	1	323	2
Computer repurchase reserve	85	1	93	1	59	1
Plant and equipment depreciation	234	3	216	2	2	2
Small- and medium-sized business machinery depreciation	411	8	950	7	1,268	6
Corporation reserves	1,306	18	1,235	9	1,295	6
Export income increase exemption 2/	558	8	-	-	-	-
Health and welfare allowances	896	12	2,492	19	4,532	23
Total	5,854	100	8,707	100	9,691	100

1/ This exemption was terminated in 1978.
2/ This exemption was terminated in 1972.

Source: Submission by Bradley M. Richardson in U.S. International Trade Commission, investigation No. 332-162, June 1983, p. A-8. Based on Ministry of Finance Data. Dollar figures were estimated using average exchange rates for the appropriate years based on data reported in Japan Prime Minister's Office; Statistical Yearbook, various issues.

Since 1979, the Japanese Government has greatly eased its regulation of Japanese financial markets. Controls on key interest rates were removed, Government control over bond issues loosened, and limits on both inward and outward flows of capitals lifted. Changes made in Japan's banking rules in 1982 afforded foreign banks in Japan equal treatment in virtually all transactions. These changes have lessened Government control over financial transactions, and thus limited its ability to direct funding to targeted industries.

Before deregulation, Japanese financial authorities kept Japanese interest rates below market-clearing levels by influencing the allocation of credit, maintaining interest rate ceilings (similar to Regulation Q in the United States) and controlling banks' access to funds. In 1979, Japan removed controls on interest rates for key short-term instruments--call money, certificates of deposits, and commercial bills. Certain controls are still in effect, such as established deposit-ratio requirements and enforced waiting periods for bond issues. These controls are also in effect in other industrialized countries.

Prior to 1980, capital flows into and out of Japan were substantially limited by the Bank of Japan, and foreign portfolio investment played a minor role in the Japanese financial market. The Foreign Exchange and Foreign Trade Control Law of 1950 was amended in 1980 to allow Japanese residents to hold unlimited foreign currency deposits. As a result, both inward and outward flows of capital have surged. Japan still influences capital flows through administrative guidance. In 1981 and 1982, administrative guidance was used to stem capital outflows, which were having a depressing effect on the value of the yen in international currency markets.

As shown in the table 13, Japan's various financial market policies do not appear to have significantly changed the contribution of various sectors to gross savings. The relative importance of depreciation and retained

Table 13.--Gross savings in Japan, by components, 1952-54 and 1970-72. 1/

Component	1952-54		1970-72	
	Share of GNP	Share of Total Savings	Share of GNP	Share of Total Savings
Depreciation	8.1	33.3	14.2	35.8
Corporate retained earnings	3.3	13.5	5.7	14.4
Personal savings	6.0	24.6	13.1	33.0
Government	5.7	23.4	7.4	18.7
Statistical discrepancy	1.3	5.2	-0.7	-1.9
Gross savings	24.3	100.0	39.6	100.0

1/ Arithmetic average of 3 years.

Source: Hugh Patrick and Henry Rosovsky, "Japan's Economic Performance: An Overview," Asia's New Giant, 1976, The Brookings Institution, Washington, D.C., p. 19. Based on data from the Economic Planning Agency.

earnings in the overall savings rate did not change significantly from 1952 through 1972. However, Government savings grew less important over the period, while personal savings grew more important. Personal savings deposited in the postal savings system could be used to target industries, but only about 30 percent have been directed to institutions charged with implementing industrial policy. A large share of those funds go to industries such as electric power and utilities. 1/

Capital investment in Japan.--Levels of capital investment in Japan have consistently been higher than those in the United States during the postwar period. From 1970 to 1977, for example, Japan's average annual fixed capital investment, as a share of the GDP, was nearly twice as high as that of the United States, as shown in the following tabulation (in percent):

	Net 1/	Gross
Japan	20.1	33.5
United States	5.9	17.5

1/ Net is defined as gross domestic fixed capital investment less depreciation.

Source: Statement of H. William Tanaka, op. cit., p. 8, based on OECD data.

Japan's growth from 1955 to 1970 was investment-led. Investment accounted for nearly 40 percent of Japan's real GNP growth in the 15-year period, and net exports accounted for less than 2 percent of Japan's real income growth in the period, as shown in the following tabulation (percent): 2/

	United States	Japan
Net exports	-	1.5
Government expenditure	19.2	14.2
Private investment	9.5	39.5
Private consumption	71.3	44.8
Average real growth rate	3.4	10.3

Interest rates were fixed by the Government for much of the postwar period. 3/ However, real interest rates in Japan were generally higher

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1/ Based on information contained in table 22. Loans from JDB, JEXIM and SBFC could be used to target specific industries.

2/ Minoru Kobayashi, The Industrial Bank of Japan, "The Japanese Economy in the World," March 1983, p. 11.

3/ The Japanese policy of controlling interest rates by itself would probably be bad for growth. Lower interest rates attract fewer savings and less credit, so there are less funds available for investment, and, thus, these controls may create a need to ration credit. However, other Government policies encouraged savings.

(Continued)

than in the United States until 1972. Table 14 compares short-term interest rates in Japan and the United States. From 1960 to 1977, nominal interest rates usually were higher in Japan. From 1978 to 1982, nominal interest rates were consistently higher in the United States. In the 1960's, real interest rates, those adjusted for inflation, were higher in Japan in 7 out of 10 years. From 1970 to 1982, however, real interest rates were higher in the United States in 9 out of 13 years. Thus, whereas Japanese interest rates at one time generally were higher than U.S. interest rates; in more recent years, Japanese interest rates generally have been lower than U.S. interest rates.

Banks in Japan.--The Bank of Japan and the Ministry of Finance have joint responsibility for conducting monetary policy in Japan. The Bank of Japan has control over the private banks and is their source of funds; the Ministry of Finance, through the Trust Fund Bureau, administers the Fiscal Investment and Loan Program (FILP) and oversees the Government's policy-implementing banks under the FILP (see discussion of the FILP below). Thus, the Bank of Japan has primary responsibility for monetary policies, and the Ministry of Finance is primarily concerned with fiscal policies.

The Bank of Japan uses its authority as the country's central bank to control the money supply through its supply of funds to major banks and its reserve requirements. The Bank of Japan could use credit rationing--through its control over the credit allocations for the private banks--to influence industry. 1/ The influence of the Bank of Japan was particularly strong through the early 1970's, because demand for funds by commercial banks was great.

During the 1970's and 1980's, however, the Bank of Japan appears to have used window guidance and its ability to set credit ceilings for individual banks primarily to achieve broad economic goals--such as higher rates of growth or maintaining currency stability--rather than to target particular industries.

The Bank of Japan may employ "window guidance," to encourage banks to lend to particular industries or firms. Among its "sticks" are its ability to set credit ceilings for the individual city banks. Today the Bank of Japan is much less likely to employ window guidance to target industries. Credit ceilings are now set by an established formula. However, pressure can still

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(Continued)

3/ Because consumer credit has been extremely limited and often highly expensive, consumers were forced to save for such things as education and major purchases. Furthermore, until the 1970's, Japan did not have social insurance programs, such as social security or unemployment insurance. The exemption of interest income on small savings accounts from income taxes, which averaged 25 percent in 1982, may also have offset the dampening effect on savings caused by Government-set low interest rates. (Interest payments on savings accounts that are smaller than 3 million yen, or approximately $12,000 at 1982 exchange rates, are exempt from income taxes.)

1/ During the period of foreign exchange rationing, discussed in the "Home-Market Protection" section above, the Ministries of International Trade and Industry and Finance exerted considerable influence over the allocation of foreign exchange and generally used this influence to direct foreign exchange to favored industries.

Table 14.--Short-term interest rates in the United States and Japan, 1960-1982 1/

(In percent)

Year	Nominal rates		Real rates 2/	
	Japan	United States	Japan	United States
1960	8.4	3.2	4.7	1.7
1961	11.4	2.0	6.0	.9
1962	10.3	2.7	3.7	1.6
1963	7.5	3.2	-.2	1.9
1964	10.0	3.5	6.3	2.3
1965	7.0	4.0	.3	2.3
1966	5.8	5.1	.9	2.1
1967	6.4	4.2	2.3	1.6
1968	7.9	5.7	2.5	1.5
1969	7.7	8.2	2.4	2.8
1970	8.3	7.2	.7	1.3
1971	6.4	4.7	.2	.4
1972	4.7	4.4	.3	1.1
1973	7.1	8.7	-4.7	2.4
1974	12.5	10.5	-11.8	-.4
1975	10.7	5.8	-1.2	-3.4
1976	7.0	5.1	-2.3	-.8
1977	5.7	5.5	-2.4	-1.0
1978	4.4	7.9	.6	.4
1979	5.9	11.2	2.3	.1
1980	10.9	13.4	2.9	-.1
1981	7.4	16.4	2.6	6.0
1982	6.9	12.2	4.2	6.2

1/ Japanese interest rates are represented by the call money rate; U.S. interest rates by the call money rate's analogue in the U.S. market, the Federal funds rate. H. Wallich and M. Wallich, in "Banking and Finance," in Asia's New Giant, Washington, D.C., p. 313.

2/ Real interest rates are measured by subtracting the inflation rate from the nominal interest rate. The inflation rate is measured by the change in the consumer price index.

Source: Nominal rates are official statistics of the International Monetary Fund. Real rates are calculated by the staff of the U.S. International Trade Commission based on statistics of the International Monetary Fund.

be applied to firms through their banks to comply with Government industrial policy goals, as was the case in Yamazaki Machinery. 1/

Japanese companies rely on bank loans to finance most new investment. The share of equity financing relative to bank borrowings has actually declined over the postwar period. 2/ The proportion of investment funds

1/ This incident is described under "Methods" in the introduction to the "Japanese Industrial Policy" section.

2/ Chalmers Johnson, MITI and the Japanese Miracle, Harvard University Press, 1982, p. 10, and Noguchi, op. cit., p. 131.

accounted for by loans in Japanese companies is roughly twice as great as that in other industrialized countries. 1/ Equity accounts for less than one-sixth of company financing needs, compared with one-half in the United States. 2/ However, small- and medium-sized firms (with capital under 1 billion yen) are much more likely to depend on debt than are large enterprises. In 1981, 97 percent of external financing, by small and medium sized business was derived from borrowing, compared with 68 percent for large firms during the same year. 3/ Companies raised money from bank loans rather than through equity financing because raising capital through loans was relatively cheap, international transactions were virtually prohibited, and domestic equity markets were underdeveloped. Interest charges on debt are tax deductible. 4/

Private financial institutions have extended the bulk of loans to Japanese industry. In 1982, nearly 86 percent of the loans outstanding in Japan were extended by private financial institutions, with City Banks--the 13 largest banks in Japan--accounting for nearly 24 percent of all loans outstanding, as illustrated in table 15.

Table 15.--Component ratios of outstanding loans of financial institutions, fiscal years 1978-82

Item	1978	1979	1980	1981	1982
Private financial institutions-percent--	88.9	88.2	87.5	86.6	85.9
Banking accounts of all banks---do----	47.2	47.2	47.2	45.8	45.1
City banks--------------------do----	25.2	25.0	24.8	24.0	23.5
Local banks-------------------do----	14.4	14.6	14.8	14.6	14.5
Long-term credit banks--------do----	5.9	5.9	5.8	5.6	5.5
Trust accounts of all banks-----do----	6.5	6.3	6.1	5.9	5.8
Insurance companies-------------do----	5.3	5.2	5.1	5.3	5.6
Financial institutions for small business----------------do----	17.2	17.2	17.5	17.6	17.3
Government financial institutions-do----	11.1	11.8	12.5	13.4	14.1
The Japan Development Bank------do----	1.8	1.8	1.8	1.7	1.7
Total------------------------do----	100.0	100.0	100.0	100.0	100.0
Total---------------trillion yen--	213.3	233.5	255.8	282.3	309.0

Source: The Japan Development Bank, Facts and Figures About the Japan Development Bank, 1982.

1/ Yoshio Suzuki, Money and Banking in Contemporary Japan, New Haven: Yale University Press, 1980, pp. 13 and 14.

2/ Vogel, op. cit., p. 135. Corporate funding in Japan, by source of funding is shown in appendix F.

3/ Kobayashi, op. cit., p. 24. Based on Ministry of Finance data.

4/ Ibid., p. 28.

Interestingly, the private banks do not have access to the vast pool of personal savings deposited in the postal savings system. The funds in the postal savings system are placed in a separate trust fund, which is distributed by the Ministry of Finance to Japan's Government banks under the FILP. The commercial banks depend on corporate and individual deposits and call money markets for the bulk of their funds. Loans from Japan's central bank, the Bank of Japan, generally account for only a small share of commercial bank funds. (The Bank of Japan also does not have access to funds deposited in the postal savings system.) Government banks accounted for 14 percent of the loans outstanding in the year. The JDB, one of the major industrial policy funding institutions run by the Government, extended slightly less than 2 percent of the loans outstanding during the year.

Japanese companies rely heavily on bank loans to purchase equipment. Loans accounted for 88 percent of total new equipment financing in 1981, and bonds and equity, about 12 percent, as illustrated in table 16.

Table 16.--Component ratios of new supply of industrial equipment funds, fiscal years, 1978-82

Item	1978	1979	1980	1981	1982
Shares and corporate bonds-----percent--	10.8	11.7	12.8	12.1	9.6
Private financial institutions					
Banking accounts of all banks---do----	36.0	36.9	35.6	36.0	38.5
Long-term credit banks--------do----	12.6	10.9	8.9	10.4	10.6
Trust accounts of all banks------do----	10.4	8.7	7.5	7.5	8.7
Insurance companies-------------do----	7.1	5.9	5.0	5.8	6.4
Financial institutions for small business----------------do----	16.3	17.5	19.9	19.3	17.3
Total, private financial institutions----------------do----	70.5	69.6	68.7	69.3	71.7
Government financial institutions					
The Japan Development Bank------do----	4.5	3.9	5.1	4.4	4.6
Hokkaido and Tohoku Development Finance Corp.------do----	0.6	0.7	0.7	0.7	0.6
Small Business Finance Corp.----do----	3.8	3.5	3.1	3.8	3.6
Other--------------------------do----	9.8	10.6	9.5	9.7	9.9
Total, government financial institutions----------------do----	18.7	18.7	18.4	18.6	18.7
Total--------------------------do----	100.0	100.0	100.0	100.0	100.0
Total-----------------trillion yen--	16.9	17.4	19.4	21.6	21.2

Source: The Japan Development Bank, Facts and Figures About the Japan Development Bank, 1982.

Government financial institutions supplied nearly 19 percent of the funding for new-equipment investments in the year, with the JDB accounting for nearly 5 percent of total new lending for equipment investments.

City banks.--The 13 largest banks in Japan, the so-called city banks, are the major lenders to large companies. The financial resources of the 13 city banks come from both short- and long-term deposits. These banks mainly make short-term loans and security investments. However, they also extend long-term loans. 1/ Data obtained from the Ministry of Finance on the interest paid by city banks to their depositors, as well as the rates charged by the city banks to their customers, are shown in the following tabulation (in percent):

Item 1/	1980	1981	1982
Interest charged for loans-------	9.21	8.97	8.13
Interest paid on deposits--------	7.27	8.40	7.24

1/ Data are from the Ministry of Finance and include all funds available from domestic and foreign sources. The difference between these two rates is not the city banks' net profit margin.

An overall ceiling on credit by the Bank of Japan to the city banks is in effect as well as individual ceilings for each city bank. The overall ceiling is based upon the monetary policy the bank is pursuing--tight or easy credit; the individual banks' ceilings are based upon the actual performance and net worth of each city bank. Currently, there is a ceiling of 3 trillion yen for all city banks. Every quarter the ceiling for each city bank is reviewed in light of actual deposits of the bank; actual lending conducted by the bank in the previous quarter; and how much the bank borrowed from the Bank of Japan in the previous quarter.

Long-term credit banks.--As the name implies, Japan's three long-term credit banks concentrate almost entirely on long term lending. These banks are legally forbidden to make short-term loans in excess of the value of their deposits. Long-term credit banks raise most of their funds by selling debentures. In 1980, 68.8 percent of their funds came from selling debentures; 12.8 percent from deposits and 0.5 percent from certificates of deposit. 2/ The major purchasers of debentures are households and commercial

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1/ The Bank of Japan, The Japanese Financial System, 1978, p. 3.

2/ E. Sakikabara, R. Feldman, and Y. Harada, "The Japanese Financial System in Comparative Perspective," U.S. Congress, Joint Economic Committee Report, March 1982, p. 37. Data are as of September 1980. Long-term credit banks may accept deposits from the Government and from their borrowers but not from the general public.

banks, as shown in the following tabulation, by type of holder, December 31, 1977: 1/

Holder	Value of debentures (million yen)	Share of total (percent)
Households	98,358	49.0
Commercial banks	32,024	16.0
Other depository institutions	29,531	14.7
Trust accounts	6,237	3.1
Insurance companies	8,996	4.5
Public financial institutions	12,762	6.4
Other	12,658	6.3
Total	200,566	100.0

Although it is sometimes suggested that the Japanese Government uses long-term credit banks to channel funds to targeted firms, these data show that most of these banks funds come from households and other financial intermediaries, not from the Government.

Government financial institutions.--Government banks fall under the Fiscal and Investment Loan Program (FILP). The FILP was established in 1953 to further Government policy objectives. It receives most of its funds from the postal savings and annuity funds; a very small percentage of its funds comes from the Industrial Investment and Special Account (one of the 38 Special Accounts mentioned above). Government-guaranteed loans and bonds also contribute to the program.

All of Japan's postal savings deposits go to the FILP to support the Government financial institutions. Japan's savings rate has grown in tandem with rising national income. In 1955, households saved 13.4 percent of their income; by 1970, the household savings rate had risen to 20 percent. 3/ Small savings accounts are granted preferential tax treatment. The interest paid on up to 3,000,000 yen deposited in such accounts, either in the postal savings system or in commercial banks, is tax free. A large portion of small savings is deposited in the postal savings system. The postal savings system, involving 23,000 post office branches throughout Japan, is convenient for individual savers. It is also easier to open multiple accounts under the postal savings system than in commercial banks.

The interest paid on postal savings is lower than that paid by commercial banks to corporate customers. The interest currently paid on postal savings accounts is about 1.25 percentage points less than that paid on deposits in commercial accounts in the city banks. As noted above, small savings accounts have tax advantages over other accounts, so this difference may be narrowed accordingly. The interest on postal savings accounts for 1979-83, obtained from the Ministry of Finance, is shown in the following tabulation (in percent):

1/ Ibid.
2/ Kobayashi, op. cit., pp. 21 and 22.

Period	Percent 1/
August 1979-March 1980	6.25
March 1980	7.25
April 1980	8.00
December 1980	7.25
April 1981	6.50
January 1982-present	6.00

1/ Rates shown are those paid on time deposits of over 3 years, the most popular postal savings account.

FILP funds are held by the Trust Fund Bureau of the Ministry of Finance and are used to finance industral development projects, export sales, public investments, and distributed to local governments for public works and for funding small- and medium-sized businesses. As shown in table 17, the major recipients of these funds are local governments, the Housing Loan Corporation, and the Small Business Financing Corporation (SBFC). Two of the major industrial policy implementing institutions, the Japan Development Bank (JDB) and the Export-Import Bank of Japan (JEXIM), received less than 10 percent of FILP funds in every year from 1978 to 1981. However, loans from the SBFC could be used to target particular industries.

Table 17.--Component ratios of amounts allocated of FILP to principal institutions, fiscal years 1978-82

(In percent)

	1978	1979	1980	1981	1982
Japan National Railways	8.0	7.4	6.9	7.0	7.2
Housing Loan Corporation and Japan Housing Corporation	21.4	21.8	22.5	21.7	20.6
Small Business Finance Corporation	14.3	15.5	17.1	18.1	17.8
The Japan Development Bank	3.9	3.8	4.0	3.9	3.9
The Export Import Bank of Japan	6.0	4.9	4.1	3.8	4.4
Public Highway Corporations	7.0	5.9	5.7	6.0	7.2
Local governments	16.4	17.3	16.9	16.3	16.3
All other	23.0	23.3	22.8	23.2	22.6
Total	100.0	100.0	100.0	100.0	100.0

Source: The Japan Development Bank, Facts and Figures About the Japan Development Bank, 1982.

Each year in formulating the FILP program budget, the JDB and other agencies decide which industries will be supported. At the meetings, MITI gives advice on which industrial sectors should receive loans. Lending policy is set by an advisory committee to each of the financial institutions, which includes representatives from Government, industry, and academia. In 1982, about one-half of the funds in the FILP were used to finance projects which furthered Government policy objectives, as illustrated in table 18.

Table 18.--Uses of funds of the Fiscal Investment and Loan Program, 1978-82

	1978	1979	1980	1981	1982
Total funding--------billion yen---	14,888	16,833	18,180	19,490	20,289
Public investment---------------do---	4,725	4,842	4,976	5,545	5,196
Policy implementation financing---------------------do---	7,017	8,230	9,194	9,793	10,112
Local government----------------do---	3,146	3,761	4,011	4,151	4,381
Public investment----------percent---	32	29	27	29	29
Policy implementation financing---------------------do---	47	49	51	50	50
Local government----------------do---	21	22	22	21	22

Source: The Japan Development Bank, Facts and Figures About the Japan Development Bank, 1982.

As table 19 illustrates, in 1982 nearly 43 percent of policy implementing financing under the FILP was used to finance small businesses. Funding for exports, imports, and overseas investments accounted for 13 percent, and development loans, 10 percent of such financing.

Table 19.--Percentage distribution of amount disbursed by policy implementing financial institutions, fiscal years 1978-82

	1978	1979	1980	1981	1982
Development loans-------------------------	10.2	9.6	9.9	9.9	9.7
Japan Development Bank------------------	8.8	8.2	8.5	8.6	8.5
Hokkaido and Tohoku Development Corporation-------------	1.4	1.4	1.4	1.3	1.2
Export-import and overseas investment loans------------------------	16.4	15.4	12.4	12.0	13.0
The Export-Import Bank------------------	13.5	12.3	8.9	8.2	8.9
The Overseas Economic Cooperation Fund--------------------------------------	2.9	3.1	3.5	3.8	4.1
All other	73.4	74.9	77.7	78.1	77.3
Small business loans-------------------	40.4	39.4	41.2	42.3	42.7
Housing loans---------------------------	22.6	25.5	26.6	26.2	25.8
Agriculture and Fishery loans----------	5.7	5.5	5.5	5.5	5.0
Other-----------------------------------	4.7	4.5	4.4	4.1	3.8

Source: The Japan Development Bank, Facts and Figures About the Japan Development Bank, 1982.

Yukio Noguchi notes that in the early postwar period (1952-55), almost 30 percent of the funds supplied to industry came from the FILP; during 1956-60, 18 percent of these funds came from the FILP; during 1961-65, 16 percent; during 1966-70, 15 percent; and from 1971-75, 14 percent of total capital (lending plus equity). Today, Government financial institutions under the FILP account for 14 percent of the outstanding loans of all financial institutions. For the four basic industries--steel, coal, shipping, and electric power--the FILP funds accounted for as much as 37 percent of total corporate funding in the early postwar period. 1/ The FILP account has gradually increased as a share of the GNP, from 4.38 percent in 1953 to 7.56 percent in 1980. 2/

The importance of Government loans to particular industries during 1980-82 is shown in table 20. The data in table 20 show that loans from the JDB, JEXIM, and the SBFC were the most important to the utility industry, accounting for fully 60 percent of that industry's loans in 1982. The three government banks were also significant lenders to the shipping and aircraft industries (shown in the "Other transportation" row), and to the fabricated metal product, iron and steel, and general machinery industries. Small businesses dominate the fabricated metal product and general machinery industries, and SBFC loans have been the main element of loans extended by the industrial policy implementing banks.

Table 21 indicates the relative weight of small businesses in particular industries as well as the importance of the SBFC to these industries. In 1982, loans to firms characterized as small businesses were a substantial portion of all loans to the fabricated metal product, general machinery, electrical machinery, and precision machinery industries, accounting for 62.0, 46.6, 31.9, and 40.7 percent, respectively, of all loans to those industries.

The SBFC provided small businesses in the fabricated metal product industry with 23 percent of their loans. SBFC loans were also important to the ceramic, stone, and glass, general machinery, iron and steel, and electrical machinery industries.

The share of total investment in particular industries which was accounted for by the FILP was estimated by Gary Saxonhouse. 1/ According to his estimates, the Government share of all facility investments in the electronics equipment industry was 2.5 percent in the early 1960's, and it was only 0.8 percent in the latter part of the 1970's. Funding provided to the machine tool industry by the JDB and the SBFC was no more than $3 million annually during the late 1970's and early 1980's. The robotics industry benefited from the more than $5 million in loans given annually to the Japan Robot Leasing Co. (JAROL) and from $3.5 million in loans given each year to small- and medium-sized firms for the purchase of certain kinds of robots. The computer industry has benefited from over $300 million in loans in 1982, many of which went to the Japan Electronic Computer Co. (JECC) to finance the leasing of Japanese computers. Funds for the fifth generation computer project and software development projects are also included in this figure. Such funds represented about 6 percent of the annual sales of the Japanese computer industry (excluding IBM Japan).

1/ Noguchi, op. cit., p. 131.
2/ Trezise, op. cit., p. 16.
3/ Statement of Gary Saxonhouse, p. 15.

Table 20.—Outstanding loans to industry, by all banks and by Government financial institutions, 1980-82

Industry	JDB 1980	JDB 1981	JDB 1982	ExIm bank 1980	ExIm bank 1981	ExIm bank 1982	SBFC 1980	SBFC 1981	SBFC 1982	Total JDB ExIm, SBFC 1980	Total JDB ExIm, SBFC 1981	Total JDB ExIm, SBFC 1982	Total bank loans 1980	Total bank loans 1981	Total bank loans 1982
	Value (billion yen)														
Chemical products	241.9	252.9	264.6	38.4	38.1	36.1	68.3	70.5	75.0	348.6	361.5	375.7	5,173	5,699	5,986
Ceramic, stone, glass	80.9	113.9	120.5	5.7	8.0	4.8	166.3	181.1	193.0	252.9	30.3	318.3	2,098	2,307	2,465
Iron and steel	251.0	263.9	263.4	144.9	227.5	246.0	83.3	96.6	99.3	479.2	588.0	608.7	4,224	4,542	4,952
Non ferrous metals	62.9	67.3	73.9	51.9	67.5	81.1	33.9	38.9	39.9	148.7	173.7	194.9	2,073	2,363	2,546
Fabricated metal products	25.8	27.2	27.8	.9	1.9	1.7	252.7	284.6	303.0	279.4	313.7	332.5	1,845	1,939	2,102
General machinery	12.9	16.3	15.3	177.9	191.1	174.6	200.2	240.9	263.6	390.8	448.3	453.5	3,243	3,510	3,831
Electrical machinery	30.9	39.6	44.8	61.4	83.2	85.1	114.4	140.7	156.7	206.7	263.5	286.6	3,166	3,459	3,802
Motor vehicle and parts	42.5	40.6	39.3	22.5	28.5	45.9	-	-	-	65.0	69.1	85.2	1,745	2,043	2,438
Other transportation equipment	39.8	37.1	31.3	307.6	363.9	352.4	-	-	-	347.4	401.0	383.7	1,956	2,109	2,314
Total transportation machinery	82.4	77.8	70.5	330.2	392.4	398.3	73.1	81.8	88.7	485.7	552.0	557.5	3,700	4,152	4,751
Precision machinery	6.1	5.9	5.8	.5	1.3	1.0	41.0	48.8	50.3	47.6	56.0	57.1	930	1,089	1,251
Electricity, gas, water	1,626	2,035	2,324	500.5	398.7	377.9	12.8	12.9	13.2	2,138.8	2,446.6	2,715.1	3,517	4,057	4,528
													Loans to small business 1980	Loans to small business 1981	Loans to small business 1982
	As a percent of all bank loans to the industry														
Chemical products	4.7	4.4	4.4	.7	.7	.6	1.3	1.2	1.3	6.7	6.3	6.3	25.4	25.0	26.0
Ceramic, stone, glass	3.9	4.9	4.9	0.3	0.3	0.2	7.9	7.9	7.8	12.1	13.1	12.9	41.4	41.0	41.3
Iron and steel	5.9	5.8	5.3	3.4	5.0	5.0	2.0	2.1	2.1	11.3	12.9	12.4	15.0	14.9	14.6
Non ferrous metals	3.0	2.8	2.9	2.5	2.9	3.2	1.6	1.6	1.6	7.1	7.3	7.7	19.3	18.8	20.5
Fabricated metal products	1.4	1.4	1.3	-	-	-	13.7	14.7	14.4	15.1	16.1	15.7	60.7	61.2	62.0
General machinery	0.4	0.5	0.4	3.5	3.5	2.9	4.6	5.0	5.1	8.5	9.0	8.4	45.9	46.1	46.6
Electrical machinery	1.0	1.1	1.2	1.2	1.5	1.4	2.6	2.9	3.1	4.8	5.5	5.7	30.2	31.1	31.9
Motor vehicle and parts	2.4	2.0	1.6	0.4	0.5	0.8	-	-	-	2.8	2.5	2.4	26.1	24.9	23.7
Other transportation equipment	2.0	1.8	1.4	6.1	6.7	5.9	-	-	-	8.1	8.5	7.3	16.4	16.4	16.2
Total transportation machinery	2.2	1.9	1.5	8.9	9.5	8.4	2.0	2.0	1.9	8.1	13.4	11.8	21.0	20.5	20.1
Precision machinery	0.7	0.5	-	-	-	-	4.4	4.5	4.0	5.1	5.0	4.0	44.8	12.3	40.7
Electricity, gas, water	46.2	50.2	51.3	14.2	9.8	8.3	0.4	0.3	0.3	60.8	60.3	59.9	6.9	6.6	6.5

Source: Bank of Japan, Economic Statistics Annual; 1982.

Table 21.--Loans to small business, by industry, 1980-82

(billion yen)

Industry	SBFC	Total	SBFC share of total	Small business share of all loans
1980:				
Chemical products	68.3	1,313	5.2	25.4
Ceramic, stone, glass	166.3	869	19.1	41.4
Iron and steel	83.3	634	13.1	15.0
Nonferrous metals	33.9	400	8.5	19.3
Fabricated metal products	252.7	1,120	22.6	60.7
General machinery	200.2	1,489	13.4	45.9
Electrical machinery	114.4	959	12.0	30.2
Motor vehicles and parts	-	456	0	26.1
Other transportation equipment	-	321	0	16.4
Total transportation machinery	73.1	778	9.4	21.0
Precision machinery	41.0	409	10.0	44.8
Electricity gas and water	12.8	244	5.2	6.9
1981:				
Chemical products	70.5	1,424	5.0	25.0
Ceramic, stone, glass	181.1	947	19.1	41.0
Iron and steel	96.6	677	14.3	14.9
Nonferrous metals	38.9	444	8.8	18.8
Fabricated metal products	284.6	1,186	24.0	61.2
General machinery	240.9	1,617	15.0	46.1
Electrical machinery	140.7	1,074	13.1	31.1
Motor vehicles and parts	-	508	0	24.9
Other transportation equipment	-	345	0	16.4
Total transportation machinery	81.8	853	9.6	20.5
Precision machinery	48.8	461	10.6	12.3
Electricity gas and water	12.9	266	4.9	6.6
1982:				
Chemical products	75.0	1,557	4.8	26.0
Ceramic, stone, glass	193.0	1,019	19.0	41.3
Iron and steel	99.3	722	13.8	14.6
Nonferrous metals	39.9	523	7.6	20.5
Fabricated metal products	303.0	1,304	23.2	62.0
General machinery	263.6	1,785	14.8	46.6
Electrical machinery	156.7	1,212	13.0	31.9
Motor vehicles and parts	-	579	0	23.7
Other transportation equipment	-	376	0	16.2
Total transportation machinery	88.7	956	9.3	20.1
Precision machinery	50.3	509	9.9	40.7
Electricity gas and water	13.2	296	4.5	6.5

Source: Bank of Japan, Economic Statistics Annual; 1982.

As mentioned in the "Definition" section, Governments may also boost the competitiveness of targeted industries by financing foreign purchases of products in targeted industries at below market interest rates. Most industrialized nations have export financing schemes that provide both direct loans and loan guarantees. Export financing, however, is targeting only if exports of certain industries are given preferential treatment. The bulk of Japan's Export-Import Bank loans have been used to finance heavy industrial projects, particularly ship sales and exports of turnkey industrial plants, which incorporate flexible manufacturing systems, machinery, buildings, etc. The Export-Import Bank also finances imports of raw materials, resources, and energy. It provides funds to develop resources overseas, such as projects for natural gas development, which can be expected to provided long-term, stable supplies of resources and energy to Japan.

Japan Development Bank.--The Japan Development Bank (JDB) was established in 1951 to promote economic reconstruction and industrial development. It is a fully owned Government financial institution and receives funds from the FILP and from issuing bonds and notes. Its primary purpose is to act as a catalyst encouraging the types of industrial development sought by Government policy. The loans given by JDB are generally designed to supplement and encourage lending by private financial institutions. JDB lends funds for a variety of prescribed projects, including regional development, development of technology (including commercialization), pollution prevention and safety measures, resource and energy projects, and urban development.

The basic lending policy of the JDB is to provide long-term capital for domestic plant and equipment investment. Funds are provided for capital investments such as the purchase of land, buildings, and machinery and equipment, and the loans generally cover between 30 and 50 percent (but no more than 60 percent) of the investment costs. There is no value limit on the amount of a loan. The JDB requires collateral for its loans and may also request guarantees from a parent company. Loan periods are generally between 5 and 15 years, but may be as long as 30 years. The JDB has also extended loans to foreigners for plant and equipment investments in Japan.

The JDB uses stringent financial criteria to analyze the projects it chooses to finance. In its analysis, the JDB assesses the feasibility of the project and the financial prospects of the company. The default rate of all JDB loans is less than 1 percent.

Private financial institutions conduct their own credit analysis of loans for projects co-financed by JDB. They may consult with the JDB, and the JDB will share the information gathered in its analysis, provided it is not business confidential data. However, the JDB does not act as a go-between to city banks and the company concerned. The firm negotiates its own loan with the private bank. JDB never negotiates with the private banks regarding particular loans.

The JDB is required by law to be self-financing. It cannot and does not make loans at less than cost. The JDB's major source of funds are borrowings from the Central Government, received through the Trust Fund Bureau of the Ministry of Finance. It currently borrows funds from the Trust Fund Bureau at an interest rate of 7.3 percent, for a period of 15 years. That rate is the lowest rate offered by the JDB to its loan recipients.

The two major advantages of JDB loans over commercial loans are lower interest rates and the fact that no compensating balances are required. Other advantages include the fact that JDB loans may be for as long as 30 years, longer than all or almost all commercial loans. 1/ According to the JDB, it does not discriminate against small, venture companies that show future growth potential. Commercial banks, on the other hand, base their credit analysis on the size of the company, financial strength, and future profitability.

The interest rates charged on JDB loans are fixed. The standard interest rate for such loans was 8.4 percent as of March 1983, equal to the commercial bank's interest rates for 7 to 10 years to highly creditworthy borrowers, the long-term prime rate. The minimum interest rate on JDB loans ranged from .8 percentage points to 1.1 percentage points below the long-term prime rate from 1979 to 1982. 2/ Targeted industries are likely to receive rates at, or close to, the minimum.

Compensating balances are funds firms must leave on deposit with a bank as a condition for receiving a loan. These balances are generally 10 percent of the value of a long-term loan. 3/ Compensating balances on long-term loans earn no interest; their cost to the firm, therefore, is the interest the firm would have made had it been able to hold those funds in a different type of asset. The subsidy element of a JDB loan will include the savings due to both the lower interest rate and the lack of a compensating balance. Subsidies inherent in JDB loans are estimated in appendix C. In recent years these subsidies generally have ranged from 1.6 percent to 2.0 percent of the value of the loan.

During the first 20 years of its operation (1951-71), JDB lending totaled approximately $13 billion. JDB's principal customers have been big business, infrastructure, and prospective high-growth sectors. 4/ The two industries that received the bulk of these loans were shipping and electric utilities, which received, respectively, 31.5 and 21.3 percent of all JDB loans during the period. Loans to these sectors, together with regional and urban development loans, accounted for over 75 percent of all JDB loans during the period. The steel industry received less than 1 percent of JDB lending, or about $110 million, over this period. The bulk of post-1972 lending has been aimed at building up infrastructure and improving the quality of Japanese life.

Reflecting Japan's drive to achieve technical parity with the industrialized countries, the National Technology Promotion Fund was established within the Japan Development Bank in the late 1960's. Since 1972, the JDB has spent roughly $313 million annually, or 11 percent of all JDB lending for technology development loans. 5/

1/ Japan Development Bank, "Introducing the Japan Development Bank, 1983."

2/ Japan Development Bank annual reports for those years.

3/ Henry C. Wallich and Mable I. Wallich, op. cit., p. 271. Short-term loans require higher compensating balances, but these balances may earn interest.

4/ Statement of Philip Trezise before the Joint Economic Committee, July 13, 1983, p. 7. Problem industries like coal in the 1960's have been assisted.

5/ Subsidies inherent in JDB loans for the development of technology since 1972 are estimated in app. C. These subsidies never exceeded $38 million per year.

These loans were directed at: (1) computer leasing, manufacturing and software; 1/ (2) raising the technological level of machinery industries; and (3) general technological development. The computer industry has received the bulk of JDB loans for technology development in the period. From 1977 to 1981, 48 percent of new JDB loans for the development of technology went to the computer industry (table 22). 2/ Almost all of these loans

Table 22--JDB loans for the development of technology, by end users, fiscal years 1977-81

(In billions of yen)

End Use	1977	1978	1979	1980	1981
Development of electronic computers:					
Domestically manufactured computers	35.5	53.5	45.0	54.0	44.0
Computer manufacturing plants	.4	.2	.4	.6	.5
Data processing systems	2.3	1.6	1.7	.8	.6
Total	38.2	55.3	47.1	55.4	45.1
Use of high technology in certain electronic and machinery industries:					
Electronic industry	3.8	2.1	7.0	12.0	9.8
Machinery industry	4.5	5.7	3.2	2.5	2.2
Total	8.3	7.8	10.2	14.5	12.0
Development of domestic technology:					
Development of new technology	20.4	57.4	40.9	22.6	35.5
Trial manufacture for commercial use	.9	4.0	1.2	.3	-
Development of heavy machinery	3.4	4.5	9.1	3.6	3.5
Total	24.7	65.9	51.2	26.5	39.0

1/ Includes loans to Japan Electronic Computer Corp., a Government-sponsored computer leasing company, which purchases computers from Japanese manufacturers and leases them to users.

Source: Japan Development Bank, Facts and Figures About the Japan Development Bank, in 1981, p. 26, and 1982, p. 20.

1/ According to the Lease Business Association of Japan, office equipment, computers, and industrial machinery (including robots) accounted for 50, 30, and 16 percent, respectively, of all items leased in Japan in 1981. The Lease Business Association of Japan, "Survey of the Lease Market," Tokyo, 1981. As cited in McKinsey, op. cit., p. 98.

2/ Hitachi, one of Japan's largest computer manufacturers, does not receive any loans from the JDB, reportedly because of the extensive administrative procedures required to obtain loans.

support the JECC, the industry's joint leasing company. 1/

The JDB's lending activities are carried out in accordance with an annual cabinet decision on the basic lending policy for the bank. The fiscal year 1981 cabinet order called for, among other things, the JDB to promote the development of technology and the creation of a more knowledge-intensive industrial structure. Within this general policy framework, the JDB makes its own specific lending policies and decides which loan projects it will support as well as the amount, interest rate, and other terms of the loans.

The JDB has a representative on MITI's Industrial Structure Council and its Subcommittees, but no decisions on particular projects to be supported by the JDB are made there. An advisory committee, composed of government, labor, and academic representatives makes such policy decisions. Table 23 indicates the current terms which apply to JDB loans, by project areas.

New lending in the fiscal year ended March 31, 1982, totaled approximately $4.9 billion. Loans for resources and energy projects accounted for 37 percent of new loans in the year, and loans for regional development and pollution control and safety measures accounted for 13.4 and 14.5 percent of new loans respectively. Loans for the development of technology accounted for about 9 percent, or $441 million in new loans during the year. The JDB also guarantees the foreign currency obligations of Japanese companies, such as loans from foreign banks and credits from foreign suppliers. These guarantees have been used to buy nuclear power equipment and aircraft from foreign suppliers. New guarantees in 1981 amounted to 24.0 billion yen, or approximately $110 million for the purchase of aircraft from foreign suppliers, mainly U.S. firms.

The lending by the JDB has varied in importance relative to total lending, by industry, as table 24 illustrates.

1/ Japan Development Bank, "Facts and Figures about the Japan Development Bank," 1981 and 1982.

Table 23.--Terms and conditions for JDB loans, by project areas, 1983

Category	Loan objective	Amount of loan	Interest rates	Loan period
Regional development.	Promote development in less developed regions, create employment and increase income in the regions. Projects located in Kyusho, Shikoko, Chugoku, HoKuriko, Kanto, Tokai, and Kinki regions are eligible. Projects in Tokyo, Osaka and Nagoya are not eligible	Approximately 30 to 50 percent of the investment cost, with more favorable treatment for less developed regions.	8.4 percent	7 to 10 years.
Development of industrial technology.	Promotion of industrial technology, including commercialization of new technology, manufacture of new technology and plans using new technology or designs, development of heavy machinery, construction of research facilities, and purchase of equipment for use in electronics, new materials, biotechnology, and aerospace. Note: The new technology must be developed in Japan by Japanese companies or joint ventures with Japanese companies. Commercialization must be carried out in Japan.	Up to 50 percent of the investment cost.	7.3 percent. Loans for the trial manufacture of new products bear a rate of 7.8 percent.	Approximately 10 years.
Electronics and machinery industries.	Pursuant to the Law for temporary Measures for Designated Machinery and Information industries, loans are provided to raise the technology level and productivity of industries.	Up to 40 percent of the investment cost.	8.4 percent per annum, although special rates from 7.3 to 8.3 percent may apply to certain projects.	Approximately 7 years
Pollution Prevention.	Assist in the installation of antipollution facilities required by laws or standards.	Up to 50 percent of investment cost.	7.5 percent for the first 3 years and 8.0 percent thereafter.	Approximately 10 years.
Safety Measures.	Improve laboratory procedures and building safety.	From 30 to 50 percent of the investment cost.	8.0 to 8.4 percent	Approximately 10 years.

Table 23.--Terms and conditions for JDB loans, by project area, 1983, continued

Category	Loan objective	Amount of loan	Interest rates	Loan period
Resources and energy development.	Alternate energy, offshore oil development, other energy projects.	40 to 50 percent of investment cost.	8.4 percent. Special rates from 7.3 to 8.3 percent may apply to certain projects.	From 5 to 15 years.
Urban development.	Improving quality of life in cities such as Tokyo, Osaka, and Nagoya, including redevelopment, and so forth.	30 to 50 percent of investment cost.	8.4 percent. Special rates from 7.3 to 8.3 percent may apply to certain projects.	Up to 25 years.

Source: Japan Development Bank, "Introducing the Japan Development Bank, 1982.

Table 24.--JDB lending as a share of total bank lending to industries, selected periods, 1953-80

(In percent)

Industry	1953-60	1961-70	1971-80
Shipping	48.6	59.9	44.3
Electric power	55.4	52.2	1/
Coal	24.6	38.8	1/
Petroleum refining	.1	.6	11.5
Iron and steel	12.2	1.4	3.8
Machinery 2/	1.5	1.6	.7
Electric machinery 3/	.3	.6	.8
Transportation machinery 4/	1.3	1.8	.9
Precision machinery 5/	1.5	1.0	.4
Textiles	.8	1.0	1.3

1/ Data not available.
2/ Machinery includes processing machinery, general industrial use machinery, and textile machinery.
3/ Includes electronics and computers.
4/ Transportation machinery includes automobiles, ships, and railway machinery.
5/ Includes optical measuring devices.

Source: Submission of Bradley M. Richardson to the U.S. International Trade Commission in investigation No. 332-162, 1983, p. A-6, based on Bank of Japan, Economic Statistic Yearbook.

JDB lending accounts for about 3 percent of total private capital formation in the industries affected by JDB loans. JDB funding in the energy, resource development, and technology promotion fields accounts for 1 percent of total private capital formation in those areas; in petroleum, nonferrous metals, depressed industries, shipping, transportation, aircraft, railways, power utilities, and gas, JDB lending accounts for roughly 3 percent of private capital formation. 1/

The JDB and MITI are now discussing a new loan program to fund high-risk research and development projects. The proposed program represents a significant break with past JDB policy which prohibited the Bank from loaning money at interest rates below its cost of funds.

As noted previously, the JDB lends money to private firms at rates at or slightly below the long-term prime rate, currently 7.3 percent. The new loan program would allow the JDB to lend money at 4.3 percent for a period of 10 years, and to fund up to 70 percent of the total project (the JDB only funds up to 60 percent of a given project now). Proponents of the new program argue that the projects that would be eligible for such loans are now eligible for

1/ Ministry of Finance.

direct grants from MITI; converting the direct grants to loans would save the Government money and reduce subsidies. MITI has suggested 10 projects to be funded under the new program, including research on new materials, advanced chemicals, and biotechnology.

Science and technology policies

The Japanese Government has long pursued policies aimed at advancing science and technology. Initially, these policies were designed to increase overall productivity and develop technical capability in Japan. Today, Japan's science and technology policies are intended to encourage R&D in high-risk fields that have potentially large, economywide payoffs.

Despite Japan's strong desire to encourage the development of technology, it has spent less as a share of GNP for R&D than most OECD countries, including the United States. Also in contrast with those countries, the vast majority of R&D is conducted and funded by private firms in Japan. In fiscal 1980, Japan's total expenditures for R&D totaled 5.2 trillion yen; in the United States, total expenditures were 13.9 trillion yen. The share of this R&D accounted for by Government expenditure (excluding military) in Japan was 1.4 trillion yen, or 27 percent; in the United States, the Government spent the equivalent of 3.6 trillion yen, or 33 percent. 1/ Less than 1 percent of Japan's research and development expenditures are for defense purposes, compared with almost 20 percent of those of the United States. 2/ Less than 1 percent of Japan's GNP is spent on defense, compared with over 6 percent in the United States. Total Japanese Government funding for R&D has been highest in agriculture, mining, railways, aircraft, and shipbuilding industries. 3/ Japanese Government spending on R&D during 1978-81 4/ is shown in the following tabulation:

	Value (billion yen)	Value (billion dollars)
1978	1,219.2	6.3
1979	1,353.4	5.7
1980	1,465.0	7.2
1981	1,612.4	7.3

The Japanese believe that the Government plays an important role in high-technology development, particularly in those industries where the social need is great, the leadtimes are long, the risks are high, and the funding required is prohibitive. In May 1982, Japan announced that it would actively promote international cooperation in research and development and would maintain a nondiscriminatory policy with regard to participation by partially or wholly foreign-owned Japanese firms in projects supported by the Government.

1/ MITI.

2/ Saxonhouse statement, op. cit., p. 30.

3/ Statistics Bureau, Prime Minister's Office, Report on the Survey of Research and Development, 1982.

4/ Ibid. Dollar figures were estimated using annual exchange rates as reported in the International Monetary Fund, International Financial Statistics, various editions.

The major tools used by the Japanese Government to foster high-technology development are tax incentives for R&D, grants and preferential financing for R&D projects; NTT research and development; and a new regional development program. Though not directly aimed at commercialization, Government-funded R&D projects often have spinoff effects on private industry.

Industry promotion and rationalization laws have been in effect since 1956 for a variety of industries, including electronics, machinery, and aircraft. These laws have also been the basis for promoting high-technology industries, including computers, numerically controlled machine tools, and robotics.

Some guidance and subsidization is provided by the Government to small businesses to raise their technological levels. Technical guidance is provided through the national laboratories under the MITI umbrella. Counselors from these labs also visit small businesses to provide on-site technical advice. 1/

Direct grants for research and development.--In 1979, research and development expenditures in Japan totaled approximately $18.6 billion, roughly 2.3 percent of national income. The United States spent $54.3 billion on R&D in the same year, or about 2.5 percent of national income. Private R&D in Japan, on the other hand, has surpassed that of the United States in relative terms. The Japanese Government funds less than 2 percent of all of the research and development undertaken by the Japanese private sector. As illustrated in table 25, the Japanese Government spent $6.4 billion on major technology projects in 1981, with the bulk used to fund general research. A list of Government-funded research projects and projected funding, along with their sponsoring Ministry, can be found in appendix G. Although estimates of the total funding requirements for a particular research project are made at the time of its inception, funds are appropriated a year at a time. Thus, actual appropriations may be much less than projected funding.

Table 25.--Japanese Government expenditures on large-scale technology projects and general R&D expenditures, 1979-81

(In millions of dollars)

Project	1979	1980	1981
Total	5,256	6,030	6,354
Promotion of Science and Technology	2,354	2,300	2,506
General research support	2,902	3,730	3,848
Space development	454	451	477
Nuclear energy development	904	1,099	1,233
Ocean development	184	190	211
Major technology projects	134	130	139
Other	1,226	1,860	1,789

Source: Submission of Bradley M. Richardson, op. cit., p. A-18, from data of Japan's Science and Technology Agency.

1/ Organization for Economic Cooperation and Development, The Industrial Policy of Japan, Paris, 1972.

Table 26 shows R&D expenditures for Japan's top 14 companies in 1980. At an exchange rate of 203 yen to the dollar, the dollar equivalent of their R&D would be $4.5 billion.

Table 26.--R&D expenditures of major Japanese companies, fiscal year 1980

Rank	Company	Value	Percent of total sales
		Million dollars	
1	Toyota Motor	650.0	4.0
2	Hitachi	569.5	5.9
3	Matsushita Electric	500.5	5.0
4	Nissan Motor	492.6	3.3
5	Toshiba	366.0	4.8
6	Fujitsu	266.0	9.3
7	Honda Motors Company	266.0	4.0
8	Mitsubishi Electric	256.2	4.3
9	Nippon Steel	211.8	1.4
10	Sony	205.9	6.9
11	Toyo Kogyo	125.6	2.5
12	Nippon Denso	123.2	4.8
13	Takedo chemical	114.3	5.4
14	Tokyo Electric Power	109.4	0.7

Source: Nihon Keizai Shinbun, Sept. 11, 1981, as cited in Japan 1982, p. 17.

MITI has control over about 12 percent of Japanese Government spending on R&D in 1983. 1/ The total MITI budget for R&D in fiscal 1983 was 170 billion yen, or approximately $708 million. Of this, 50 billion yen, or $208 million, was allocated for energy-related projects. The remaining 120 billion yen, or $500 million, was allocated to programs such as (a) technology development for small- and medium-sized businesses, (2) international R&D cooperation, (c) R&D in the electronics and machinery industries, and (d) R&D on environmental pollution.

According to Saxonhouse, Government grants and subsidies accounted for the following shares of total R&D in particular industries in the late 1970's (including grants, subsidies, and R&D contracts from the Government) (in percent):

Industry	R&D Subsidies
Pharmaceuticals	0.3
Machinery	1.4
Precision equipment	0.5
Agriculture	18.0
Mining	19.0
Transportation (shipbuilding aircraft, and railways)	28.0
Computers and semiconductors	6.0 to 7.0 percent.

1/ Statement of Philip H. Trezise before the Joint Economic Committee, The Japanese Government provided approximately $35 million in direct grants, subsidies, and R&D contracts for the biotechnology industry in 1983; approximately $15 million on flexible manufacturing systems (which include numerically controlled machine tools, robots, and computer-aided manufacturing) in 1982; and $48 million on computer and semiconductor research and development in 1982. 1/

Government sponsored R&D projects.--Like most governments, the Japanese Government funds R&D in areas which may potentially benefit the society and the economy as a whole. In recent years, such projects have been the most important Government policy tool in the science and technology area. Saxonhouse argues that Japanese Government-sponsored R&D projects which involve cooperation by firms are primarily designed to diffuse technology rather than to overcome technological bottlenecks. 2/ Government ministries receive applications to perform designated research and development from companies or from associations formed for that purpose. The Government has a number of major research projects underway which involve private-sector participation, including research on a fifth generation computer. The Government has often had a hard time convincing the leader in particular technologies to participate in cooperative R&D projects, for instance in the flexible manufacturing system and the fifth generation computer projects. These projects, the participating companies, and the amount of funding are described in appendix G. Profiles of the companies participating in these projects can be found in appendix H.

There are two categories of Government-funded R&D in Japan: those that are funded entirely by the Government and those which are funded by conditional loans to private firms.

Completely Government-financed R&D--In the case of R&D that is completely Government financed the Government owns the results of the research, including all the patents that may arise from the project, and it generally makes the results available to all interested parties for a fee.

1/ Saxonhouse notes that despite the fact that the Japanese Government has placed high priority on the biotechnology sector, the total amount of resources (both public and private) devoted to R&D in this area is significantly lower than in the United States. In 1981, the value of industrial research and development in biotechnology in Japan, excluding pharmaceuticals, was $50 to $70 million. Japanese Government funding for biotechnology research totaled about $35 million in 1983. From 1980 to 1982, the value of total R&D expenditure in Japan rose by 2 to 2-1/2 times. During the same period U.S. spending on such R&D increased between sixfold and ninefold, and capital investment in the stock of biotechnology firms rose by more than three times from 1979 to 1981. Saxonhouse statement, op. cit., p. 18.

2/ Saxonhouse statement, op. cit., p. 18.

Information regarding the patents which arise from these projects is made publicly available to all interested firms, whether domestic or foreign, at the same time. There are two different ways the Government might perform this type of R&D:

(1) It can be conducted by National Research Laboratories. The Agency of Industrial Science and Technology (AIST) within MITI has 16 labs attached to it which perform research--similar to Brookhaven and Lawrence Livermore Laboratories, for example, in the United States--which conduct R&D for the Government,

(2) The Government can pay private research associations or firms to conduct research in specified areas, i.e., consign the research to private firms. In this case, the Government announces areas for which it will fund research. Private research associations can then propose projects which fall into the general areas outlined by the Government. If their proposal is accepted, funding is supplied by the Government through consignment, or itakuhi, payments. For instance, the project to develop high-speed computers for scientific and technical uses is one of the research projects that has been consigned to a private research association.

Only consigned research involves private-sector participants. In both these types of research, the results belong to the state, and MITI controls the patents. MITI allows nondiscriminatory access to the patents, and it will license its patents to any firm that pays a fee and that has the manufacturing capability for using the patents (they do not have to use the patent in Japan). The use of Government-owned patent is not exclusive. All firms will continue to have access to the patent. 1/

<u>Private sector R&D which receives conditional loans from the Government</u>.--The Government also funds research through success-conditional loans--that is, the loans need not be repaid if the commercial production which follows the R&D project is not profitable within 5 years. 2/ During the interim, no interest is charged. In the case of private-sector R&D which is funded through conditional, or hojokin loans, the results of the R&D are controlled by the private firms. The Government has no control over these patents and their licensing. The Government has no role in authorizing licensing agreements and has no authority to compel licensing of technology developed with such loans. Often the initiatives for such research--proposing the project, forming a research association--come from the private sector. The VLSI semiconductor research project is an example of a project that was funded by conditional loans. Conditional loans for R&D by MITI's AIST were as shown in table 27. According to MITI, of the 18.6 billion yen in

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1/ Recently, some business interests, including the leading Japanese business association, Keidanren (comparable in membership to the Business Roundtable in the United States), have suggested that patents that arise from consigned research be jointly owned by the Government and the firms involved, thus giving the firms greater control over the technology developed and allowing them to collect licensing fees. Such a change might limit foreign access to those patents.

2/ In 1983 the terms of conditional loans were changed. Now firms must repay conditional loans that show a profit within 7 years. Previously, conditional loans could finance up to 50 percent of the cost of a research project, now they cannot finance more than 45 percent.

Table 27.--Conditional loans for R&D by MITI's AIST, 1974-78

Fiscal years	Amount of loan (A)	Repayments (as of 1982) (B)	Ratio of B to A
	1,000 yen		Percent
1974	4,159,200	1,715,466	41.2
1975	3,895,800	2,091,349	53.7
1976	4,112,904	2,106,421	51.2
1977	3,403,038	1,387,950	40.8
1978	3,107,447	845,765	27.2
Total	18,678,389	8,146,951	43.6

Source: MITI.

conditional loans AIST made from 1974 to 1978, 43.6 percent were repaid by 1982.

Eligibility of foreign companies for conditional loans.--As long as a firm is established under Japanese law, the Japanese Government does not discriminate against foreign-owned firms in granting conditional loans. However, the Japanese Government must judge the firm to be "competent" to conduct the research. To be competent, the company must be financially strong, i.e., won't go bankrupt in the near future, and the company must be able to do the research within Japan and conduct the research in Japan. Small- and medium-sized Japanese firms have received loans to perform such research. Out of 90 loans in 1981, 36, or 40 percent of the number of loans, went to small- and medium-sized businesses. In some industries, projects are set aside for small- and medium-sized businesses, but in other cases it just happened that a small- or medium-sized firm qualified to receive a conditional research loan.

How MITI funds R&D--Consignment, or itakuhi, payments and conditional or hojokin loans are the two alternatives for Government funding of R&D performed by private firms. These alternative means of financing differ significantly from each other, in terms of access to technology. There has been a definite shift from hojokin to itakuhi financing over the past several years. For instance, the VLSI project was funded through hojokin loans while the Next Generation Industries Project is being funded through itakuhi payments. Although this change will increase the share of direct grants in Government-financed R&D, it also implies that more of the patents that result from these projects will be available for licensing by non-participants.

Most consignment payments and research proposals go through the MITI's AIST. Most conditional loans do not go through the AIST. Conditional loans related to machinery and electronics industry go through the Machinery and Electronics Industry Bureau of MITI. R&D funds for small- and medium-sized businesses go through the Small and Medium Sized Business Agency. Other agencies, such as the Science and Technology Agency and the Ministry of Education, also fund research, as illustrated in appendix G.

Cooperative Research Associations.--Cooperation in R&D is widespread and important among both large and small companies in Japan. The nature of that cooperation varies considerably depending on the industry. In January 1981, for example, the Mitsui group announced that it planned to form a joint research institute in which members of the Mitsui group will conduct cooperative R&D in biotechnology. In other industries, trade associations play an important role in organizing such cooperation. Sometimes private research institutes serve particular industries. For instance, the Japan Automobile Research Institute is used by most major car manufacturers. In most of these cooperative R&D efforts, competition between the individual firms remains intense and eventually limits the extent of cooperation.

Cooperative associations of firms have been formed to do research which is funded by the Government as consigned research or through conditional loans. Many associations are made up of small businesses. 1/ Cooperative associations of small and medium sized businesses may be eligible to receive benefits under the Government's various programs to promote such businesses, which include favorable treatment in Government procurement and a small business set aside for research grants from MITI's AIST. R&D responsibilities are allocated according to the technological and financial capability of companies within the association. MITI's research laboratories sometimes play major roles in cooperative R&D projects.

Research associations are nonprofit, and they generally do not own technologies which are patented as a result of the project. Companies which are members of the research association may control individual patents, or they may jointly hold the patents which result from the research if the Government provides conditional loans. In the case of jointly held patents, the research association may coordinate licensing agreements and disburse licensing fees. If the Government gives direct grants for the research, the Government generally controls the patents.

Research associations are not formally granted exemptions from the Antimonopoly Law. The JFTC appears to believe, however, that such associations usually include all the parties which could potentially use the technology to be developed, and, thus, they do not limit competition. Indeed, H. William Tanaka argues "Even though Japanese companies may join together to do research, competition is the rule when it comes to commercializing the results of this research. Rather than allowing one company a technological monopoly, this system forces competition." 2/

Government-sponsored, cooperative R&D projects absorb only a small amount of the resources devoted by the firms to R&D in the areas in which the project is undertaken. Although the assets which member firms use in connection with research and development done under the auspices of research associations can be totally depreciated in 1 year, in 1982, the Ministry of Finance estimated only $17 million in tax revenues were lost from the use of this provision. 3/

1/ Ira Magaziner and Robert Reich, op. cit., p. 292.
2/ Statement of H. William Tanaka, op. cit., p. 4.
3/ Saxonhouse statement, p. 27.

Many Japanese research associations such as the Electric Car Research Association are formed for very specific R&D ventures and actually have no joint laboratories. There are currently about 30 research associations operating in Japan, including the Electric Car Research Association, the Nuclear Steelmaking Research Association, and the Technical Research Association for Optics. 1/

Control over technology licensing.--The Japanese Government has also used its control over technology licensing from foreign firms to influence industry. The Foreign Investment Law of 1950 was the legal basis for regulating technology contracts. Under the Law, firms were required to submit proposed transactions to MITI for approval. Government control over technology imports influenced not only the composition of imported technology, but also the terms on which it was purchased. 2/ To better guide the inflow of needed technologies, MITI periodically issued lists detailing the kinds of technologies desired by industry. The law also allowed MITI to intervene in technology contracts to achieve more favorable contract terms. Approval of contracts was conditioned on, for example, changes in the scope of the technology or a reduction in royalty payments.

Technology licensing has been extremely important in the industrial machinery, electronics, communications, precision machinery, and transportation machinery industries. 3/ American companies have supplied the bulk of Japan's imported technology, as is shown in table 28, which shows Japan's technology imports during 1950-69.

Table 28.--Japan's technology licenses from abroad, 1950-69

	1950-59	1960-64	1965-69	Total, 1950-69
Total------------------number-----:	1,029	2,039	3,926	6,994
United States---------------do----:	665	1,219	2,180	4,064
United States share of total---------percent--:	65	60	56	58

Source: Kobayashi, op. cit., p. 14. Based on data from the Science and Technology Agency.

Table 29 shows the value of Japan's imports and exports of technology during the 1970's. U.S. licensing receipts from Japan grew by an average of 22 percent annually in the 1970's, and stood at $809 million in 1980. 4/ American companies currently account for about 50 percent of Japan's technology licensing agreements. Nearly half of these licenses are in areas

1/ Saxonhouse, "Japanese High Technology . . .," p. 15.

2/ Economic Research Association, Yearbook of Foreign Capital Presence in Japan, Tokyo, 1982.

3/ Caves and Uekusa, op. cit., p. 152, feel that the Japanese Government substantially reduced the price its firms paid for imported technology.

4/ McKinsey & Co., op. cit., p. 2.

where Japan has taken a leading position. In addition, technology licensing (as opposed to joint ventures or wholly owned subsidiaries) is the most prevalent form of participation in the Japanese market by U.S. firms.

Many American firms chose to license their technology because import restrictions and investment barriers kept them out of the Japanese market. Indeed, until the early 1970's, many companies "bought" access to the Japanese market by agreeing to license key technologies. 1/

Table 29.--The value of Japan's imports and exports of technology, selected fiscal years 1971-80

(Billions of yen)

Year	Exports	Imports
1971	27	135
1975	67	169
1976	83	177
1977	93	190
1978	122	192
1979	133	241
1980	160	240

Source: Prime Minister's Office of Japan as cited in Japan 1982, p. 17, published by Keizai Koho Center, p. 17.

Contracts between foreign and Japanese firms, including technology licenses, are subject to review by the Japanese Fair Trade Commission (JFTC), the Japanese antitrust agency. The JFTC has published guidelines stating what restrictions in licensing contracts it is likely to object to. In particular, the JFTC is unlikely to approve a licensing agreement that requires the licensee to tell the licensor ". . . of knowledge or experience newly obtained regarding the licensed technology . . . ." This provision may be allowed, however, if the agreement also requires the licensor to share this knowledge with the licensee. 2/

1/ Zysman and Cohen argue that, "When Japan lacked basic electronic technologies, American firms were forced to license Japanese firms in order to have any access to that market. Texas Instruments, with its strong patent position in generic semiconductor technology was able to trade its licenses for a permanent share of the Japanese market; its share of that market, however, has not moved significantly up or down over the last years." Zysman and Cohen, op. cit., p. 1122.

2/ Toshikazu Nasu, "Japan FTC's Doors Are Open," Les Nouvelles, 18(2), June 1983, pp. 73-75.

As Japan's economy and balance-of-payments position improved, controls over the import of technology were gradually eased. The first relaxation occurred in 1959, when approval was broadened to include technologies related to consumer goods. Widescale liberalization of technology imports did not occur until 1968. At that time, technology contracts with compensation of less than $50,000 for certain industries could automatically be approved. The Government specifically excluded some sectors, including aircraft, weapons, nuclear energy, computers, and petrochemicals, from this provision. Amendments to the Foreign Exchange and Foreign Trade Control Law in 1980 required notification of a technology license agreement be filed 30 days prior to the conclusion of the agreement for transfer of technology. A recent ministerial order abolished this 30 day period and allowed agreements in all areas except aircraft, weapons, nuclear energy, and petrochemicals. Agreements in these areas require special review for national security reasons.

Special tax measures for R&D--Several special tax measures are designed to encourage R&D and the diffusion of technology. Revenue losses due to these special tax measures are shown in table 30. A tax credit of 25 percent of any year-to-year increase in research and development expenditures over the previous year is allowed, up to a limit of 10 percent of total corporate tax. In 1981, corporations realised tax savings of about 27 billion yen, or $122 million through this credit. Another tax incentive is accelerated depreciation on research and development facilities and hardware, which can mean as much as a 60 percent write-off of the original purchase price in the first year. The provisions try to conserve the cash flow of high-technology businesses.

Firms may deduct part of the income they receive from selling technical services overseas from their taxes. In 1981, firms saved 15 billion yen, or $68 million due to this provision.

As mentioned previously, research associations are special entities for tax purposes in Japan. Firms which are members of Government-authorized research assocations can take a 100-percent depreciation deduction for all fixed assets used in connection with association activities.

Table 30.--Revenue losses attributable to special taxation measures for the promotion of technology and modernization of equipment, 1972-81

(In billions of yen)

	1972	1973	1974	1975	1976
Experimental and research expenses tax credit	9	20	21	21	14
Overseas technical service transactions	4	5	10	12	8
Electronic computer repurchase loss reserve	10	6	3	5	5
Special depreciation for specified plant and equipment	31	13	17	12	11
Special depreciation for machinery purchased by small enterprises	47	52	54	60	54
Other	1	2	1	1	4
Total	102	98	106	111	96

	1977	1978	1979	1980	1981
Experimental and research expenses tax credit	17	15	21	24	27
Overseas technical service transactions	12	10	13	14	15
Electronic computer repurchase loss reserve	3	0	3	2	2
Special depreciation for specified plant and equipment	9	15	14	16	16
Special depreciation for machinery purchased by small enterprises	50	45	62	53	57
Other	6	9	8	4	5
Total	97	94	121	113	122

Source: Tax Bureau, Ministry of Finance, as cited in Wheeler, Pepper, Janow, op. cit., p. 100-101.

<u>NTT's research and development activities</u>.--NTT has also promoted high-technology industries. It often conducts research with its "family" of firms or shares the results of its own research with them. Private companies under contract to supply NTT are licensed to use NTT-developed technologies. NTT has never allowed foreign firms to participate in its research projects. In 1983, NTT had an R&D budget of $390 million. NTT has a large budget for research and development, as shown in the following tabulation: 1/

	billion yen	million dollars
1979----------	69	290
1980----------	75	370
1981----------	80	360
1982----------	88	350
1983----------	94	390

NTT has 4 laboratories for research purposes, which together employ 3,000 engineers. It has registered 7,964 patents in Japan and 848 overseas. NTT laboratories are currently conducting research on electronic switching systems, memories, semiconductor integrated circuits and components, data processing, new materials, transmission systems, visual communications systems, satellite and maritime communications systems, and optoelectronics. Concurrent with general Government R&D projects in these areas, internal NTT research projects are now underway to develop a very high-speed computer for scientific purposes and to develop optical measurement and control devices.

A significant portion of NTT's research activities are carried out jointly with members of the NTT "family," particularly members of the NEC, Fujitsu, Hitachi, and Oki groups. This has strategic implications for industry development, since joint-development activities are a major conduit for the transfer of NTT's technology to the private sector. For example, NTT developed an integrated, nationwide telecommunications system capable of accessing a variety of noncompatible computers and terminal equipment, and the system is now used to rapidly transmit and process data. NTT developed this network in cooperation with NEC, Hitachi, Fujitsu and Oki. NTT has also conducted research on semiconductors with its suppliers. It has been jointly developing large-scale integrated circuits with NEC, Hitachi, and Fujitsu for many years, and Oki worked with NTT and the other companies to develop the 256K dynamic random access memory (DRAM) chip. NTT has developed the 64K and 256K DRAM, and 1 megabit read-only memory (ROM) chips. It is currently developing a very large scale integration (VLSI) processor with a density of 20k+ gates and a coded VLSI for voice and visual signal processing.

It has been NTT's practice to discourage joint research among its suppliers. It has preferred to deal with each firm on a separate basis, assigning them separate production and technical problems. NTT's major suppliers did participate directly in the MITI-sponsored VLSI semiconductor project. MITI tried to encourage NTT to take an active role on the project,

1/ Data are from the Japanese Government. Yen figures were converted to dollars using market rates exchange from the International Monetary Fund <u>International Financial Statistics</u>, various issues.

because NTT's research staff had more expertise on VLSI technology than any of the actual participants. However, NTT confined itself to a purely advisory function in the project.

NTT was also pivotal in the development of fiber optic cable in Japan. NTT developed the advanced vapor axial deposition fiber optic production method in conjunction with Sumitomo Electric, Fujikara Cable, and Furukawa Electric. This process made continuous production of high-quality, low-loss optical-fiber feasible. 1/

NTT is now in the process of massively revamping Japan's telephone and telecommunications system, a feat which will make it possible to transmit a greater variety of information over telephone lines. Prudential Bache estimates that this program, the INS project, will represent a 27 trillion yen (approximately $120 billion) market over the next two decades. 2/

Regional technopolis development program.--In April 1983, the Japanese Diet enacted a program to develop regional technopolis centers in Japan, with the aim of dispersing R&D functions and capabilities of Japanese firms throughout the country. The regional technopolis program provides supportive measures, such as funding and special tax benefits to high-technology, research-intensive firms that locate in specified regions. The program was informally begun in 1982 and will stretch into the 1990's. So far, 19 technopolis centers have been approved by MITI.

The goal of the technopolis development program is to move industries, especially high-technology and high-value-added industries, into the various prefectures. By moving employment opportunities to the local areas, the Japanese Government hopes to alleviate overcrowding in the cities and to revitalize depressed local economies. Some of the local areas have been devastated by structural recessions and the lack of competitiveness of their primary industries, such as textile manufacturing and aluminum smelting. This program will alleviate crowding in the cities, relieve pressure on land prices, housing, and factory construction costs, and provide jobs in the outlying regions. 3/

The criteria for location of the technopoli are location near a large city, proximity to a major airport or railroad, and inclusion of academic and research centers in the technopolis development. Industries ranging from biotechnology to semiconductors to new materials are included, as well as energy research, aerospace, and electronics. Many industries are locating in areas that support related industries, such as new metals in a mining and metalworking district.

Because of budget constraints, the Japanese Government is requiring the prefectural governments to shoulder most of the costs of constructing factories, schools, and laboratories. Total expenditures on the technopolis development effort will run into trillions of yen.

1/ Based on information in Prudential Bache, op. cit., pp. 17-19.

2/ Ibid., pp. 24 and 25.

3/ Japanese External Trade Research Organization, "Technopolises," Now in Japan, No. 34, 1983.

The technopolis development program is very similar to a variety of local government programs underway in the United States to attract investment by high-technology companies. Indeed, the Japanese technopolis development effort was inspired by Research Triangle in North Carolina and Silicon Valley in California. The inducements provided in Japan's technopolis development program may directly and indirectly benefit high-technology industries in Japan.

The technopolis development effort may also be of substantial benefit to foreign firms. Many local governments in Japan are encouraging foreign high-technology firms to locate there, often competing with other local governments by providing inducements to prospective investors. Materials Research Corp., an American maker of semiconductor-manufacturing equipment, recently opened a factory in one of the regions that is participating in the program, as have Texas Instruments and Motorola. These programs may ultimately help U.S. companies compete in the Japanese market. By opening up investment opportunities in the Japanese market, the program may give U.S. firms a better chance at succeeding in the Japanese market and at the same time substantially lessen home-market protection in Japan. Because the companies would have both manufacturing and research facilities in Japan, they should also be eligible to participate in Government-sponsored joint research and development projects. The presence of U.S. high-technology firms in Japan may also enhance their competitiveness by helping the companies keep abreast of what Japanese companies are doing.

<u>Temporary measures laws for the promotion of the electronic and machinery industries</u>.--A series of laws designed to foster the electronics and machinery industries have been in effect since 1956 which have served as the basis for promoting a variety of industries, including computers, machine tools, and robotics. The two most recent laws are the Law on Extraordinary Measures for the Promotion of Specific Electronic and Machinery Industries, which was in effect from 1971 to 1978, and the Law for the Promotion of Specific Machinery and Information Industries, which superseded it in 1978. Machine tools, chemical-processing machinery, materials-handling equipment, electronic computers, optical and precision instruments, and integrated circuits were among the industries specified in the 1971 law. The 1978 law covers essentially the same industries in the 1971 law plus the software industry and is in effect until 1985.

The laws focused on supporting prototype R&D, developing commercial applications for these technologies, and encouraging manufacturing improvements in the electronics and machinery industry, sometimes with Government assistance. Several successful programs were carried out under the original (1971) law: Japanese computer manufacturers developed prototype technologies in integrated circuits and commercially produced a mainframe computer. The 1978 law placed increased emphasis on the development of leading-edge technologies, potentially benefiting the: (1) computer hardware and software; (2) analytical instruments; (3) communications equipment; (4) office automation equipment; (5) electronic components; (6) scientific instruments; (7) cryogenic equipment and materials; (8) biotechnology; (9) avionics; (10) optoelectronics; and (11) construction and related equipment industries.

The Law also allowed MITI to order certain joint activities which were exempted from the Antimonopoly Law. MITI was given the authority to direct manufacturers to engage in joint activities related to industrial standards, technology improvement, production, and procurement. The Law permitted corporate mergers when needed to meet the goals of the programs. MITI is required to confer with the JFTC before issuing instructions to firms to take concerted action. There were only two instances where joint actions were taken at the direction of MITI: regarding bearing and artificial whetstone grinding machinery.

In the 1978 law, joint activities--such as cooperative R&D--were encouraged, displacing the emphasis on mergers shown in the 1971 law. Companies, either independently or through industry associations, participate in all phases of research and development projects. Sometimes special-purpose associations are set up to coordinate the conduct of particular R&D projects and to act as the conduit for Government and corporate funding.

The 1971 law empowered MITI to identify products which were to receive Government assistance through "elevation plans" after consultations with the Electronic and Machinery Industry Council, an advisory body to the MITI. Elevation plans are different from visions because they tend to be more specific and usually are aimed at particular products. The elevation plans include technology development goals; projections of the funding needed to achieve these goals; plans to increase standardization, attain optimum production capacity, and increase specialization in the industry; and overall production goals for the industry. A broad vision was drawn up for the information industries in December 1980 covering the software, computer and information processing, and optoelectronics industries. It was updated in June 1981.

Elevation plans have been formulated for a variety of products, ranging from machine tools, lumber processing machines, pollution prevention equipment, cast metal machinery, gas-leakage warning appliances, to products of various high-technology industries, including semiconductors and computers. Elevation plans have been formulated for 89 types of products in the machinery and information industries since 1978. A partial list of the products covered by these elevation plans can be found in Appendix F.

Although projections of the industry's funding requirements are made in the elevation plans, this does not mean that Government funding will be provided to the industry. MITI may give direct grants and conditional loans to firms to help them reach the technological goals set forth in the plans. MITI also recommends products to the Ministry of Finance for special depreciation and may recommend projects or firms to the JDB or the SBFC. However, MITI has no formal role in providing funds through Government banks.

The JDB extends loans to the electronic and machinery industries for investments that will raise the technology level and productivity of those industries. Up to 40 percent of the investment can be funded by the JDB at rates of 7.3 to 8.4 percent. The average term of the loans is 7 years. In 1981, the JDB extended 12 billion yen in loans to those two industries or approximately $50 million. 1/

1/ Based on data in table 22 and 23.

Antitrust exemptions

Japanese antitrust law differs from U.S. law in several respects. Japanese law takes a permissive attitude towards joint research and development. Private antitrust suits are rare in Japan, whereas they are relatively common in the United States. 1/ Furthermore, the Japanese Government is much more likely than the U.S. Government to give industries exemptions to the antitrust laws. These exemptions allow industries to carry out joint actions that ordinarily are illegal under Japanese law. Japanese antitrust law seems to have grown stricter in recent years. 2/ Government ministries have become less likely to take actions that contravene the antitrust laws, and the number of exemptions to these laws has declined.

Antitrust exemptions to specific industries can be a form of targeting, because they may enable Japanese firms to make cost reductions that otherwise would not have been possible, thereby increasing their international competitiveness. However, the existence of these cost reductions is often questionable. Furthermore, if antitrust exemptions are effective, they allow Japanese producers to take advantage of monopoly power to raise their prices, thereby reducing their international competitiveness. In fact, such exemptions sometimes are deliberately designed to reduce the international price competitiveness of Japanese exporters to avoid import restrictions by foreign governments.

Cartels in Japan.--The Antimonopoly Law of 1947 generally forbids agreements to limit competition by fixing prices, limiting production, restricting production capacity, or dividing markets. Japanese firms, however, may legally make such agreements by forming cartels under certain provisions of Japanese law. The numbers of legal cartels, by types, is shown in table 31. The number of legal cartels in Japan declined dramatically from 1972 to 1977, but declined more slowly from 1977 to 1981. The number of cartels increased in 1982 because of an increase in the number of small- and medium-sized business cartels. 3/

The general decline in the number of legal cartels may be due to stricter antitrust laws in Japan. There appear to be several possible reasons for a slowdown in the decline after 1977. In December 1977, an amendment to the Antimonopoly Law greatly increased the penalties for illegal cartels. The increased penalties may have made firms wanting to form cartels more willing

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1/ A plaintiff has never won a private antitrust suit in Japan. There are several reasons why private antitrust suits are so uncommon in that country, for example, damages in such suits are not trebled, as they are in the United States; private litigants in Japan may not file an antitrust suit until after the JFTC has brought suit; discovery is more limited under Japanese law than under U.S. law; and, class actions are not possible under Japanese law. See J. M. Ramseyer, "Japanese Antitrust Enforcement After the Oil Embargo," The American Journal of Comparative Law, 31(3), summer 1983, pp. 395-430.

2/ Other authors also contend that Japan is generally strengthening its antitrust policy, "Trustbusting in Japan," Harvard Law Review, 94(5), March 1981, pp. 1064-1084, and A. Uesugi, "Japanese Antimonopoly Policy - Its Past and Future," Antitrust Law Journal, 50(3), pp. 709-719.

3/ Comprehensive data on the number of cartels that exist in 1983 are unavailable. It is known, however, that in 1983, the number of export cartels fell to 52, and the number of small- and medium-sized business cartels fell to 260, the lowest level since 1957. Thus, the total number of Japanese cartels has probably declined in 1983.

Table 31.--Number of legal cartels in Japan, by types, 1972-82 1/

Type	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Depressed industry	9	2	0	2	1	1	6	9	9	9	7
Rationalization 2/	10	10	9	0	0	0	1	0	1	1	0
Export	175	179	136	105	95	82	72	70	66	62	59
Import	2	2	2	4	3	4	4	4	4	4	3
Small and medium business	604	607	591	511	395	279	290	274	267	268	290
Environmental hygiene	123	123	122	122	122	122	122	122	122	122	122
Machinery and electronics industry promotion	0	13	15	17	16	15	9	1	1	2	1
Fertilizer price stabilization	4	4	2	2	3	3	3	3	3	3	3
Export marine products promotion	8	7	7	8	8	8	8	8	7	7	7
Liquor tax preservation	7	4	4	0	0	0	0	0	0	0	0
Fishery production adjustment	7	7	7	7	7	7	6	5	5	4	4
Sugar price stabilization	0	0	0	0	0	1	0	0	0	0	0
Pearl culturing	8	7	6	6	0	0	0	0	0	0	0
Fishery reconstruction 3/	0	0	0	0	0	1	9	5	1	2	3
Coastal shipping	19	14	7	4	4	5	5	5	5	5	6
Total	976	979	908	788	654	528	535	506	491	489	505

1/ Data show cartels existing at the end of March 1982. Data include both active and inactive cartels.

2/ Includes only rationalization cartels authorized under art. 24 of the Japanese Antimonopoly Act.

3/ Fishery reconstruction cartels were not legal before 1977.

Source: Official statistics of the Japanese Fair Trade Commission.

to endure the increased Government scrutiny involved in legal cartels rather than form illegal cartels. Another possible reason is that the general slowdown in Japanese economic growth led industries to form cartels. Also, in 1978, the Japanese Government passed a law making it easier to form depressed-industry cartels. The number of these cartels and the number of small- and medium-sized business cartels, which often have the same function, increased from 1977 to 1982.

Two major types of cartels have no apparent relationship to targeting. Environmental hygiene cartels are regional cartels limited to small- and medium-sized businesses. These cartels are designed to maintain and improve sanitation in six industries: barbershops, beauty parlors, butchers, laundries, movie theatres, and ice cream shops. Small- and medium-sized business cartels are allowed as part of a policy to encourage small businesses; this policy apparently is not directed at specific industries and so is not targeted. 1/ Small- and medium-sized business cartels also are usually regional and not national in scope. These cartels are not limited as to duration; therefore, they are often formed as alternatives to rationalization or depression cartels, which usually are allowed to exist for only a short period of time. Other major types of cartels are discussed in the following sections.

Depressed-industry cartels.--Depressed-industry cartels are supposed to aid the adjustment of firms in industries facing insufficient demand or excess capacity. These cartels are allowed by article 24 of the Antimonoply Law, which was passed in 1953, and by the Provisional Law on Measures for the Stabilization of Designated Depressed Industries, which was passed in 1978. The 1978 law also provides for loan guarantees and tax credits to help depressed-industries. Since this law was passed, almost all depressed industry cartels have been formed under its auspices. 2/

1978 law allows the Government to designate an industry as structurally depressed if this designation is requested by at least two-thirds of the firms in the industry. The ministry that is responsible for that industry then forms a cartel and joins with the industry to develop a plan for eliminating excess capacity. The JFTC may reject or modify this plan. The responsible ministry approves any new investment. Such cartels are permitted to fix production levels, but not prices. This law does not authorize the imposition of import restrictions. Firms' participation in the cartel is voluntary. Under this law, eight industries were designated as depressed:

1/ Small- and medium-sized business cartels are concentrated in specific industries, however. In 1983, there were 260 such cartels, and they existed in 19 industries; 13 of these industries involved textiles and apparel, such as tube socks. Other industries where these cartels existed included stainless steel utensils, mosaic tiles, dyeing, polyethylene film, dinnerware, and carton boxes.

2/ The 1978 law expired in 1983, but it was replaced by a new law with almost identical provisions. From 1979 to 1981, only one depressed-industry cartel existed under the terms of art. 24. This cartel covered shipbuilding.

aluminum refining, chemical fertilizers, ferrosilicon manufacturing, open hearth and electric-furnace steelmaking, container board, shipbuilding, spinning, and synthetic fibers. In 1982, petrochemicals was added to the list; in 1983, shipbuilding was removed.

By increasing an industry's profits during a time of reduced demand, depressed-industry cartels may encourage producers to remain in an industry they otherwise would leave. As a result, when demand returns to normal and the cartel ends, the industry will have more capacity than it would have had the cartel not existed. This argument seems to be MITI's primary reason for supporting the 1978 law. 1/ However, although the depressed industry cartel is still operating, it will reduce the industry's international competitiveness, because it will act to increase the industry's prices to increase its profits. Furthermore, depressed-industry cartels may cause an industry to have higher costs and thus be less competitive even after the cartel ends. Without a cartel, a decline in demand will generally cause an industry's least efficient productive capacity to be scrapped. With depressed-industry cartels, political considerations enter into the determination of what capacity is scrapped. 2/ Thus, the cartel may cause the industry to operate less efficient facilities than it would otherwise. 3/

Export cartels.--The Japanese have used export cartels to a greater extent than other major industrialized nations. 4/ At the beginning of 1983, there were 52 Japanese export cartels, of which 27 involved textile products; 9 machinery; 6 chemicals; 4 steel and nonferrous metals; 2 rubber products; and 4 other goods. 5/ Export cartels have several possible purposes: to

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1/ K. Yamamura, "Guidance and Cartels," in K. Yamamura ed. Policy and Trade Issues of the Japanese Economy, University of Washington Press, Seattle, 1982, p. 100.

2/ Ibid., p. 97.

3/ It is sometimes argued that the potential for forming depressed-industry cartels may partially protect prospective member firms from shifts in demand, thereby reducing the riskiness of their investments. This reduced risk may encourage investment. It is not clear that the policy of allowing depressed industry cartels reduces investors' risk. The possibility that an industry's suppliers will form a cartel when demand is depressed may increase the riskiness of that industry's investment. Furthermore, given the relatively small number of depressed-industry cartels that have existed in the past, the policy of allowing these cartels is unlikely to have had much effect on investment. (Table 34 shows that depressed-industry cartels were rare after 1972. Hadley, op. cit., p. 375 and Caves and Uekusa, op. cit., p. 148 show that depressed industry cartels were also rare from 1953 to 1972.) Even if this policy were to encourage investment, because all industries may form these cartels, the policy is too general to constitute targeting.

4/ In 1965, cartels controlled 27.4 percent of Japanese exports, 4.3 percent of U.S. exports, less than 3 percent of West German exports, and less than 5 percent of United Kingdom exports. In 1970, cartels controlled 18.9 percent of Japanese exports. In 1976, cartels controlled 1.5 percent of U.S. exports. Comparable data are not available for later years. See Mitsuo Matsushita, "Export Control and Export Cartels in Japan," Harvard International Law Journal, 20(1), winter 1979, pp. 114 and 115.

5/ Information on the products involved in Japanese export cartels were provided by the JFTC. Data on export cartels do not include small- and medium-sized business cartels that primarily involved goods for export. In 1983, there were small- and medium-sized business cartels involving exports of the apparel, dinnerware, dyeing, knit goods, and yarn industries.

negotiate reductions in foreign import barriers, to share certain joint costs of exporting, to set product standards, and to increase prices in export markets. The cartel may increase its prices solely to increase its profits or to avoid having a foreign government impose import restrictions. For example, steel export cartels were formed in the late 1960's in response to U.S. pressure to reduce steel exports. 1/

An export cartel that reduces foreign barriers to trade or costs of exporting will increase an industry's international competitiveness, but an export cartel that raises prices will decrease an industry's international competitiveness. The dominant motive for Japanese export cartels has been to increase prices. Of the 52 Japanese export cartels, 31 were established to restrict export sales to avoid friction with the importing country; 6 handle trade with Communist countries; and 15 set minimum-quality standards for exports. 2/ Export cartels, therefore, seem to play little role in targeting.

Import cartels.--Import cartels might be used to protect domestic industry by restraining competition among importers and thereby increasing import prices. However, there have been very few import cartels. In 1983, two import cartels existed; they involved onions from Taiwan, and woven silk from China. These cartels were started to counteract the power of monopolistic selling agencies in the exporting countries. Thus, formal import cartels apparently play little or no role in targeting of Japanese industries.

Rationalization cartels.--Rationalization cartels are designed to allow firms to undertake joint actions to improve their industry's overall performance. Since 1953, firms have been allowed to form rationalization cartels under article 24 of the Antimonopoly Law. This article has been used only rarely. From 1975 to 1982, only two industries formed rationalization cartels under this act. 3/ However, special laws have been passed to allow certain industries to form rationalization cartels. Industries appear to

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1/ I. Magaziner and T. Hout, Japanese Industrial Policy (Institute of International Studies, Berkeley, Calif., 1980), p. 65.

2/ A study of 83 Japanese export cartels that existed in 1970 showed that 62 of them were formed to raise prices, 6 were formed to increase trade, 5 were formed to simplify import procedures in foreign markets, and 10 had miscellaneous objectives. Of the 62 cartels that were designed to raise prices, 27 were formed to avoid dumping in foreign markets. Matsushita, op. cit., p. 114. A study by Jacquemin, Dewez, and Nambu, op. cit., also indicates that the primary purpose of Japanese export cartels was to raise prices.

3/ Nine rationalization cartels existed in 1974; they all involved purchasers of scrap iron. This provision was also rarely used earlier. Hadley, op. cit., p. 375.

prefer specific exemptions to using article 24, because cartels under article 24 require approval of the JFTC. 1/

Whether they are formed under the Antimonopoly Law or under special legal exemptions, rationalization cartels perform many different functions. Functions of rationalization cartels include joint research and development, assigning product lines, setting product standards, sharing joint facilities, purchasing parts and raw materials, and guiding new investment. 2/ Any of these activities might serve to reduce industry costs and so increase international competitiveness. Therefore, rationalization cartels can play a role in industrial targeting, although it is not certain how important this role is. Many of the cost savings of rationalization cartels might have been realized even without the antitrust exemption. Furthermore, rationalization cartels can also allow firms to increase their prices, and this effect would reduce international competitiveness.

Rationalization cartels are sometimes used to encourage joint research and development, but these activities generally do not require an antitrust exemption. 3/ The JFTC will not challenge joint research projects if all relevant Japanese firms are included and have access to the technology involved. Agreements to restrict technology would violate the Antimonopoly Law, but the JFTC believes that most joint research and development does not restrict technology and so does not violate the law.

1/ Hadley, op. cit. The similarity between rationalization cartels under art. 24 and cartels established under special exemptions is shown by the behavior of the bearing industry. In 1955, this industry started a cartel under art. 24. This cartel still exists, but is now organized under the "Specific Machinery and Information Industry Promotion Temporary Measures Act." Under this cartel, producers agreed to concentrate on producing specific types of bearings and to then sell these bearings to each other. They contend that by concentrating the production of certain types of bearings, they can realize economies of scale, and selling bearings to each other allows each of them to offer their customers a full line of products. The cartel regulates the production of 79 percent of the types of bearings produced, but these bearings only account for 4 percent of industry revenue. Statement of Anti-Friction Bearing Manufacturers Association in Commission investigation No. 332-162, June 30, 1983.

2/ A number of examples of rationalization cartels can be cited. Since the early 1950's, Japanese steel industry representatives have met with MITI officials to develop a joint expansion plan for their industry (Magaziner and Hout, op. cit. pp. 58 and 59). Since the passage of the "Extraordinary Measures Law for the Rehabilitation of the Machinery Industries" in 1956, there have been a number of rationalization cartels dealing with various types of machinery. These cartels have established product standards, developed new products, and assigned product lines. In 1982, the only cartel existing under the current version of this law was the bearing cartel described in the preceding footnote. (The 1956 law has been renewed with changes on several occasions. Magaziner and Hout, op. cit., pp. 92 and 93). Rationalization cartels in computers and semiconductors have done joint research and development and assigned product lines in the area of computer peripherals. (Magaziner and Hout, op. cit., pp. 102 and 103).

3/ Nonetheless, some formal antitrust exemptions for joint research and development do exist. For example, the 1978 Law for Extraordinary Measures for Specific Machinery and Information Industries provides exemptions for joint research and development in these industries.

Administrative guidance and cartels.--Japanese Government agencies can form an agreement in an industry without a formal antitrust exemption. For example, MITI officials might hold separate talks with firms in an industry about the ideal level of output. MITI officials can then recommend output levels to firms in the industry. If those firms follow the MITI's advice, the effect is similar to a cartel. MITI has used administrative guidance in the past principally to reduce output in depressed industries. In the mid-1960's this practice was sharply curtailed. 1/ Since then, administrative guidance has been used only to directly affect the level of output once--in 1977, for the synthetic fibers industry. After protests from the JFTC, this industry formed a formal depressed-industry cartel. 2/

In 1980, two Japanese court decisions held that firms could be held criminally liable for violations of the Antimonopoly Law even if they were following MITI's guidance. After this decision, the JFTC issued guidelines stating that administrative guidance that affects "such market conditions as prices and quantities" would conflict with the Antimonopoly Law. 3/ Thus, the Japanese Government's ability to use its guidance as a substitute for a formal antitrust exemption apparently has been greatly reduced.

One area in which actions by MITI still often substitute for cartel actions is exports. To prevent retaliation against Japanese exports, MITI can set minimum export prices and impose quantitative limits on exports. 4/ For example, in 1977, after some U.S. machine tool manufacturers complained of Japanese dumping, MITI began to set minimum export prices for machine tools. 5/ Minimum prices or quantitative restrictions on exports, however, will reduce, not increase, an industry's international competitiveness.

1/ General Accounting Office, Industrial Policy: Japan's Flexible Approach, Washington, D.C., 1982, pp. 38 and 39, "Trustbusting in Japan," op. cit., p. 1074.

2/ Japanese Fair Trade Commission, "Interpretations Concerning the Relation Between the Antimonopoly Act and Administrative Guidance, mimeo, Mar. 16, 1981. The court did not hold that all agreements to restrict competition that took place under the MITI's guidance were illegal, and the effect of these court decisions on the use of administrative guidance is uncertain. Frank K. Upham, "Administrative Guidance in Japan: In Decline or Evolution?" in U.S. Japan Relations in the 1980s: Toward Burden Sharing, CFTA, Harvard University, 1982, pp. 121-7. The JFTC apparently has no power over Government procurement practices. It is not certain if these practices are used to support cartels.

3/ Amelia Porges, "On Import Cartels and Industrial Organization in Japan," Office of the U.S. Trade Representative memorandum, August 1979, p. 10.

4/ MITI uses its power to issue or deny export licenses to enforce these constraints. Matsushita, op. cit., pp. 105 and 106.

5/ General Accounting Office, United States-Japan Trade: Issues and Problems, Washington, D.C., October 1979, p. 120.

The Japanese Government has often taken action to support legal cartels. Membership in such cartels is usually voluntary, but MITI has pressured reluctant firms to join. 1/ Among the tools the Japanese government has used to increase membership of cartels and to enforce cartel agreements are financial incentives, such as low-interest loans, control over foreign exchange, and control over imports of technology and materials. 2/ As the Government's control over foreign exchange and imports declined in the 1960's, its ability to support cartels also declined.

Mergers.--The Japanese Fair Trade Commission is empowered to prevent any mergers that would substantially lessen competition. The JFTC, however, rarely challenges a merger. There seem to be two reasons why mergers are less likely to be challenged on antitrust grounds in Japan then in the United States. The JFTC's policy towards mergers is more lenient than the policy of U.S. antitrust officials. 3/ Furthermore, because most large Japanese firms are embedded in a web of interrelationships with banks and unions, mergers of large Japanese firms may be harder than mergers of large U.S. firms. MITI, which often has supported mergers in targeted industries, has occasionally pressured the JFTC to allow mergers it might otherwise prevent. For example, in 1970, under pressure from MITI, the JFTC allowed the Yawata-Fuji steel merger. 4/ In recent years, MITI has pressured the JFTC to allow mergers only in depressed industries. Even without MITI pressure, the JFTC is more inclined to allow mergers in depressed industries than in other industries.

MITI generally believes that larger firms are more efficient and has repeatedly encouraged mergers in targeted industries. That behavior does not constitute an antitrust exemption, however, unless those mergers reduce competition. In many cases, MITI encouraged mergers of relatively small firms in unconcentrated industries. Such mergers are unlikely to be challenged on antitrust grounds. 5/

1/ Yamamura, op. cit. p. 97.

2/ Caves and Uekusa, op. cit., pp. 148-150. For example, in 1965, when Sumitomo expanded capacity beyond the limits called for in the steel industry agreement, MITI restricted its allocation of imported coking coal. Magaziner and Hout, op. cit., p. 59.

3/ Both the JFTC and the U.S. Department of Justice, Antitrust Division, have a policy of usually challenging mergers involving firms with market shares above the levels stated in their respective merger guidelines. The JFTC's guideline market shares are substantially above those of the Antitrust Division. See JFTC, "Administrative Procedure Standards for Examining Mergers or Acquisitions of Business," July 15, 1980 and Department of Justice, "Merger Guidelines," May 30, 1968. The Antitrust Division's guidelines were recently revised.

4/ Caves and Uekusa, op. cit., p. 151 and 152. The JFTC imposed certain conditions on the merger, and stated that with these conditions, the merger would not substantially reduce competition.

5/ Interestingly, MITI's attempts to increase industrial concentration often met little success. For example, MITI's attempts to increase concentration among auto assemblers and parts suppliers fell far short of its goal. Magaziner and Hout, op. cit., pp. 70-78. Data from 1967 to 1976 show that producer concentration is generally increasing in Japan. However, concentration is decreasing in markets where the three largest firms produce over 70 percent of output, OECD, Annual Reports on Competition Policy, Paris, 1980, No. 2, p. 69. It is in these more concentrated markets that mergers are likely to create antitrust problems.

Assessment

Japan's targeting policies seem to have encouraged the growth of selected industries, such as the steel, electronics, machinery industries. These three industries have come to dominate Japan's export sales, accounting for over 80 percent of its total exports in 1981. However, market forces played an important role in the growth of these industries. For instance, expanding and open world markets, rapidly rising domestic income, and relatively cheap and abundant raw materials were the norm until the early 1970's. The oil crisis of the 1970's was a major factor behind the increases in machinery shipments, which include autos and electric appliances.

Until the early 1970's, the Government used a number of tools to spur the development of these industries. The combination of a protected home market, tax subsidies, direct grants, loans at below market rates, and cooperation among firms seems to have had direct, positive effects on some targeted industries. Despite the fact that cooperation among firms was used to achieve a variety of purposes--such as standardization, specialization, and the sharing of technological information--Japan seems to have maintained sufficient domestic competition to keep targeted industries internationally competitive.

During the 1970's, Japan progressively dismantled many of the targeting policies previously in place. Home-market protection has been reduced, tax and loan subsidies have declined, and financial markets have been liberalized:

Home-market protection.--Home-market protection through high tariffs and restrictive quotas declined considerably from the mid-1960's to the mid-1970's. Since then, Japan's tariffs and quotas have been comparable with those in other industrialized countries.

o Other barriers remain, however, such as discriminatory standards and certification procedures and problems in customs classification and clearance. Progress has been made in resolving some of these problems in the past several years. If implemented fully, these changes could substantially lessen home-market protection in the Japanese market, but it is to soon to assess the real benefit of them.

o Government procurement in Japan is still substantially closed to foreigners. However, recent changes in procedures by NTT may result in more sales by foreign firms to the Japanese Government. A large telecommunications project now being undertaken by NTT--the INS project--will provide an important source of growth in demand for products by NTT. Access to that market may thus be crucial to foreign firms.

o Restrictions on investment and technology licensing have been substantially removed. Foreign firms' are now able to invest in and license technology without Japanese Government interference, except for national security reasons.

Tax policy.--Tax policy is still an important targeting tool in Japan.

o Despite the fact that differences in tax rates between industries are relatively low, Japan's tax policy has provided benefits to targeted industries. The electronics and machinery and equipment industries have particularly benefited from these policies. In the past decade, Japan's tax code has encouraged purchases of computers, robots, machine tools, and flexible manufacturing systems. Preferential tax treatment also applies to purchases of aircraft and ships. These special tax measures have given substantial incentives to Japanese purchasers to buy products of targeted industries.

o Tax policy has been used to encourage savings and investment generally. In the most recent 5-year period, tax losses due to such tax incentives for savings accounted for over one-half of all tax losses attributable to special tax measures. If effective, these tax policies could have important effects on overall growth. However, they are too broad to be considered targeting as defined in this report.

Financial markets.--Targeted industries have benefited from Government loans at low-interest rates. However, Government banks accounted for less than 15 percent of all loans to industry in 1982. Lending by Government banks charged with implementing Japan's industrial policy accounted for less than 30 percent of all Government lending in Japan in 1982. Targeted industries that have received those funds include the shipping, aircraft, fabricated metal product, iron and steel, and general machinery industries. The importance of these loans to targeted industries, however, may sometimes be slight.

As shown in appendix F, subsidies involved in low-interest loans to high-technology industries seem to be small. Furthermore an earlier study of tax and financial benefits received by the Japanese steel industry concluded, "It would be difficult to attribute the success of the Japanese steel industry to Government support, given the relatively small amount of public assistance received by the industry." 1/

o The Japanese financial system has undergone significant changes in the past 5 years. Restrictions on capital flows have been eliminated and controls over interest rates and asset instruments have been substantially loosened in recent years. These changes have lessened Government control over financial transactions and thus limited its ability to direct funding to targeted industries.

o Government financial policy seems to have encouraged savings and investment generally. Still, real interest rates, those adjusted for inflation, were higher in Japan than in the United States for much of the postwar period. In the past 3 years, however, real interest rates in the United States have been considerably higher than those in Japan.

o Small businesses have benefited the most from Government loans because they depend more on debt than large firms and because they normally would not qualify for the low-interest rates charged on such loans. In 1982, over 40 percent of the value of all Government loans to achieve industrial policy purposes were extended to small- and medium-sized businesses.

o Loans to small- and medium-sized businesses have accounted for the bulk of loans to the fabricated metal product, general machinery, electrical machinery, and precision machinery industries. Government

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1/ Federal Trade Commission, The United States Steel Industry and its International Rivals, 1977, p. 368.

bank loans have been important to most of these industries, in some cases, accounting for over 15 percent of total loans to the industry in the most recent 3-year period.

Science and technology policies.--Direct grants and subsidies provided by the Japanese Government to support research and development have generally been comparable with those in the United States (when adjusted for military R&D). Such subsidies have been particularly important to the aircraft, computer, and semiconductor industries.

o Cooperative research and development projects that are jointly financed by the Government and private industry frequently have been used to make Japanese firms more competitive in targeted industries. Japan's antitrust laws facilitate these projects by putting almost no restriction on inter-firm cooperation in R&D. Aircraft, computers, machine tools, robotics, and semiconductors are among the industries that have benefited from such programs. The fruits of such research often have not been available to foreign firms. Recent changes in Japan's Government policy may allow foreigners equal access to the patents that arise from such projects. Continued access to those patents will remain an important bilateral issue.

o Research conducted by NTT in cooperation with domestic firms has been important to the computer, semiconductor, and telecommunications industries. The next generation semiconductor chip, the 256K RAM, and technology for the manufacture of fiber optic cable both were developed by Japanese firms in cooperation with NTT. To date, no foreign firms have participated in such projects. Recently, it was announced that IBM Japan may work with NTT to develop software for the INS telecommunications project. Similar participation should have direct beneficial effects on the foreign firms involved and result in higher sales to NTT.

o A series of laws have been in effect since 1956 to promote the electronics and machinery industries. Research programs carried out under its auspices have benefited firms in those industries. For instance, cooperative programs were organized by MITI that succeeded in developing mainframe computers and sophisticated semiconductor elements.

o Japan's effort to develop industrial complexes in Japan's rural regions revolving around high-technology industries appears to be beneficial to both Japanese and foreign firms.

Antitrust policy.--Japan's antitrust policy has allowed the creation of formal cartels for targeting purposes. However, the use of such cartels has declined dramatically in recent years. Most of the cartels currently in existence in Japan involve small- and medium-sized businessses or declining industries such as textiles, aluminum, and petrochemicals.

Targeting practices in specific industries

Japan has used a number of targeting practices to foster the development of certain industries. Here we focus on the specific targeting techniques that Japan has used in the aorcraft, aluminum, automobile, computer, iron and steel, machine tool, robotics, semiconductor, and telecommunications industries.

Aircraft.--The Japanese civil aircraft industry has been targeted for much of the postwar period. Despite the industry's special status and direct Government support--through research and development grants and preferential loans--the industry has had few commercial successes. It has recently made inroads in the commuter aircraft sector of the industry. Unlike some other targeted industries, import protection has never been used in this industry. Indeed, special tax measures and preferential loans have generally served to defray the costs of purchasing aircraft from foreign companies. At the present time, a new industry promotion law for the aircraft industry is being drafted (one has been in effect since 1954.) The Science and Technology Agency recently published a long-term vision for the aerospace industry.

MITI oversees production of both military and civil aircraft. Within MITI, the Aircraft and Ordnance Division of the Machinery and Information Industries Bureau is responsible for overseeing the aircraft sector. The Aircraft and Machinery Industry Council, with representatives from industry, Government, labor, and academia, advises the Division. The Society of Japanese Aerospace Companies, a trade association, represents the industry's interests to the Government. 1/

The vast majority of Japan's aircraft industry sales are to Japan's military; in 1979, it accounted for nearly 90 percent of the industry's orders. The Japan Defense Agency (JDA) selects the planes it wants to purchase, but MITI makes recommendations to JDA regarding contract awards. 2/

The industry often depends on joint ventures with foreign firms for transfers of technology and demand for its products. MITI has encouraged Japanese aircraft producers to pursue joint ventures with foreign producers, both to defray the huge costs involved in new aircraft production and to gain valuable technical knowledge. Joint ventures also help the industry overcome the limitations of Japan's small domestic market by opening up at least a portion of overseas contracts to Japanese firms. 3/ MITI has provided some of the funding for these joint ventures through success-conditional loans and direct grants for research and development. These grants usually are given through its Agency for Industrial Science and Technology (AIST). Several government laboratories from various Ministries are also involved in aircraft research. These laboratories sometimes give contracts to private research associations to conduct research.

1/ General Accounting Office, Industrial Policy: Case Studies in the Japanese Experience, Washington, D.C., 1982. p. 36.
2/ Ibid.
3/ Government Accounting Office, U.S. Military Coproduction Programs Assist Japan in Developing Civil Aircraft Industry, Washington, D.C., 1982, pp. 12-16.

AIST gave a consortium of Japanese firms--Kawasaki, IHI, and Mitsubishi--20 billion yen in consignment payments between 1971 and 1982 to develop a fan jet engine for aircraft, the FJR-710, in cooperation with Rolls-Royce of Great Britain. That project succeeded, and Rolls-Royce and the same consortium are now working together to develop the RJ-500 engine. The projected cost of the 8-year project is 140 billion yen, split equally between the consortium and Rolls-Royce. Thus far, MITI has provided 5 billion yen for this project in the form of success-conditional loans to the consortium.

The Science and Technology Agency, which is located in the Prime Minister's Office, has been trying to develop a short take-off and landing (STOL) aircraft since 1972. MITI's National Aerospace Laboratory also began work on an experimental fanjet STOL in the same year, with first year funding of 23 billion yen. The Laboratory hopes to develop a commerical STOL plane by 1990. Private manufacturers have participated in MITI's project under contract. For instance, in 1982, Kawasaki received a consignment payment of 5.2 billion yen to develop a prototype C-1 transport plane. 1/

In 1973, the Civil Transport Development Corporation (CTDC) was formed by a consortium of Japanese aircraft producers--Mitsubishi, Kawasaki, and Fuji Heavy Industries--to manage the YX program, an effort to develop a 767 aircraft in cooperation with Boeing and an Italian aircraft firm. The JFTC approved the establishment of the CTDC and MITI is responsible for overseeing its operation. The CTDC submits its budget, financial statements and planned activities to MITI for is review. 2/

The CTDC has received success-conditional loans from MITI which covered slightly more than half of CTDC's costs for the project. The five-year 767 project cost the CTDC 33.6 billion yen, of which MITI loans accounted for 17 billion yen. Repayments of the loans are now being made.

The CTDC is also coordinating the research and production by the consortium for the YXX or next generation aircraft project. The six-year project began in 1981, and is to receive 25 billion yen in conditional loans from MITI.

The Government provided direct grants to the industry's trade association, the Society of Japanese Aerospace Companies, for it to set up a research arm in 1981. The research arm is called the Revolutionary Aircraft Development Center, and it proposes joint research projects and allocates research tasks among the member companies. The Government has provided the Center with direct grants totaling 40 percent of the cost for its basic research. The Center is currently sponsoring projects to develop a combustion control system using microprocessors, machining processes for lightweight structures, a data processing system for aircraft that incorporates optical fibers, and more fuel efficient aircraft.

1/ General Accounting Office, Industrial Policy: Case Studies in the Japanese Experience, Washington, D.C., p. 41.

2/ Ibid., p. 38.

Aluminum.--The Japanese Government has used a variety of tools to cushion the decline of the aluminum industry since the first oil crisis of the 1970's. As part of the Government's efforts to rationalize the industry, coordinated investment and cooperation in reducing excess capacity have been encouraged. The Government efforts were designed to spread the burden of adjustment to the industry's dramatic loss of competitiveness since the 1970's. The significant increase in the price of imported oil, on which Japan is heavily dependent, greatly increased the cost of electricity in Japan relative to the cost in other major industrialized countries. Because electricity is one of the most significant costs of aluminum smelting, this change in energy prices made the industry uncompetitive internationally.

Japan's aluminum smelters began to experience severe operating losses in 1977, and the Government began to consider measures that could be used to help the industry adjust. In a report on how to rescue ailing smelters in 1977, the Industrial Structure Council of MITI recommended that the Government take steps to eliminate about 24 percent of smelting capacity; cover ingot shortages by purchases from abroad; create a joint sales company to reduce competition among smelters; and introduce a tariff quota system.

Industry members, however, felt short-term reversible measures were the correct ways to solve the problem. They argued that the industry should retain its capacity for economic security reasons, and they opposed forced mergers and groupings. MITI did implement the freezing plan and tariff quota system during 1977 and 1978. Under the quota system, Japan's 9 percent tariff was reduced to 5.5 percent on a certain volume of imports. Importers however, were required to pay the difference between the 9 and 5.5 percent duties into a fund which was used to subsidize interest payments on frozen facilities. MITI also urged the primary aluminum industry to seek a "vertical unification" with wrought aluminum fabricators in order to increase the value added of aluminum products so that profits from the semifabricating segment could be used to cover the deficits occurring in the smelting segment.

None of these measures proved to be fully effective. The trilemma of a sharp fall in international aluminum ingot prices, increased imports due to the yen's appreciation, and a decline in domestic demand made it difficult for Japanese aluminum smelters to pass their higher costs on to their customers in the form of higher prices.

In 1978, the aluminium smelting industry was designated a structurally depressed industry in the "Provisional Law on Measures for the Stabilization of Designated Depressed Industries." This law provides financial assistance to depressed industries and allows them to form cartels and join with the Government to plan changes in industry capacity. 1/ In 1979, the Japanese Government again drafted a basic plan for stabilization of the aluminum smelting industry. The plan called for a 50 percent cut in smelting capacity and extending the tariff quota system for another fiscal year. MITI also actively encouraged investments by aluminum smelters, rollers, and processors in overseas aluminum smelting ventures to secure stable aluminum ingot import sources. Japanese interests are currently participating in several projects. The major projects are located in Indonesia, Brazil, Venezuela, New Zealand, and Australia.

1/ A depressed-industry cartel for aluminum ingot producers previously had been formed under the Antimonopoly Act.

MITI's latest guidance statement dealing with the aluminum industry recommended that 1.5 billion pounds of smelting capacity be maintained (present capacity is approximately 3.7 billion pounds). But, actual production this past year was only around 441,000 million pounds, according to representatives of Keidanren, i.e., 1.1 billion less than suggested capacity.

While Japanese aluminum smelters have faced increasing difficulties, Japanese aluminum fabricators have improved their international competitiveness. Prior to the 1970's, these fabricators used only domestically produced ingots, which were priced higher than their foreign counterparts. As a result, the industry was domestically oriented rather than export oriented. Wrought aluminum fabricators were able to bolster overseas business operations, as the importation of cheaper ingots reduced their high material costs, and enabled them to be more price competitive in world markets. 1/

Automobiles.--The Japanese Government used a number of methods to target the automobile industry, including protecting the home market and encouraging mergers. Nevertheless, firms in the Japanese automobile industry seem to have followed a course dictated by their own interests--a course often different from that suggested by MITI. Indeed, the automobile industry provides the most convincing example of the countervailing power of firms in Japan's economy, even in the early postwar period.

The automobile and truck industry was targeted in 1952 after debate within the Japanese Government. MITI sought to encourage the industry by (1) protecting the home market through tariffs, quotas, and limits on foreign direct investment; (2) encouraging producers to modernize and expand production facilities through the use of loans, grants, and tax incentives, and (3) assisting the industry to develop export markets.

Some of these targeting policies undoubtedly had direct beneficial effects on Japan's auto makers, notably, home-market protection. Imports of automobiles were under strict quota limits until the mid-1960's, prohibitive tariffs were in effect until the mid-1970's, and restrictions on foreign direct investment were in effect until the early 1970's. Since that time, procedures for inspecting automobiles by Japan's customs officials have been a factor in keeping foreign shipments of autos to Japan at extremely low

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1/ According to the Japan Economic Journal, Industrial Review of Japan, various issues, 1977 through 1983. In the aftermath of the 1974 recession, the aluminum rollers did form a depressed-industry cartel under the Antimonopoly Act, but that cartel ended in February 1978.

Recent changes in those procedures could significantly lessen import protection for the automobile industry. 1/

The Government's attempts to encourage industry rationalization and consolidation were unsuccessful. Despite what are often characterized as big "sticks"--its control over technology licensed from abroad and influence over import allocation for such important materials as rubber and aluminum, and despite its influence over government and private financial institutions, the Japanese Government appears to have failed in all of its attempts to reduce the number of firms in the industry and encourage product specialization.

Until 1959, Nissan and Toyota dominated passenger car production. Escalating demand fueled by rising incomes prompted three more firms--Mitsubishi, Fuji, and Toyo Kogyo--to enter the passenger car business in 1960. The combined market share of Toyota and Nissan dropped from three-quarters to less than one-half of the Japanese market between 1960 and 1965. MITI attempted to discourage the new firms, for example, by rejecting two out of six applications to import technology from abroad in 1963. In 1965, in another scheme to reduce the number of producers and encourage specialization, MITI suggested that the car producers each develop a prototype People's Car, and then permit MITI to select a design and subsidize its production by the manufacturer that created it. However, the companies objected to the plan, and it died a quiet death. In 1961, MITI suggested that each car producer should devote itself to production in one of the following areas--regular passenger cars, minicars, or specialty cars. The objective was to increase specialization and eliminate small producers. Although Toyota and Nissan did not come out against the proposal, the other carmakers--Toyo Kogyo, Mitsubishi, Daihatsu, and Fuji--strongly objected to MITI proposal, and it was abandoned. 2/

1/ Until recently, the peculiarities of Japan's standards certification system meant that imports of automobiles had to be individually inspected at port. In March 1983, the Government of Japan announced that it planned to simplify the procedures for inspecting foreign-made automobiles, giving foreigners the same access to "type certification" that is available to Japanese companies. In other words, a particular type of car (e.g., a 1983 Ford Mustang) would be inspected, and if it met all Japanese standards, that "type" would be certified and thus not subject to individual inspection on the dock. The change requires foreign companies to submit a prototype for inspection up to 6 months in advance of the first shipment to Japan. Otherwise, they will have to undergo individual inspection at port. Some U.S. auto manufacturers have complained that they will receive little benefit from this change. However, European carmakers and Volkswagon of America have all praised the recent changes.

2/ Ira C. Magaziner and Thomas M. Hout, Japanese Industrial Policy, Institute of International Studies, Berkeley, Calif., 1980, pp. 73-74.

Some mergers did occur after 1965, but these were largely self-motivated and not in response to MITI's plans to reorganize the various firms. For example, Hine's truck and Daihatsu's minicars were purchased by Toyota, a merger arranged by the Mitsui Bank, the primary creditor for the three companies. At the request of the manufacturers, MITI did not participate in the discussions. 1/ Joint ventures with foreign producers also took place (for example, General Motors with Isuzu, and Chrysler with Mitsubishi). Honda entered the car industry in 1969.

Certain tax provisions that were broadly aimed at encouraging exports were of particular benefit to automobile exporters. For instance, the automobile industry was one of the principal users of the tax provision which allowed tax-free reserves to cover costs associated with overseas marketing development. From 1964 to 1972, a reserve of 0.5 percent of export sales could be created to fund overseas market development. During that period, the automobile industry was one of the main beneficiaries of this provision. Since 1972, only small firms have been allowed to create such reserves. The auto industry was also one of the principal users of an accelerated depreciation measure that was tied to export performance; this measure was in effect from 1964 to 1972.

The industry will also benefit from several of the Government-funded research projects described in appendix F. For instance, MITI's Next Generation Industries Project will involve research in several areas of great interest to automobile manufacturers, particularly new materials and new semiconductor elements. Separate but similar research is being conducted by the Science and Technology Agency and the Ministry of Education. However, the Government-sponsored research projects are quite small relative to the R&D now being conducted by the industry itself. For instance, in 1980, R&D expenditures of Japan's leading auto companies--Honda, Nissan, Toyota, and Toyo Kogyo--totalled approximately $1.5 billion. The total amount projected to be spent by the Government on the Next Generation Industries Project is $452 million. That spending will be spread over ten years. Thus, Japanese Government spending on R&D that could potentially benefit the auto industry during the ten years amounts to just over 30 percent of the amount spent by the four leading firms in the industry in one year, or an average of 3 percent of the industry's annual expenditures over the decade.

Computers.--The Japanese Government has used an extensive array of targeting tools to foster the development of the computer industry, including grants and subsidized loans for research and development, special tax measures, import protection, technical support, and a government-funded computer leasing company. Home market protection in the form of import and investment restrictions and government involvement in technology agreements was an important element of Japan's targeting policy for the computer industry until the mid-1970's. Government sponsored research was a major factor in setting up the Japanese computer industry in 1958, and has remained important since that time.

1/ Ibid., p. 77.

Japanese electrical equipment firms began developing computers in the mid-1950s, about ten years after the first American computers were built. In response to requests from five electrical equipment manufacturers--Fujitsu, Hitachi, Matsushita, NEC, and Toshiba--MITI established the Research Committee on the Computer in 1955. The Committee, made up of representatives from government, industry, NTT, and academia, recommended limiting imports of computers, licensing of foreign technology, and expanding then ongoing research projects within NTT, the Ministry of Education, and MITI's AIST. 1/

MITI's AIST had started a computer development project in 1954, but this program, as with other computer development projects, was not a priority either of government or industry at the time. The 1955 Research Committee recommendation gave these projects new importance. In 1957, AIST made available the results of its 3-year computer development program, and by 1958 Fujitsu, Hitachi, NEC, and Toshiba had each introduced computers onto the market. 2/

The 1957 Law Providing Temporary Measures for the Promotion of the Electronics Industry was designed primarily to encourage the rapidly growing consumer electronics sector, but it also affected computers. The law designated the electronics industry section of MITI's Heavy Industries Bureau as the office responsible for dealing with computer manufacturers and set up what is now known as the Electronic and Machinery Industries Deliberation Council as a consultative body to MITI. The law also qualified computer manufacturers for financial assistance in the form of special depreciation measures and direct grants from the Government, and enabled MITI to exempt the industry from the Anti-Monopoly Law. 3/

Acquisition of technology was a major concern of Japanese computer makers during the 1950's and 1960's. In 1960, when IBM sought to establish a wholly owned manufacturing operation in Japan (IBM had been involved in a joint venture before World War II), the Japanese Government required IBM to license basic patents to all interested Japanese computer makers in return for permission to operate in Japan. Thirteen Japanese companies subsequently entered into licensing agreements with IBM. 4/

MITI designated domestic firms to negotiate with specific foreign firms in technology licensing negotiations, thereby keeping royalty fees from being bid up and ensuring that no Japanese computer maker could secure a monopoly by outbidding other manufacturers. For example, Hitachi's arrangement for licensing from RCA was delayed by MITI until NEC began negotiations with

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1/ Eugene J. Kaplan, "Japan: The Government-Business Relationship," Washington: U.S. Department of Commerce, 1972, pp. 79-80.

2/ Ibid., p. 83.

3/ Ibid., p. 82.

4/ MITI has the legal right to force Japanese firms to license patents for essential technology.

Honeywell. 1/ Joint ventures with foreign manufacturers that had technical superiority were also encouraged. In 1963, Oki entered into a joint venture with Sperry Rand and other joint ventures were also begun. 2/

The Japanese Government maintained a system of quotas and tariffs on computer imports until 1976, as well as informal barriers such as the requirement that a would-be importer of computers justify such a purchase to the import planning section of MITI. In addition, until the 1970's the Japanese Government controlled the allocation of foreign exchange, and could in this way limit and control access to imports. "Buy Japanese" policies were also encouraged, and the leasing activities of the Japan Electronic Computer Corp. (JECC) extended only to domestic units. 3/

At MITI's urging, the Japan Electronic Computer Corp. was founded in 1961 by Fujitsu, Hitachi, Mitsubishi, Oki, Toshiba, NEC, and Matsushita (which withdrew in 1964 and rejoined in 1979). 4/ JECC buys computers, peripherals, and software from the member firms and leases them to users at favorable rates. JECC was originally capitalized at $3 million, and from 1961 to 1979 received almost $2 billion in loans, one-third from the Japan Development Bank (JDB) and the rest from commercial banks. Most of the JDB's funds for the development of technology have gone to the JECC. 5/

JECC did not eliminate the firms' costs of maintaining inventory or of marketing support. Computer manufacturers still marketed their products and competed for contracts on the basis of price and technology. The JECC purchased computers outright from the manufacturer, thus quickly returning the price of the computer to the manufacturer. It then leased them on favorable terms and at virtually no risk to the end user--the user could return them at any time--and often did so because of the rapid pace of technological advance. The JECC thus expanded demand for computers by lowering the costs and risks involved in leasing them. This arrangement allowed the manufacturers to compete more effectively with IBM's leasing operations. 6/

Today, a substantial portion of Japan's computer production is sold directly to end users and some computer manufacturers--such as Fujitsu and Hitachi--have their own leasing services that handle most of their leasing contracts. Since those two companies are the No. 1 and No. 3 manufacturers of computers in Japan, the JECC appears to play a much less important role to the Japanese computer industry today than it did from 1961 to 1975.

1/ Leslie D. Helm, "The Japanese Computer Industry: A Case Study in Industrial Policy," (master's thesis). University of California at Berkeley, 1978, pp. 74-77.
2/ Ibid., p. 84.
3/ Kaplan, op. cit., pp. 84-86.
4/ According to the Japan Electronics Almanac (1981), Fujitsu, Hitachi, NEC, Toshiba, Mitsubishi Electric, and Oki were the six leading computer manufacturers in Japan in 1981.
5/ Kaplan, op. cit., p. 87.
6/ Helm, op. cit., p. 102.

The computer makers must buy back the units which are returned to JECC. In a period of rapid technological changes, this proved to be a serious cash drain to the manufacturers: 40 to 50 percent of the revenue from the sale of new computers went for buy-back expenditures. To alleviate this problem, the Ministry of Finance allowed the computer firms to create a tax-free reserve of 10 to 20 percent of the gross revenue from the sale of computers to JECC for use in repurchasing computers. The actual buy-back cost during the year is deducted from the amount allowed in the reserve, and buy-back costs cannot be deducted from taxable income. After 5 years, the reserves are phased back into the income stream. Foreign-owned computer manufacturers residing in Japan, such as IBM Japan, can also use this reserve.

The subsidies to computer hardware producers inherent in JDB loans and the repurchase reserve from 1977 to 1981 are shown in table 32. Appendix C discusses how these subsidies were estimated. During this period, these subsidies were never more than 0.8 percent of the value of computer production. The Japanese Government also subsidized this industry through other methods.

Table 32.--Computer subsidies inherent in JDB loans and the repurchase reserve, 1977-81

Year	JDB loans	Repurchase reserve	Total	Production	Ratio of total to production
	Million Yen				Percent
1977----	2,602	3,000	5,602	719,274	0.8
1978----	2,490	0	2,490	910,248	.3
1979----	3,134	3,000	6,134	1,124,492	.5
1980----	3,414	2,000	5,414	1,292,556	.4
1981----	4,042	2,000	6,042	1,478,094	.4

Source: Subsidies inherent in JDB loans are estimated by the staff of the U.S. International Trade Commission, subsidies inherent in the repurchase reserve are from Wheeler Pepper and Janow, op. cit., pp. 100-101, and production data are from the Electronics Industries Association of Japan.

In the mid-1960's, when IBM introduced the third generation of computers, the Japanese Government recognized the need to keep up with rapid technological advances by then-dominant foreign manufacturers, and decided to give the industry greater support. In 1966, MITI organized the large scale computer project, in an effort to develop a computer comparable to the third generation IBM 360 series. 1/ Six firms took part, with $33 million in Government funding. Fujitsu, Hitachi, and NEC were assigned the research on the memory and processing functions of the new computer, as well as software development; Toshiba, Oki, and Mitsubishi were assigned the development of peripheral equipment. This division of duties by MITI encouraged specialization by the firms within the industry that has continued to the present. 2/

The 1957 Law Providing Temporary Measures for the Promotion of the Electronics Industry permitted MITI to allocate production of specific items among producers. In 1969 MITI, fearing too many producers and too little specialization among producers, set up a cartel of peripheral equipment producers. The structure of the cartel was decided upon after extensive consultations with reluctant manufacturers. This allocation was limited to products which MITI felt were unlikely to experience any further technological innovation, such as punch card equipment, line printers, and magnetic drums. Products seen as more likely to undergo further development were not included in the allocation plan, to ensure further research on a competitive basis. 3/

Another MITI effort to rationalize the computer industry in 1969 failed. MITI suggested that the six major computer manufacturers merge into three large firms. The proposal was categorically rejected by the six firms, each of which maintained an independent bases of support within its keiretsu, and was both horizontally and vertically integrated (for example, into telecommunications equipment).

In 1971, MITI began a joint project to develop a fourth generation computer that used large-scale integration, as did the IBM 370 series. Fujitsu and Hitachi joined efforts to develop a large, multi-purpose computer known as the M series, which was an IBM compatible unit. Mitsubishi and Oki developed the ACOS series of smaller computers, and NEC and Toshiba jointly produced the COSMOS series, designed by Honeywell and not compatible with IBM computers. All of these lines continue to be marketed. 4/

Development of computer software.--Japan has consistently lagged behind the United States in the area of computer software. In 1967, the Japan Information Processing Development Center (JIPDEC) was established by six computer manufacturers and JECC. JIPDEC was designed to increase knowledge of data processing and promote its uses.

In 1970, MITI and six firms organized the Information Technology Promotion Agency (IPA), which became a semi-private corporation in 1972, although the Government continues to underwrite some of its expenses. The IPA was designed to promote the use of software, market software packages, and guarantee loans to private software firms for software development. Such firms often had trouble securing financing because of their small size and limited financial resources. 5/ Although rather unsuccessful in the goal of marketing software packages--only 20 percent of packages resulting from one

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1/ Gresser, op. cit., p. 10.
2/ Helm, op. cit., p. 80.
3/ Kaplan, op. cit., p. 94.
4/ Ibid., pp. 81-83.
5/ Kaplan, op. cit., pp. 95-96.

project have been commercial successes--the agency has been quite successful in guaranteeing loans to software companies. In the first year of operations, $1.1 million in initial capitalization secured $30 million in loans. 1/

A special tax free reserve applies to software sales; 40 percent of the revenue accruing from the software sale can be placed in a tax free reserve during the first 4 years of commercial sales for the particular software program. Funds in the reserve are to be used for software development. 2/ This tax measure provides companies with a tax subsidy for the development of general purpose software and promotes its diffusion. 3/

Current research projects in the computer field.--A number of joint R&D projects are currently being sponsored by the Japanese Government in the computer field. Nevertheless, the amount of funding that will be provided by the Government is small relative to the amount of R&D that is financed by the companies themselves. Total actual and projected funding for computer and semiconductor research projects from 1972 to 1990 is approximately $685 million. That amount is to be spread over 18 years. The leading firms in the industry--Hitachi, Matsushita Electric, Toshiba, Fujitsu, and Mitsubishi Electric--spent nearly $2 billion on R&D in 1980. Thus, total funding for Government-sponsored cooperative research projects over two decades represents about 41 percent of the amount spent by five firms in the industry in one year, or an average of 2.3 percent of the industry's annual R&D expenditures. It should be noted that these firms also produce telecommunications and consumer electronics equipment. Their R&D expenditures thus include spending on research in all of these industries. A list of the projects, companies involved, duration of the project, and form of Government payment can be found in appendix F. A brief description follows:

Supercomputer.--This is a 9-year project, running from 1981 to 1989, and is intended to develop a computer capable of the extremely high-calculating speeds necessary for various scientific and defense applications. While MITI's Electrotechnical Laboratory will participate, research by the firms will be conducted in their respective facilities. Each participating computer manufacturer (except for Mitsubishi) is carrying out parallel in-house research on supercomputers, financed from within.

U.S. supercomputer manufacturer Cray Research has had difficulty selling its computers in Japan since the 1979 announcement by MITI of the supercomputer joint R&D project. Prior to the announcement, Cray sold two of its supercomputers to private companies: Mitsubishi Research and Century Research. Since 1979, Cray has been unable to sell any of its supercomputers in Japan, where Government institutions or Government-funded private laboratories account for the bulk of potential demand. 4/

1/ General Accounting Office, U.S.-Japan Trade: Issues and Problems, 1982, p. 31.

2/ "Japan Launches New Software Development Effort," Byte Magazine, May 1983, p. 496.

3/ General Accounting Office, Industrial Policy: Japan's Flexible Approach, p. 63.

4/ NTT is currently negotiating with Control Data Corporation and Cray Research to purchase a supercomputer. NTT bypassed Japan's own Fujitsu, Hitachi, and NEC because of the unproven record of Japanese companies in supercomputers and their lack of sophisticated software. Japan Economic Institute, JEI Report, No. 34B, September 9, 1983, p. 2.

Optoelectronics.--This project is for the development of a system for monitoring large-scale industrial processes using optical sensing and data transmission devices. The companies involved have established a facility with 30 researchers within Fujitsu's laboratories, consisting of both Government and private researchers.

Fourth generation computers.--This effort is to develop the hardware, software, and peripheral equipment for a computer which will supersede in memory capacity and computing speed the top of the line models of the mid-1970s (e.g., the IBM 370 series). The project is divided into two phases:

Phase I: The Very Large Scale Integration (VLSI) project ran from 1976 to 1979, with Fujitsu, Hitachi, Mitsubishi, NEC, and Toshiba participating. Over the life of the project MITI provided $132.3 million in loans; the companies spent $190.9 million of their own funds.

Phase II: Eight firms (Fujitsu, Hitachi, Matsushita, Mitsubishi, NEC, Oki, Sharp, and Toshiba) are participating in the development of peripheral equipment and operating system software in the 5-year project, which will run from 1981 to 1985. MITI loaned $102.3 million to the participants, which put up $111.4 million of their own.

Fifth generation computers.--This is a 12-year project (1979-91) with a goal of developing computers capable of some degree of artificial intelligence and knowledge assessment rather than merely processing data. The results of this project will be Government property, and thus will be available for licensing to all firms, including foreign firms, which meet the following conditions: the company must pay a patent fee and have the manufacturing capability (whether or not in Japan) to use the patents. No firm is allowed an exclusive license on such technologies, as explained in the science and technology section above.

Software projects.--The Japanese Government has underwritten a number of joint R&D programs to develop computer software. Part of the impetus for these projects is the fact that Japan is generally believed to be about 10 years behind the United States in software development, with the notable exceptions of software for robotics, banking, video games and graphics, and airline reservation systems.

Japanese computer hardware companies have not generally developed or used standard operating systems--the master program that manages the computer's operations, memory, disk drives, terminals, and other resources. 1/ In 1981, 91 percent of the applications programs used in Japan were customized programs--i.e., written specially for each customer and his applications needs--and 9 percent were standardized; in the United States 47 percent are customized and 53 percent standardized. Japanese companies must rely on in-house programers to supply their customers with software designed for their needs, whereas many U.S. companies can rely on packaged software and independent software houses to develop software for their computers. As

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1/ An example of a standard operating system for personal computers is CP/M, which is used in a variety of computers, such as Apple and Osborne. Kurt Veggeberg, "The Japanese Microcomputer Marketplace," Byte Magazine, May 1983, pp. 236.

of 1982, 76 percent of Japan's software was developed by computer hardware manufacturers; in the United States, 54 percent of the registered programs originate in independent software houses. 1/ The lack of sufficient and efficient software capabilities by Japans mainframe computer manufacturers is considered to be a weakspot of the industry which MITI-sponsored research and development projects are designed to remedy. 2/

A 6-year program that was intended to develop a capability for computers to automatically write their own applications software ended in 1981. In the project, sponsored by MITI's Machinery and Information Industries Bureau, 17 major software companies directed the efforts of nearly 100 smaller such firms. MITI provided $30 million in funding for the project through the IPA. During the course of the project, the original goal was seen as too ambitious, and it was changed to creating a "library of working aids for programmers." The IPA markets all software developed under the project; so far, only 20 percent of the software packages resulting from the project have been commercially successful.

Software development, particularly developing standard operating systems and new program languages is one aspect of the second phase of the Next Generation Computer Project, which will run from 1981 to 1985. Project funding totals about $192 million, with half of the funds provided by the Government and the other half by the participating companies: NEC, Hitachi, Fujitsu, Matsushita, Toshiba, Mitsubishi, Oki, and Sharp. Independent software firms will be given $10.6 million of the funds, and the rest--approximately $181 million--will go to the hardware manufacturers.

Iron and steel.--The Japanese Government took a number of steps to encourage the early development of the steel industry. These steps included financial assistance, home market protection, assistance in improving technology, and permission to form cartels. As the Japanese industry became an established world leader, however, the Government's assistance to it declined. The Japanese steel industry is no longer receiving significant benefits from targeting. 3/

In the early stages of the steel industry's development, the Japanese Government restricted imports through a variety of measures, especially tariffs and foreign exchange controls. After 1960 barriers to imports

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1/ McKinsey and Co., op. cit., p. 78.

2/ McKinsey and Co., op. cit., p. 76. Standard programs may sometimes be capable of running on a variety of computers because they are meant to be used with standard operating systems (e.g., Visicalc and Wordstar are standardized programs meant to run on CP/M operating systems for personal computers). Development of standard operating systems and applications programs is considered vital in mass marketing microcomputers. At least 13 Japanese companies are already marketing microcomputers in the United States: Canon, Casio, Seiko (Epson), Fujitsu, NEC, Oki (BMC), Panasonic (Matsushita), Sharp, Systems Formulate, Toshiba, Hitachi, and Sony. In addition, over the past 4 years, the share of microcomputer sales in Japan accounted for by Japanese producers has increased from 10 percent in 1980 to 75 percent in 1983. Phil Lemmons, "The Machines Behind the Machines," Byte Magazine, May 1982, pp. 115-138.

declined. 1/ Import penetration of the Japanese domestic steel markets, though still low, has risen in recent years.

When the Japanese Government controlled the import of technology, it used that power to stop Japanese steel makers from competing against each other when bidding on licenses for imported technology. This policy apparently reduced the price Japanese firms had to pay for imported technology. 2/ The policy was particularly effective because the two main alternatives a foreign patent holder had to licensing Japanese firms--establishing a subsidiary in Japan or exporting products to Japan--were precluded by the Japanese Government's restraints on foreign investment and imports. The Japanese Government, however, has removed almost all controls over technology imports.

The Japanese Government gave financial assistance to the steel industry in a number of ways, such as low-interest rate JDB loans, and investment in import improvements. This financial assistance was greatest during the 1950's when the industry's development was guided by the Government's first and second rationalization plans. The sources of the steel industry's investment funds during this period are shown in the following tabulation (in percent). 3/

First rationalization, 1950-55

Sources	Percent
Government loans	39.8
Industrial Bank of Japan	17.8
Long-term Credit Bank	6.4
Japan Development Bank	8.2
Foreign exchange loans	7.4
Commercial banks	11.2
Corporate bonds	15.4
Stocks	9.3
Internal funds	24.3
Total	100.0

Second rationalization, 1956-60

Sources	Percent
Government loans 1/	2.9
Japan Development Bank	0.5
Export-Import Bank	2.4
Commerical banks	1.1
Industrial Bank of Japan	5.5
Long-term Credit Bank	4.0
Corporate bonds	11.8
Stocks	20.2
Internal funds	31.9
World Bank	8.6
Trust & insurance co.	12.6
Other foreign sources	1.3
Other	0.1
Total	100.0

1/ In the early 1950's, the Industrial Bank of Japan and Long-Term Credit Banks were transferred to private control.

After 1960, the steel industry received much less financial help from the Government, though the Government did guarantee some loans to the industry. 4/ Furthermore, the Government reduced the tax benefits, such as accelerated depreciation, that had been given the industry in the 1950's.

1/ Statement of the Bethlehem Steel Corporation in investigation 332-162, June 1983, pp. 13-15.
2/ Ibid. pp. 124-126.
3/ These data are from Ministry of International Trade and Industry, Tekkogyo no Gorika to Sono Seika (Tokyo, Kogyo tosho Shuppan, 1963, p. 4 and pp. 156-57 as listed in Kiyoshi Kawashito, The Japanese Steel Industry, (New York, Praeger, 1972) pp. 27 and 41.
4/ Magaziner and Hout, op. cit., p. 58.

The staff of the Federal Trade Commission estimated the subsidies inherent in the financial assistance and tax benefits that the Japanese Government gave the steel industry between 1951 and 1975. They found that these subsidies were small relative to the cost of producing steel and concluded that the subsidies had little if any effect on the growth of the Japanese steel industry. 1/

The Japanese Government has funded a number of research and development projects for the steel industry. For example, from 1973 to 1983 it agreed to provide 24,450 million yen or approximately $104 million of funding on projects to improve the industry's energy efficiency. 2/

From the early 1950's to the mid-1970's representatives of Japan's major steel companies met with representatives of MITI to plan a joint expansion plan for their industry. These meetings were not part of a formal legal cartel, but were conducted under MITI's administrative guidance. These joint planning sessions led to significant dissension in the industry. In the mid-1960's, one major producer, Sumitomo, increased its capacity in violation of the plan. MITI punished Sumitomo by restricting its allocation of imported coking coal. The demand for steel, however, soon grew sufficiently to require Sumitomo's additional capacity, and MITI's rescinded its restrictions. 3/

There have also been a number of export cartels in the steel industry. These cartels are primarily aimed at restricting exports to avoid having foreign Governments impose import restrictions. 4/

The Japanese steel industry has used the provisions in the Antimonopoly Act that allow rationalization and depressed-industry cartels. Rationalizaton cartels have been formed to coordinate purchases of scrap iron and steel; there were nine such cartels in 1974 but none have existed since that year. Depressed-industry cartels involving specific products have also been formed. In the last 10 years these cartels have only involved small steel bars and rods. These products, which are almost entirely produced by electric furnace steel makers, constitute about 10 percent of all steel produced in Japan. 5/ In 1977 a small- and medium-business cartel was formed for this product. 6/ This cartel no longer exists. MITI has had to force recalcitrant firms to participate in the small bar and rod cartels.

1/ Federal Trade Commission, "The United States Steel Industry and its International Rivals," Washington, D.C., 1977, Chapter 6.

2/ Some of these projects are planned to continue until as late as 1987. Statement of the Bethlehem Steel Corporation, op. cit., p. 124-125.

3/ Magaziner and Hout, op. cit., pp. 58-59.

4/ Magaziner and Hout, op. cit., p. 65.

5/ K. Kawahito, "A Critique of the 'Bethlehem Steel Report' on Japanese Government Promotion of the Steel Industry," August 16, 1983, p. 14.

6/ See Submission of Bethlehem Steel Corporation in U.S. International Trade Commission inv. No. 332-162, June 1983, pp. 28-29, Yamamura, op. cit., p. 97.

In 1978, open-hearth and electric furnace steel makers, who accounted for 19.1 percent of steel industry capacity, were designated a structually depressed industry by the "Provisional Law on Measures for the Stabilization of Designated Depressed Industries." 1/ These producers are now allowed to form depressed-industry cartels under this law.

Machine tools.--The Japanese machine tool industry has benefited from a series of targeting efforts since the mid-1950's. During the 1950's and 1960's, the Government used several practices to promote the machine tool industry, including home-market protection, cartels, special tax measures, and export assistance. Since the 1970's, the Government has relied less on those measures and more on research and development assistance for firms producing high technology goods, such as numerically controlled (NC) machine tools, robots, and flexible manufacturing systems.

Import restrictions were in effect during the early part of the postwar period, and exporters received tax and other benefits. Starting in the 1950's, only machinery that could not be produced domestically could be imported. This practice was eliminated by 1965. In 1953, the industry formed an export association, the Japan Machinery Exporters Association, under the Export and Import Trading Law of 1952. Under MITI supervision, such associations can share market information and promotional costs, assemble groups of companies for large export orders, and act as an arbiter for the industry in negotiations with the Government. Export associations cannot set prices. 2/ The JFTC reviews the operations of export associations for possible antitrust violations.

From the mid-1950's through the 1960's, the Government sought to improve efficiency, consolidate small firms, and promote specialization in the machine tool industry, using tools provided in a 1956 industry promotion law. The "Extraordinary Measures Law for the Rehabilitation of the Machinery Industry" was passed on June 15, 1956, to promote the entire industrial machinery sector, including machine tools. The law authorized the creation of rationalization cartels, set guidelines for technical improvements, and included measures that could be employed to encourage the adoption of basic standards by the industry. (It remains in effect, with some changes, today.) The law--which was extended in 1961 and again in the mid-1960's--also gave MITI the authority to divide product lines among manufacturers.

In 1956, a product allocation agreement was reached among the members of the Japan Machine Tool Builder's Association (JMTBA), which was later approved by MITI and administered by the JMTBA. Consolidation of small firms and coordinated investment activities, with Government encouragement in the form of preferential loans and tax rates, began in earnest around 1960. Under an agreement reached in 1964 (and extended in 1969) the members of the JMTBA agreed to concentrate their production on types of machinery in which their individual shares in the industry's total production exceeded 5 percent or which accounted for 20 percent of its total production in 1967.

1/ Data on capacity are in metric tons and are from Bank of Japan, Economic Statistics Annual, 1981, Tokyo, p. 275.
2/ Cincinnati Milacron submission, pp. 37-39.

Preferential loans from the Japan Development Bank (JDB) and the Small Business Finance Corp. (SBFC) were extended to firms in the machine tool industry. The SBFC gives long-term loans to small companies which feature interest rates below the prime rate. A list of Government loans to the machine tool industry, as well as the companies which received these loans, is shown in table 32. Subsidies inherent in JDB and SBFC loans to the machine tool industry are estimated in appendix C. These subsidies amounted to 0.1 percent of the value of production in 1981.

By 1970, the rationalization of the machine tool industry had virtually been completed. The emphasis of targeting efforts shifted to development of numerically controlled machine tools in the mid-1970's, and more recently, toward development of robotics and flexible manufacturing systems. MITI has encouraged machine tool producers to increase the share of their production accounted for by numerically controlled machine tools to 50 percent. Government grants, loans, and tax incentives were provided to induce firms to shift investment and other resources into these areas.

The machine tool industry includes a number of small companies. The firms tend to derive more benefit out of Government-sponsored R&D programs, loans, and other measures than do large firms. Large firms that have the internal capital or the ability to independently obtain funds to invest prefer these methods to the longer, more burdensome Government channel. They then conduct research as they see fit. In many cases, these larger firms have felt that government-sponsored research projects give them little or no benefit, and the technological leader in a given product or process often will resist participation in cooperative R&D programs. For instance, Yamazaki Machinery, the Japanese leader in flexible manufacturing systems originally did not want to participate in the Government sponsored R&D project to develop flexible manufacturing systems because it was the technological leader in that area.

JMTBA was among the recipients of proceeds from bicycle race wagering. From 1978 to 1981, an average of 87 million yen, or $397,000, was given to JMTBA for printing and translation of publications and catalogues, exchanges of scholars and engineers, and participation in trade fairs. 1/

Special tax measures, such as accelerated depreciation, R&D credits, and export deductions have applied to many industries, including the machine tool industry. The U.S. National Machine Tool Builders Association determined in 1981 that "investment incentives are no more liberal in Japan than they are in the United States." 2/ During 1981 and 1982, special initial depreciation allowances of 13 percent were allowed for purchasers of new NC machine tools.

1/ Comments on Houdaille petition submitted by Wender, Murase, and White on behalf of the Japan Machine Tool Builders Association, Dec. 27, 1982.

2/ National Machine Tool Builders Association, Meeting the Japanese Challenge, 1981, p. 5.

Table 33.--Loans to the machine tool industry by the Japan Development Bank, the Small Business Finance Corp., and MITI's AIST, by specified years, 1965-82

Year	Number of loans	Amount of loans	Purpose/project area	Company	Agency
1965----	1	1/	Trial production of continuous path control machines.	Toshiba Machine Co.	AIST
1966----	1	1/	Trial production of horizontal jib borer.	Mitsui Seiki Kogyo Co., Ltd.	AIST
1966----	1	1/	Trial production of Multi-spindle Lathe having simplified mechanisms for keeping accuracy and changing spindle speed.	Tsudakoma	AIST
1966----	1	1/	Trial production of continuous broaching machine.	Nachi-Fujikoshi Corp.	AIST
1968-1970--	6	1/	Research on DNC Integrated Manufacturing System.	Ikegai Corp. Hitachi Seiki Co., Ltd. Okuma Machinery Works, Ltd. Makino Milling Machine Co., Ltd. Toshiba Machine Co., Ltd. Fanuc, Ltd.	AIST
1968----	1	1/	Trial production of 5-axis simultaneously controlled machining center.	Toshiba Machine Co., Ltd.	AIST
1968----	1	1/	Trial production by Gear generator for finish cutting.	Yutaka Seimitsu Kogyo, Ltd.	AIST
1970----	1	1/	Trial production of adaptive control machine tool.	Makino Milling Machine Co., Ltd.	AIST
1972----	1	1/	Development of adaptive control horizontal boring machine.	Kurashiki Machinery Co., Ltd.	AIST
1973----	1	1/	Research on machine tools for high precision fully automatic machining center.	Makino Milling Machine Co., Ltd.	AIST

Table 33.--Loans to the machine tool industry by the Japan Development Bank, the Small Business Finance Corp., and MITI's AIST, 1965-82--Continued--

Year	Number of loans	Amount of loans	Purpose/project area	Company	Agency
1975-1977---	4	1/	Research on high performance automatically adjustable machining system.	Makino Milling Machine Co., Ltd.	AIST
1976----	1	1/	Trial production of high precision numerically controlled camgrinding machine.	Toyota Machine Works, Ltd.	AIST
1979----	1	Y 170 million	Metal cutting machine tools	2/	JDB
1979----	4	Y 345 million	Metal cutting machine tools.	2/	SBFC
1980----	1	Y 100 million	Metal cutting machine tools.	2/	JDB
1980----	1	Y 80 million	Metal cutting machine tools.	2/	SBFC
1980----	1	Y 60 million	Metal forming machine tools.	2/	SBFC
1981----	3	Y 420 million	Metal cutting machine tools.	2/	SBFC
1981----	4	Y 535 million	Metal forming machine tools.	2/	SBFC
1981----	1	Y 1,200 million	Financing for the promotion of industrial technological development.	2/	JDB
1982----	2	Y 1,300 million	Metal cutting machine tools.	2/	JDB
1982----	2	Y 270 million	Metal cutting machine tools.	2/	SBFC
1982----	1	Y 2,500 million	Financing for the promotion of industrial technological development.	2/	JDB

1/ Individual loan amounts are not available for AIST loans.
2/ Individual companies are not available on JDB and SBFC loans.

As shown in appendix C, tax savings due to this provision equalled approximately 6.2 percent of the value of the machine tool.

The Japanese Government spends 10 to 15 billion yen each year in direct grants for research and development in certain sectors of the machine tool industry, including factory automation. A project, to run for 7 years at a cost of 13 billion yen, or approximately 54 million, was begun in 1977 to develop flexible manufacturing systems (FMS), which integrate computer controlled machinery with other machines. Another project was begun in 1977 to develop complex manufacturing systems which incorporate lasers, at a total cost of $44 million. Twenty firms are participating in the project. There are strong indications, however, that joint R&D projects have not kept firms in the machine tool industry from vigorously competing with each other. Market share data indicate that the industry is very competitive. Saxonhouse notes,

> (D)uring just the 6 year period that this National Research Development Program has been ongoing, the Japanese machine tool industry has experienced extremely rapid growth which has created as much upheaval within the industry as it has among its foreign competitors. The Japanese machine tool company which was the leading machining center producer in 1981, with almost twice the production as the number two, wasn't even among the top 10 producers of machining centers in Japan in 1975. Indeed, the top ten Japanese machine tool producers who in 1975 produced 80.5 percent of all machining centers were producing only 46.2 percent of all machining centers just 6 years later. During this period a new group of Japanese machine tool companies, some of whom had been small family-owned firms in the early 1970's and some of whom had not participated in MITI sponsored project have assumed positions of technological leadership. And some of the firms which had been dominant in 1975 have been forced to undergo very painful readjustment in their capacity and labor force. 1/

Table 33 shows the shifting of members in the Japan Machine Tool Builders Association from 1956 to the present. The number of firms in the trade association increased rapidly during the early 1960s and has dropped steadily since 1975. The value of production nearly doubled from 1979 to 1981.

1/ Saxonhouse statement, pp. 20-21.

Table 34.--Shifting of members 1/ in Japan's machine tool industry, 1956-83

Year	Number of members	New members	Dropped members	Total value of production 2/
				Million yen
1956	55	3	0	7,174
1957	58	2	0	15,549
1958	60	5	2	21,113
1959	63	2	0	24,318
1960	65	11	0	45,169
1961	76	18	2	81,882
1962	92	11	0	100,892
1963	103	4	0	95,132
1964	107	3	7	90,906
1965	102	4	1	70,349
1966	105	1	1	76,453
1967	105	6	4	126,041
1968	107	3	3	175,986
1969	107	5	0	239,988
1970	112	4	0	312,349
1971	116	3	1	264,405
1972	118	3	0	205,180
1973	121	6	0	305,223
1974	127	0	4	358,610
1975	123	2	8	230,739
1976	117	3	3	228,604
1977	117	0	6	312,844
1978	111	0	1	365,525
1979	110	1	2	484,132
1980	109	1	3	682,102
1981	107	6	0	851,312
1982	113	1	2	782,776
1983	112	-	-	-

1/ Members are defined as companies that have full membership in the industry trade association, the Japan Machine Tool Builders Association. Associate members are not included.
2/ Production data is for the entire Japanese machine tool industry.

Source: Membership information, JMTBA; Production data, MITI.

In 1978, to avoid dumping charges in foreign countries, export price floors were established for shipments of numerically-controlled (NC) lathes and machining centers to the United States and Canada. Later, minimum prices were set for shipments to 14 European countries. MITI enforces the floor price through an export licensing system. 1/ No formal export cartel exists in the machine tool industry today. 2/

1/ General Accounting Office, Industrial Policy: Japan's Flexible Approach, p. 120.
2/ Testimony of Carl Green before the U.S. International Trade Commission, June 15, 1983.

Robotics.--The Japanese Government has used a number of targeting practices to encourage the robotics industry, including Government sponsored research and development projects, loans, tax incentives, and a Government-funded leasing company.

The robotics industry is affected by several of the R&D efforts mentioned in the computer and machine tool sections above. For instance, advances in software technology and semiconductors should have important implications for the robotics industry. The flexible manufacturing system (FMS) project is aimed at integrating computer controlled machinery, such as robots, with other mechanical components and lasers. That project will thus raise demand for robots by increasing their uses in industrial processes.

The Japan Robot Leasing Company (JAROL) was set up in 1980 to encourage the use of robots, particularly by small- and medium-sized firms. JAROL is a joint venture of 24 robot manufacturers, 10 insurance companies, and 7 general leasing firms. It handles only domestically produced robots. JAROL generally leases robots more cheaply and often for shorter periods than existing private leasing companies in Japan. Low-interest JDB loans have been provided to JAROL to cover its operating expenses. The JDB has provided 60 percent of the robot leasing company's operating funds at 0.3 percent below the prime rate. These loans totaled 140 million yen, or $600,000, in 1980 and 1,250 million yen, or $5.7 million, in 1981. In 1981, JAROL leased 435 robot units, worth $14.2 million, and in 1982, it leased 790 units, worth $25.5 million. 1/

The SBFC provides loans to small- and medium-sized firms for robot installation. The purpose of these loans, which are offered at favorable rates, is to automate processes dangerous to humans, increase manufacturing productivity, and help prevent environmental pollution. Funding for such loans from the SBFC totaled 800 million yen, or $3.6 million, in fiscal year 1981. 2/

Special tax depreciation has been used to encourage the installation of robots in manufacturing facilities. In addition to ordinary depreciation allowances, 13 percent of the initial purchase price of robots could be written off in 1980 and 1981; in 1982, this was reduced to 10 percent, and in 1983, robots were removed from the list of items which will qualify for special depreciation. 3/ As shown in appendix C, savings due to this additional depreciation can be significant. Tax savings due to 13 percent additional depreciation equal approximately 6.2 percent of the value of the robot.

Through the Japan Industrial Robot Association, the industry's trade association, the Government subsidized a number of R&D projects in 1982. Table 35 shows the total funding for those projects in 1982.

1/ General Accounting Office, Industrial Policy: Case Studies in the Japanese Experience, 1982, pp. 27-28.

2/ General Accounting Office, Industrial Policy: Japan's Flexible Approach, p. 62.

3/ Ibid., p. 63.

Table 35.--Japan's R&D projects in the robotics industry, 1982

Activity	Quantity	Value
	Million yen	1,000 dollars
Trial utilization of industrial robots	770.0	3,091,749
Robot promotion	12.2	48,986
Standardization of programing languages for robots	2.0	8,031
Standardization of robot core parts	0.5	2,008
Standardization of robot peripherals	0.3	1,205
Research and development to develop safety and automation technologies for deburring cast-iron applications	100.0	401,526
R&D on aims, principles, effects, and contents of robot activity	5.0	20,076
R&D on mechanical engineering applications	1/	1/
R&D on industrial robot applications in nuclear power plants	1/	1/

1/ Not available.

Source: Japan Industrial Robot Association, Activity Plans for 1982.

Semiconductors.--The Japanese Government has targeted the semiconductor industry since the early 1970's. It did so primarily because of its desire to build up Japan's computer industry, although advances in semiconductors will have important effects on the consumer electronic, robot, and machine tools industries.

Until 1976, high tariffs, restrictive quotas, and investment restrictions protected the Japanese semiconductor market from imports, however, in that year, most protective measures were lifted. In 1979, the United States and Japan both lowered their duties on imported semiconductors, and the two countries' formal import regimes are now comparable in this sector. 1/ According to MITI, JDB loans and SBFC loans have accounted for only a few percent of the total facility investments of semiconductor firms. Since 1976, the main thrust of targeting efforts has been Government-funded cooperative research and development projects.

1/ In April 1981, the United States asked Japan to agree to accelerate its Tokyo round tariff reductions on semiconductors. Following bilateral negotiations, the United States and Japan each agreed to reduce their tariffs: The United States agreed to accelerate its tariff reduction from 5.6 percent ad valorem to 4.2 percent in two stages, in January 1982 and January 1983. Japan agreed to lower its tariff to 4.2 percent in April 1982 from its prevailing level of 10.1 percent. U.S. International Trade Commission, Operation of the Trade Agreements Program, 33rd Report, 1981, . . ., USITC Publication 1308, 1982, p. 152.

The success of the fourth generation computer development project (discussed in the computer secton, above) hinged on the development of large-scale integrated circuits comparable to those used by IBM, the then-dominant computer manufacturer. In 1976, the Very Large Scale Integration (VLSI) project was organized as part of the fourth generation computer development project. Five companies--Hitachi, Fujitsu, Mitsubishi Electric, NEC, and Toshiba--took part, as well as MITI's Electrotechnical Laboratory. (A parallel project was undertaken by NTT at the same time with its major suppliers--Hitachi, Fujitsu, NEC, and Oki.) One of the products that resulted from the VLSI project was the 64K RAM chip. Of the companies now developing 256K RAMs, only Oki Electric did not participate in MITI sponsored VLSI project. The five companies formed the VLSI (Very Large Scale Integration) Semiconductor Research Association. The association coordinated the VLSI research project and was the channel for Government and private funding. The total budget for the VLSI project, including company contributions, was $325 million, with the Government providing $136 million in the form of success-conditional loans. 1/

Research was carried out in three laboratories. One was the "Cooperative Laboratory" located at NEC's facility near Tokyo, and it focused on basic research. Researchers from all five firms, as well as from MITI's Electrotechnical Laboratory, took part. The other two laboratories were concerned with the potential applications of the basic research, including development of fourth generation computers. These facilities were independent, jointly owned laboratories organized to conduct applications research and to coordinate the ongoing applications research of the five companies. One applications facility worked to develop IBM-compatible computers, coordinating with the work done by Fujitsu, Hitachi, and Mitsubishi in their own laboratories, the other coordinating lab organized the work of NEC and Toshiba on non-IBM compatible computer technologies.

The Government holds about 5 percent of the more than 1000 patents that resulted from the VLSI project, the Government holds about 5 percent. Government-held patents were provided to the members of the VLSI association free of charge. 2/ The participating firms hold the rest. 3/ In some cases, several firms jointly own the patents, in others, a single firm owns the patent. As noted above, MITI has no role in approving or encouraging licensing of privately held patents which result from Government subsidized research. Until 1978, foreign firms and their wholly owned subsidiaries in Japan were prohibited from licensing patents for technology developed under the VLSI project. In 1980, the Japanese Government decided to allow foreign licensing of the technology developed under the project. Only two U.S. firms have been granted licenses for technology developed during the VLSI project, and these agreements were tied to cross licenses in other areas. U.S. companies are currently licensing technology for the 64K RAM semiconductors: Hitachi has licensed its technology to Hewlett-Packard and Toshiba has licensed its technology to Zilog. U.S firms also are licensing Japanese conductor technology that was not developed during the VLSI project. IBM and Fairchild are also licensing 64K technology from Oki, which did not participate in the VLSI project. Oki and an American firm, National Semiconductor, have also done joint research and development of 64K RAM technology.

1/ Wheeler, Pepper, Janow, op. cit., p. 153.

2/ General Accounting Office, Industrial Policy: Case Studies in the Japanese Experience, Washington, D.C., 1982, p. 9.

3/ Saxonhouse statement, p. 29.

The Next Generation Industries Project entails basic research in a number of areas deemed vital to future technological development, including information processing, biotechnology, and alternative energy sources. A major aspect of the Next Generation Industries Project is the development of new function semiconductor elements. The goal of the project is to develop extremely fine lattice structured elements capable of very high computation speeds at normal temperatures. These elements will have three dimensional structures enabling many more functions to be combined on each chip, and will also be capable of operating in hostile environments, such as space, atomic reactors, and automobile engines. During 1982, approximately $6 million was spent by the Japanese Government for this project.

In contrast with the VLSI project, which involved 4 firms, the new function semiconductor research project involves ten corporate participants--Fujitsu, Hitachi, Mitsubishi, Matsushita, NEC, Oki, Sanyo, Sharp, Sumitomo, and Toshiba--who formed an association commissioned by MITI to carry out R&D. Total projected funding for this project is $113.6 million.

Although these research projects have benefited Japan's semiconductor makers, particularly in dynamic random access memory (DRAM) semiconductor production, it does not appear that these projects have served to divide product lines or limit competition in the Japanese market. As illustrated in table 35, there are currently eight major semiconductor producers in Japan. Virtually all of them produce memory semiconductors, with product specialization roughly consonant with the company's main line of business, for instance, Matsushita in semiconductors for consumer electronics.

Japanese Government support for research and development in the semiconductor industry has not eliminated U.S. competition in the Japanese market. The U.S. share of the Japanese semiconductor market was 13 percent in 1982, whereas the share of Japanese products in the U.S. market was 5 percent. 1/

Telecommunications.--Japan is the largest exporter of telecommunications equipment in the world. In 1981, it exported $9.8 billion worth of equipment, more than twice as much as did the United States. The United States was the most important market for those products. The firms in the industry have benefited from a close working relationship with the Government's telecommunication monopoly, NTT, and by research and development assistance in other, related areas such as computers and semiconductors.

Like most other countries, Japan's telecommunications market was totally closed to foreigners until 1981, when it agreed to apply the provisions of the MTN Government Procurment Code to purchases by NTT. Since that time, imports have accounted for less than 2 percent of total procurement, which stood at roughly $3 billion in 1982.

1/ Kazuo Kinbara, "Structure of the Japanese Semiconductor Market," July 1983, p. A-4.

Table 36.--Products produced by the principal Japanese manufacturers of semiconductors in 1983

Type		Fujitsu	Hitachi	Matsushita	Mitsubishi	NEC	Sanyo	Sharp	Toshiba
ICs for general electric equipment			X		X				X
ICs for telecommunication equipment		X				X			
ICs for home-electric appliances				X			X	X	
MOS	Memory	X	X	X	X	X	X	X	X
	Micro processors	X	X	X	X	X	X	X	X
	Logic	X	X	X	X	X	X	X	X
Bipolar logic	Memory	X	X	X	X	X			X
	Logic	X	X	X	X	X	X		X
Bipolar linear	For consumer appliances	X	X	X	X	X	X	X	X
	For industrial appliances	X	X	X	X	X	X	X	X

Source: Kazuo Kinbara, "Structure of the Japanese Semiconduct Market," Hitchachi, Ltd., July 1983.

Unlike A.T. & T., which uses its Western Electric subsidiary to develop and manufacture most of the equipment it needs, NTT is prohibited by law from manufacturing. Producers which satisfy NTT's quality, delivery, and other requirements become members of NTT's "family" of equipment suppliers, which includes over 300 companies, ranging from such major corporations as NEC, Fujitsu, Oki Electric, and Hitachi, to many small- and medium-sized manufacturers. The importance of the companies as suppliers to NTT, as well as the importance of NTT as a customer to the companies, is shown in table 37:

Table 37.--Sales to NTT by the top 10 major Japanese suppliers, and foreign suppliers, 1980 and 1981

Item	1981			1980		
	Actual	Share of: NTT procurement	Share of: company sales	Actual	Share of: NTT procurement	Share of company sales
	Million dollars	Percent		Million dollars	Percent	
Nippon Electric Co	533	20	12	538	20	14
Fujitsu	346	13	12	356	13	15
Oki Electric	189	7	21	215	8	27
Hitachi	173	6	2	175	7	2
Sumitomo Electric	81	3	4	73	3	4
Fujikura Cable	75	3	12	66	3	11
Furukawa Cable	71	3	4	66	3	4
Dainichi Nippon Densen	65	2	14	62	2	13
Iwatsu Electric	61	2	28	60	2	31
Tamura Electric Works	44	2	12	48	2	16
Total	1,638	61	-	1,659	63	-
Foreign suppliers	19	3	-	16	3	-
Total NTT procurement	2,708	100	-	2,673	100	-

Source: Prudential Bache Securities, op. cit., p. 20, based on data from NTT and securities reports of the individual firms.

NTT has regularly placed about 60 percent of its new orders with its top 10 suppliers. Inroads by foreign suppliers appear to be coming at the expense of smaller Japanese firms. 1/ The top four suppliers are large, vertically integrated firms whose product lines include computers, semiconductors, consumer electronics, and other electronic products. As noted in the computer and semiconductor sections, above, these companies have benefited from a host of Government programs in the postwar period.

1/ Prudential Bache Securities, op. cit.

NTT has its own laboratories which conduct research on electronic switching systems, memory chips, integrated circuits, data processing, new materials, transmission systems and optoelectronics. The companies that supply equipment to NTT receive technology transfers from NTT in order to meet its standards and requirements; these companies' R&D costs are thus lowered accordingly. NTT engineers frequently work with individual suppliers to develop products, and the companies involved may have to expend considerable time and funding to develop products NTT wishes to purchase.

Important products have resulted from this research. For instance, research projects conducted by NTT in conjunction with its member companies have resulted in the development of VLSI semiconductor chips, including the 16, 64 and 256 K RAMs, fiber optic cable, data transmission systems, and high capacity pagers.

Telecommunications products are also covered under the 1978 Temporary Law for the Promotion of Electronic and Machinery Industries. Elevation plans have been drawn up for a number of telecommunications-related products, such as communications testing apparatus and instruments, electronic measuring devices, and fiber optic materials (See Appendix F). Some companies have received grants from MITI's AIST for research. For instance, in 1982, Hitachi Cable received a grant to develop optical fiber technology (See appendix G).

Nippon Electric Company is Japan's most important telecommunications company. Telecommunication sales account for 38 percent of its total sales (table 38), and the company is the ranked seventh among world telecommunications suppliers. NEC is also NTT's most important supplier. 1/

Table 38.--Total telecommunications equipment sales and share of total sales for Japan's leading telecommunications manufacturers, 1982

Manufacturer	Telecommunications sales	Share of total sales	Ratio of exports to production
	Million dollars	Percent	Percent
Nippon Electric Co	1,980	38	33
Oki	317	30	27
Fujitsu	684	20	24
Matsushita Electric Co	924	6	46
Hitachi, Ltd	506	5	30
Mitsubishi Electric	59	1	24
Toshiba	42	1	34

Source: Prudential Bache Securities, op. cit., p. 20.

1/ Ibid., p. 3.

Prudential Bache estimates that Japan's production of selected telecommunications peripherals and equipment will expand from 30 percent to as much as 80 percent annually in value, fueled by growing exports and an explosion in new digital technology in its own market. Over the longer term, NTT's massive effort to revamp Japan's telecommunications infrastructure--the Information Network System (INS) project--should contribute substantially to domestic telecommunications demand. It estimates that the most rapid rises in demand will be for cellular mobile radios, fiber optics, and facsimiles. 1/

NTT accounted for roughly 2.7 billion dollars' worth of telecomcommunications demand in both 1981 and 1980. The value of production in Japan's electronics, consumer electronics, and telecommunications industry is shown in table 39. Production by the telecommunications industry in Japan has grown faster than NTT demand, implying that at least for some companies, NTT's importance as a customer has declined since the mid-1970's.

Table 39.--Value of production in Japan's electronics, consumer electronics, and telecommunication industries, fiscal years 1972-82.

(In billions of dollars)

Year	Electronics	Consumer electronics	Telecommunications
1972	16	6.5	2.4
1973	19	7.1	2.9
1974	20	7.3	2.8
1975	18	6.8	2.8
1976	25	9.8	3.1
1977	26	9.8	3.3
1978	27	9.3	3.6
1979	30	9.7	3.9
1980	37	12.5	4.4
1981	43	14.8	5.3
1982	46	14.4	5.7

Source: Prudential Bache, op. cit., p. 13. Based on data from the Electronic Industries Association of Japan and the Communication Equipment Manufacturers Association.

The share of public-sector-related orders has noticeably declined over the last 5 years and is decreasing in importance to Japan's telecommunications industry. However, NTT still accounts for around two-thirds of total Japanese domestic demand for telecommunications equipment. Furthermore, the profitability of public sector and NTT orders is higher than that for private sector orders. This is because cash (as opposed to promisory notes) is paid for such orders, and the value of the order includes a set and fairly high profit for the firms involved. 2/

1/ Ibid., pp. 3 and 29.
2/ Ibid., p. 16.

Aircraft and Aerospace

Description and uses

Aircraft are defined as machines or devices supported by buoyancy or dynamic action, capable of atmospheric flight. Included in this grouping are kites, balloons, gliders, airplanes, helicopters, and parts for each of these products. Spacecraft are structures capable of leaving the earth and its atmosphere to perform a specific mission in space. Included in this category are satellites, space vehicles, and launch vehicles.

U.S. industry profile

It is estimated that 1,280 establishments produced aircraft, spacecraft, and parts in 1982. Production is generally concentrated in the following States: California, Kansas, Texas, and Washington. The top four manufacturers accounted for an estimated 61 percent of domestic shipments in 1982. 1/ The majority of aerospace products are sold directly from the manufacturer to the end user, although in small airplanes, balloons, kites, and gliders, a dealer/distributor network is used to market the product.

Wide fluctuations in employment are quite common, principally due to cyclical demand for aerospace products. The U.S. industry mainly employs skilled labor. According to industry data, employment in the aerospace industry increased during 1954-72. The majority of these workers were employed in the production of military aircraft which was used in both the Korean and Vietnam Wars. Employment declined significantly in 1977 due to reduced shipments of military and commercial aircraft. During 1978-81, employment trended upward, as new generation civil aircraft production was undertaken and military aircraft shipments increased, but declined in 1982. The reduction in employment in the aerospace industry in 1982 reflects decreased aircraft orders due to the depressed financial condition of the world's airline industry and increased competition from abroad.

To the extent that any loss of domestic and/or international market share results from targeting practices, the corresponding absence of each $1 million in production not undertaken by U.S. aircraft and aerospace manufacturers would translate into an estimated 28 workers displaced in all sectors of the U.S. economy (based on 1982 production/employment relationships), according to the staff of the U.S. International Trade Commission, using the BLS input-output model as seen in the following tabulation:

Industry sector	Displaced employment
	Number
Aircraft	14
Other manufacturing	6
All other	8
Total 1/	28

1/ Aerospace is not represented in these figures.

1/ U.S. Department of Commerce, U.S. Industrial Outlook, 1983, p. 31.

Japanese industry profile

During 1945-52, all aerospace activities in Japan, including manufacture, repair, and even formal study of aircraft engineering, were prohibited by the occupational forces. On April 9, 1952, research and production of aircraft were allowed to resume upon specific approval by the Japanese Government. However, at that time there were no established airlines nor demand for military aircraft in Japan.

The industry did repair and maintain aircraft belonging to the U.S. armed forces stationed in Japan. In the early 1950's, the industry shifted production toward defense related demand. Licensed production was begun in the mid-1950's, based on technology introduced by the United States. Additionally, the industry began to produce small military trainers.

Production of civil aircraft began in 1957 with the development of a twin-engine turboprop airplane. The experience accumulated in this project was of great use in the successful development of business aircraft and single-engine light planes in the 1960's. 1/ Since that time, the Japanese have produced a variety of aircraft and are involved in coproduction agreements for helicopters and large transports.

Japan began its space activities in 1955 with simple rocket experiments, graduating to satellite launches a decade later, using foreign technology. To date, Japan has successfully launched meteorological communications and television satellites.

The Japanese aerospace industry is quite small compared with the U.S. industry. It currently consists of five fuselage makers and numerous subcontractors. 2/ Additionally, there were an estimated 92 Japanese companies involved in space programs in 1982. 3/ Industry sources indicate, in that year, that Japanese aerospace sales totaled approximately $2 billion. The five largest aerospace companies are estimated to have accounted for about 80 percent of these sales. 4/ Sales of aircraft and spacecraft are normally made directly by the manufacturer to the end user. Employment in 1982 was estimated to total almost 30,000 persons. The Japanese industry, like its American counterpart, mainly employs skilled labor. Robotics are not used to a great extent due to a slow production rate. 5/

1/ Ibid.

2/ "Aircraft Industry Still Needs to Surmount Many Difficulties," Japanese Economic Journal, June 22, 1982, p. 13.

3/ Society of Japanese Aerospace Companies, Farnborough Air Show Press Release, August 1982, p. 4.

4/ "Mitsubishi Leads Japanese Aerospace Sales," Aviation Week and Space Technology, June 20, 1983, p. 52 and "And Now Japan Looks Skyward," Fortune, Mar. 21, 1983, p. 100.

5/ Ibid., Fortune, p. 102.

U.S. market

The largest share of the domestic market for aircraft and spacecraft is made up of commercial users; the remainder consists of U.S. Government divisions and private individuals. According to industry sources, the United States is one of the world's largest markets for aircraft. In 1981, (the latest year for which complete data are available), there were an estimated 241,656 aircraft and spacecraft in use in the United States. 1/ The vast majority are planes used by U.S. commercial airlines.

Under the Airline Deregulation Act of 1978, the view of mass air transit as a public utility requiring government regulation was renounced in favor of free-market economics. The reasoning was that a more competitive environment in the airline industry would lower fares and improve service. 2/ Deregularion allowed U.S. carriers to freely enter new markets or exit those which were no longer profitable. The deregulation of the airline industry was also beneficial to equipment manufacturers, because as new routes were opened up, orders for aircraft increased. Open price competition and fare wars also increased the demand for airline seats, creating a demand for new aircraft. 3/

The early 1980's represent the third reequipment cycle for U.S. airlines. Beginning with the first equipment cycle, which commenced with the advent of the commercial jet transport in the late 1950s, each generation embodied new technology responsive to economic pressures. The first was a response to the demand for long-distance, fast, and comfortable transportation. The second generation, which encompassed the development and sale of the wide-bodied "jumbo jets" (mid-1960's) emerged as a response to the growth in demand for passenger-mile capacity and overcrowded airplanes. In the latest generation of commercial transports, environmental pressures and increased cost of fuel have resulted in new designs. 4/

Domestic manufacturers of aircraft and spacecraft produce a wide variety of products. The U.S. market demand for aircraft and spacecraft is cyclical, fluctuating with interest rates, the cost of fuel, U.S. Government procurement policies, increased passenger traffic, and route expansions. The latter two were cited by U.S. airlines as the primary factors influencing market demand for aircraft. Other factors noted were efficiency and passenger comfort. 5/ Demand for both business and private use aircraft is influenced by such factors as intended use, convenience of scheduled airlines, cost of fuel, financing, cost of the aircraft, and degree of expertise of the buyer. The demand for military aircraft and spacecraft is based on complex political factors and budgetary limits. Commercial spacecraft demand depends on the intended use and such market forces as cost efficiency, and availability of the product, and the necessary launch vehicles.

1/ Aerospace Industries Association, Aerospace Facts and Figures 1982/83, and General Aviation Manufacturers Association, GAMA Stat Databook 1983.

2/ Robert Newhouse, "A Sporty Game, Betting the Company," The New Yorker, June 14, 1982, p. 58.

3/ Ibid.

4/ Barry Bluestone, Peter Jordan, and Mark Sullivan, Aircraft Industry Dynamics, Boston, 1981, p. 47.

5/ United States International Trade Commission, The Economic Impact of Foreign Export Credit Subsidies on Certain U.S. Industries, . . ., Publication 1340, January 1983.

U.S. shipments

The aerospace industry is one of the Nation's most cyclically volatile in terms of sales and shipments. The sector exhibits its own unique business cycles for civil aircraft, military aircraft, and spacecraft. 1/ Estimated U.S. shipments of aircraft, spacecraft, and parts trended upward during 1954-82. The following tabulation shows estimated U.S. shipments of products (in millions of dollars): 2/

Year	Civil aircraft	Military aircraft	Spacecraft	Parts	Total
1954	1/ 5,226	-	183	75	5,484
1958	1/ 6,482	-	163	249	6,894
1963	559	2,876	1,911	740	6,086
1967	2,861	4,476	2,199	439	9,975
1972	3,308	3,247	1,656	3,437	11,648
1977	4,451	4,364	1,870	5,762	16,447
1978	6,458	4,664	2,324	6,238	19,684
1979	10,644	5,470	2,539	8,052	26,705
1980	13,058	6,521	3,483	8,867	31,929
1981	13,228	8,630	3,856	10,254	35,963
1982	8,610	10,356	4,851	10,041	33,858

1/ Includes both civil and military aircraft shipments.

During 1950's, the U.S. aerospace industry entered the modern era. The industry's products underwent radical transformation, in that in the commercial aircraft sector the jet engine replaced the piston engine. Since that time U.S. shipments of civil aircraft have greatly expanded, rising to their highest level at $13,228 million in 1981. U.S. shipments of civil aircraft declined significantly in 1982 due to high interest rates, decreased airline earnings, and lack of confidence in the airline industry by financial backers. 3/

U.S. shipments of military aircraft have gradually increased during 1963-82, rising to $10,356 million in 1982. Over the period 1963-67, U.S. shipments increased 55.6 percent, resulting from the escalation of the Vietnam War. A large portion of these shipments were helicopters, which were used extensively for the first time during this war. 4/ Military deescalation caused shipments to decline in 1972. However, since that time, military aircraft shipments have increased annually as the United States assumed a more strategic role in international affairs.

U.S. shipments of spacecraft began to increase following the successful Soviet Sputnik launch in 1957. During 1958-82, domestic shipments of spacecraft increased twenty-seven fold, reaching $4,851 million in 1982. The

1/ Ibid., footnote 1, p. 174.

2/ Data obtained from Aerospace Industries Association, Aerospace Facts and Figures, various issues 1954-83.

3/ "Carriers Turn to Innovative Financing," Aviation Week and Space Technology, Nov. 8, 1982, pp. 46-49.

4/ Barry Bluestone, Peter Jordan, and Mark Sullivan, Aircraft Industry Dynamics, Boston, 1981, p. 42.

U.S. space program began with unmanned expendable rockets and has evolved to reusable airplane-like spacecraft. In the most recent years, increased shipments are due, in part, to a rapidly growing military space program.

U.S. shipments of parts for use in civil, military, and space applications have increased tremendously during 1954-82, as the use of aerospace products has increased. Shipments of parts rose from $5.5 billion in 1954 to $33.9 billion in 1982.

U.S. imports

U.S. imports of aerospace products have risen annually during 1954-82, increasing from $28.8 million to $2.5 billion. The majority of these imports consist of small airplanes, helicopters, and parts for aircraft and spacecraft. The level of import penetration in the U.S. aerospace market is relatively low, but has increased annually over the last two decades. The ratio of imports to consumption was less than 1 percent in 1954, but by 1982, this ratio had risen to 6.5 percent.

Imports of aerospace products from Japan were insignificant until 1967, when imports rose to $6.6 million. The value of imports then increased each year, finally reaching $162.4 million in 1982. Japanese exports to the United States accounted for less than one-hundreth of 1 percent of total aerospace imports in 1954. However, by 1982, imports from Japan constituted 6.5 percent of total U.S. aerospace imports. The majority of these imports consist of small business aircraft (both turboprop- and jet-engined) and parts for large commercial transports. The ratio of Japanese imports to U.S. consumption of aircraft, spacecraft, and parts remained at less than 1 percent during 1954-82.

Conditions of competition in the U.S. market

The domestic aerospace industry dominated the U.S. market in almost every sector during 1954-82. In addition to excellence in product quality, and innovation in technology, the after-sale support provided by U.S. firms has built their reputations as leaders in the field. Post-sale support has become a key determinant in procurement of aircraft. Purchasers are particularly concerned with ease of service, product reliability, parts availability, and long-run minimization of operating costs.

Japan's aerospace industry has lagged behind all other major producers of aircraft and spacecraft in their penetration of the U.S. market because of their 7-year ban on aircraft manufacturing activities after World War II. Since then the Japanese industry has worked hard to raise its technological level and competitiveness in the United States through numerous license and coproduction agreements with U.S. manufacturers. Although the Japanese compete with domestic producers in only a few product lines (business aircraft and parts for aircraft and spacecraft), industry sources indicate that these products have earned a reputation for high-quality workmanship and reliability. Japanese aircraft are priced competively with comparable U.S.-made planes. Through an assembly plant in Texas all service/support and parts distribution are carried out. The Japanese aerospace industry does not compete with U.S. producers for domestic military sales because their Government prohibits the exportation of military aircraft.

The Japanese aerospace industry, through a combination of repair work, licensed production, coproduction, and manufacture of its own products, has begun to catch up with U.S. technology in many areas. According to industry sources, flying boat technology is the one area in which Japan has excelled the level of U.S. technology. 1/

The estimated Japanese share of the U.S. market rose from less than one-thousandth of 1 percent in 1954 to 0.7 percent in 1982. During this period, the Japanese marketed three types of aircraft in the United States: a turboprop engined 60-seat commuter plane (YS-11), a turboprop engined business airplane (MU-2), and a business jet (Diamond). The YS-11 commuter plane was the first Japanese-produced aircraft to be exported to other countries. It was sold in the United States from the early 1960's through the early 1970's. Various versions of the MU-Z have been sold in the U.S. market since 1965, with the Marquis and Solitaire models currently being marketed. The introduction of the Diamond business jet in 1982 is the reason for the most recent increase in the Japanese share of the domestic market. Industry sources indicate that the Japanese have increased their market share at the expense of U.S. manufacturers.

International markets

The United States is the world's leading supplier of aerospace products. Industry officials indicate that U.S. sales of these products represent approximately 60 percent of the free-world total. Japan is estimated to account for about 3 percent of free-world's aerospace commerce. Other major producers of aircraft, spacecraft, and parts (in order of importance) are located in the United Kingdom, West Germany, and Canada. 2/

The market for aerospace products has spread throughout the world, with the heaviest concentration in North America, Europe, and Asia. In the world market for aircraft, the vast majority of commercial export sales are made to foreign governments rather than to private sector airlines, because most foreign airlines are state-owned national carriers. The largest part of the remaining export sales are made to foreign military establishments. 3/

The factors influencing demand in the international market for aircraft are identical to those in the U.S. market discussed earlier in this report. Both U.S. and Japanese producers market their products internationally in a similar fashion. Interest in the product is generated by appearances at trade shows, magazine articles and advertisements, and direct mail programs. Sales offices are located in various places throughout the world, with a large staff of salesmen that remain in constant contact with potential purchasers. However, in recent years, aircraft firms have been forced to compete on the basis of coproduction percentages, as well as price and quality. Since virtually all international sales are made to governments rather than private firms, overseas purchasers are often willing to pay a premium price in return

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1/ "Comparison to Other Countries," Japan Aviation Directory, 1980, p. 12.

2/ "Canada Aerospace '83," Aviation Week and Space Technology, Apr. 18, 1983.

3/ Barry Bluestone, Peter Jordan, and Mark Sullivan, Aircraft Industry Dynamics, Boston, 1981, p. 167.

for a share of manufacturing that would reduce their import balance and create employment for their own workers. 1/ The U.S. aerospace industry, because of its large size and diversity of product manufacture, has been able to meet foreign demands for offsets and coproduction. This has enhanced their international competitiveness and made the critical difference in many aircraft sales. The Japanese industry, however, manufactures only a few aerospace products for export, and is not large enough to offer these coproduction opportunities to foreign purchasers.

U.S. exports

Export sales are very important to aerospace manufacturers, as the economies of scale involved can lower a firm's unit costs substantially, and improve competitiveness and profitability. As a share of estimated U.S. shipments, exports represented 2.2 percent in 1954. By 1982, this share had risen to 34.4 percent. U.S. exports of aircraft, spacecraft, and parts rose from $120.8 million in 1954 to peak at $14.6 billion in 1981, before declining to $11.6 billion in 1982. The decline in exports in 1982 was caused by a worldwide decrease in demand for aircraft and spacecraft brought about by the worldwide recession and high interest rates. Additionally, increased foreign competition from European producers in many traditional export markets contributed to the decline. Over the last two decades, the category "not disclosed" was the leading market for U.S. exports of aerospace products. These exports were primarily aircraft and parts for military use throughout the world. Japan, West Germany, and Canada represented the other major markets for U.S. aerospace exports during 1954-82.

The U.S. aerospace industry contributes a larger positive trade balance than any other U.S. industry except agriculture. 2/ The trade surplus in these products increased from $12.0 million in 1954 to $9.2 billion in 1982.

Japanese exports

Japanese exports of aircraft, spacecraft, and parts increased from $5.7 million in 1963 (data for 1954 and 1958 are not available) to $119.2 million in 1981. The major market for Japanese exports throughout this period was the United States, accounting for 90 percent of total Japanese exports in 1981, up from 21 percent in 1963. Other important foreign markets in 1982 included West Germany, Australia, and the United Kingdom.

As stated earlier in this report, the Japanese Government forbids the export of military aerospace products. However, the Japanese industry exports a large share of their civil aircraft products, as they have a very small domestic market for these products. These Japanese exports consist mainly of business aircraft and subcontract work for foreign aircraft industries.

Conditions of competition in international markets

The Japanese aerospace industry has strengthened its competitive position in world markets by pooling technological knowledge and reducing duplication

1/ Bluestone, Jordan, and Sullivan, op. cit., pp. 175-176.
2/ Ibid., p. 78.

of efforts among national firms. 1/ The industry has also attempted to update its level of production technology by investing in complex manufacturing equipment. By working on a national level in aircraft licensing and coproduction programs, the Japanese industry has established itself as an important member of the world aerospace community. Industry sources indicate that the biggest obstacle to Japan becoming a major competitor in international markets is its absence of a large enough domestic market to allow the country to build a strong export base. 2/ Currently, the Japanese industry is highly dependent on military demand, and the Government prohibits the exportation of military aerospace products. Additionally, a lack of substantial funding, insufficient technologies, and a shortage of research facilities weaken the industry's attempt to penetrate the world market for aerospace products. 3/ The industry also must more fully develop its overseas marketing and support/service capabilities. The lack of these important elements substantially limits Japan's ability to promote its aerospace products in world markets. 4/

According to Japanese industry sources, the aerospace industry has the development capabilities for almost any product, with the exception of supersonic and wide-bodied transports. The Japanese industry has become particularly adept at design work, coming close to European and U.S. industries in precision production technology, though it is behind other advanced nations in the areas of quality, cost, and the development of special tooling. 5/ The Japanese already lead in some technologies critical to increased fuel economy for aircraft. For example, the world's largest producer of carbon fiber, the lightweight composite increasingly being used in airplanes, is located in Japan. 6/ In the area of space, Japan has launched an agressive long-term development program aimed at bringing their level of technology to that of the most advanced nations by the turn of the century. The industry is currently developing communication, broadcast, meterological, marine observation, and earth-resource satellites. 7/ However, the industry's space efforts are expected to be limited to 1,200-pound-class payloads until the early 1990's because of the launch vehicles used by the Japanese. 8/

Currently, the only area in which Japanese aerospace products are effectively competing with U.S.-built products in the international market is business aircraft. In 1954 the Japanese were not competing in the world aerospace market because their industry was still in its infancy. However, by 1982, Japan's share of the world market totaled 3 percent. Utilizing the technology and manufacturing skills associated with military equipment, the

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1/ Memorandum of Dr. W. Stephen Piper, May 18, 1982, p. 2.

2/ "Aerospace Industry in Japan," Japan Aviation Directory 1980, 1982, p. 12.

3/ "Japan's Space Effort Moves Toward Operations," Aviation Week and Space Technology, Mar. 14, 1983.

4/ U.S. Department of Commerce, Japanese Industrial Policies and the Development of High Technology Industries: Computers and Aircraft, February 1983, pp. 30-31.

5/ Ibid., footnote 1.

6/ "And Now Japan Looks Skyward," Fortune, Mar. 21, 1983, p. 109.

7/ "Aerospace Industry in Japan," Japan Aviation Directory 1980, 1982, p. 12.

8/ "Japan's Space Effort Moves Toward Operations," Aviation Week and Space Technology, Mar. 19, 1983.

industry began to produce turboprop commuter airplanes in the early 1960's. Since then the industry has sold turboprop- and jet-engined business aircraft throughout the world. The industry has earned a reputation for quality products and timely delivery, on a par with comparable U.S. and European counterparts.

Aluminum

Description and uses

Aluminum is a relatively strong but lightweight metal, weighing only about one-tenth of a pound per cubic inch. Its qualities include high workability, excellent corrosion resistance, high reflectance, nonmagnetism, and high thermal and electrical conductivity. Aluminum's nontoxicity makes it safe for use in packaging foods and beverages, a large end-use market for aluminum.

Aluminum is produced using either primary or secondary raw materials. Using primary materials, aluminum is produced by reducing bauxite to aluminum oxide (alumina) and then converting alumina to aluminum. Using secondary materials, aluminum is produced using recycled scrap, at an energy savings of 95 percent. Primary aluminum typically differs significantly from secondary aluminum in chemical composition, use, and price. Primary aluminum is usually a high purity product which contains few alloying metals or mixtures of metals (such metals are generally contained in scrap).

Aluminum is marketed in both unwrought and wrought forms. Primary unwrought aluminum is generally sold to fabricators for conversion into wrought aluminum mill products; secondary unwrought aluminum is generally sold to foundries (for casting), extrusion plants, and steel producers (for use in deoxidation). Wrought products are produced by both fabricators and unwrought aluminum producers. These products, which include a wide variety of shapes, leaf, and powder, are made primarily by rolling, extruding, drawing, roll-forming, forging, and welding unwrought aluminum.

U.S. industry profile

About 80 percent of primary aluminum production is shipped from primary producers to subsidiaries producing fabricated products; however, significant quantities are also sold to nonintegrated fabricators. Sales of unwrought aluminum are generally handled by two means: direct sales from producers to fabricators, generally involving long-term contracts, or sales to distributors which in turn sell to fabricators, generally on a spot or short-term basis. Sales of wrought aluminum generally involve direct sales to end users by long-term contract, spot and short-term direct sales, and sales through distributors or service centers.

The U.S. aluminum industry is composed of approximately 150 firms, operating 900 establishments located throughout the United States. Of the 150 firms, 12 are primary aluminum producers, about 50 are independent secondary smelters, and approximately 100 are independent fabricators. The U.S. industry is highly concentrated, with three firms accounting for 55 percent of total domestic primary production in 1982. Most of the major aluminum producers are completely integrated. Moreover, the 12 integrated primary producers account for 75 percent of all wrought aluminum shipments.

The production and processing departments in the aluminum industry utilize primarily technical personnel, such as engineers, scientists, metallurgists, and chemists. Production workers are highly skilled employees who generally have acquired knowledge of the trade through on-the-job training.

The primary unwrought aluminum industry 1/ is smaller than the wrought aluminum industry in terms of employment, accounting for roughly one third of all aluminum industry employees. Employment in both segments of the aluminum industry increased during 1954-81, with the largest increase attributable to the wrought segment (a 72-percent increase in employment) compared with the unwrought primary segment (a 50-percent increase in employment). Total employment in the industry rose from 57,429 workers in 1954 to 93,700 workers in 1981. Production workers accounted for 46,777 of the total in 1954, versus 71,900 of the total in 1981.

To the extent that any loss of domestic and/or international market share results from targeting practices, the corresponding absence of each $1 million in production not undertaken by U.S. aluminum manufacturers would translate into an estimated 23 workers displaced in all sectors of the U.S. economy (based on 1982 production/employment relationships), according to the staff of the U.S. International Trade Commission, using the BLS input-output model, as seen in the following tabulation:

Industry sector	Displaced employment
	Number
Aluminum	10
Other manufacturing	5
All other	8
Total	23

Japanese industry profile

The Japanese primary aluminum industry is made up of six producers that have total annual capacity of over 2.8 billion pounds. Japan also has an aggressive secondary aluminum industry that is an important factor in the domestic market. There are approximately 300 establishments producing secondary aluminum in Japan and they are believed to produce about 2 billion pounds per year.

The wrought aluminum sector consists of approximately 21 companies operating roughly 51 wrought aluminum production plants in Japan, with an estimated wrought aluminum production capacity of 5.3 billion pounds in 1982. 2/ The wrought sector of the industry is highly concentrated. Of the 21 companies, 6 account for over 50 percent of Japan's wrought aluminum production. Of the six, three are primary aluminum producers.

According to the U.S. Bureau of Mines, Japanese unwrought aluminum production rose from 117 million pounds in 1954 to 842 million pounds in 1967 before rising sharply to 2.6 billion pounds in 1976. Production subsequently fell during 1977-82, to 773 million pounds in 1982 when Japanese primary

1/ Data on secondary unwrought aluminum industry is not separately available.
2/ Non-Ferrous Metal Works of the World, 1982, 3d ed., by Metal Bulletin Books Ltd.

aluminum operations were curtailed and unwrought aluminum imports increased to meet internal needs. Over the same period, Japan's production capacity for unwrought aluminum increased from approximately 150 million pounds in 1954 to approximately 3.3 billion pounds in 1982, with utilization falling to less than 25 percent of capacity between 1977 and 1982. According to the Japan Trade Center, Japanese wrought aluminum production rose from an estimated 129 million pounds in 1955 to 1.8 billion pounds in 1970 and 3.8 billion pounds in 1982.

By sector, Japanese aluminum consumption is dominated by the construction, transportation, and machinery/metals industries. The partial January-June 1980 sectoral breakdowns were as follows: 1/

Industry	Percentage distribution
Construction	33
Transportation	23
Machinery and metal industries	19
Electrical and communication	7
Packaging	6
Electric power	4
Household appliances	2
Other	6
Total	100

Japanese aluminum products are distributed primarily through three channels: (1) major Japanese producers make direct sales to Japanese customers and sell abroad through various traders; (2) smaller producers generally utilize the marketing services of Japan's major trading companies, which average product prices and sell to all users; or (3) smaller producers utilize independent traders, which sell low-priced goods directly to large users.

U.S. market

The principal competition in the sale of primary unwrought aluminum in the United States is between the 12 domestic companies and 1 Canadian company. Shipments of the 12 domestic primary aluminum producers accounted for about 95 percent of the U.S. market in 1982, with Canada and China accounting for most of the remaining market share. Competition for the sale of wrought aluminum products is between producers of primary and secondary aluminum and other fabricators, both domestic and foreign.

1/ Rhea Berk, Howard Lax, Willian Prast, and Jack Scott, Aluminum: Profile of the Industry, Atlantis, Inc., 1982.

Changes in the consumption patterns for the major wrought aluminum markets are shown in table 40. 1/

Table 40.--Estimated end-use distribution of wrought aluminum, by major categories and by selected years, 1960-82

(In millions of pounds)

Category	Years					
	1960	1963	1967	1972	1977	1982
Packaging & containers	316	490	860	1,799	2,772	3,553
Transportation	441	704	936	1,201	1,653	960
Building & construction	1,185	1,428	1,776	3,010	2,900	2,220
Electrical	451	601	1,075	1,321	1,164	998
Consumer durables	346	447	558	783	726	559
Other uses	395	624	1,253	1,299	1,383	1,197
Total	3,124	4,344	6,458	9,413	10,598	9,487

Source: Estimates by the Aluminum Association Inc.

Over the past three decades domestic demand for aluminum has grown at a faster rate than that of other major metals, and the use of aluminum now exceeds that of any other metal except iron and steel, both on a quantity and value basis. Until 1978, the building and construction industry represented the largest domestic market. However, rapid growth in demand in the container/packaging industry resulted in that market developing into the largest one in 1982. These end-use markets (building/construction and containers/packaging) receive two-thirds of domestic shipments, a share which is likely to expand in the near future.

U.S. production/shipments

In the last three decades, aluminum has become one of the most widely used industrial metals in the world. U.S. production of unwrought aluminum rose during 1954-82, from 2.9 billion pounds to peak at 11.3 billion pounds in 1978, before falling to 7.2 billion pounds in 1982. During the same period, U.S. shipments of wrought aluminum increased, from 2.1 billion pounds in 1954 to peak at 10.3 billion pounds in 1980, before falling to 9.1 billion pounds in 1982. Aluminum production expanded at a rapid pace during the 1950's and 1960's, as new markets were continually developed. The industry actively pursued research and development of new products, many of which were designed to enhance aluminum substitution for other materials. Production continued to grow rapidly in the early 1970's, though growth slowed in the latter part of the decade. Reduced demand in the early 1980's, principally due to poor economic conditions, high interest rates, and escalating production costs, resulted in a decline in U.S. production.

1/ Data is unavailable prior to 1960.

U.S. imports

Traditionally the United States has been a net importer of aluminum, serving as the largest world market for unwrought aluminum exports and the third largest world market for wrought aluminum exports. The U.S. aluminum trade balance has registered continuous annual deficits since 1950, with the exceptions of 1960, 1969, 1970, and 1980. Most imports have been in unwrought form.

U.S. imports of aluminum rose constantly during 1954-82. Unwrought aluminum imports increased from 431 million pounds in 1954 to a peak of 1.4 billion pounds in 1982; wrought aluminum imports increased from 27 million pounds in 1954 to a peak of 456 million pounds in 1982 (see table 41). U.S. imports of unwrought and wrought aluminum in 1982 were 1.4 billion pounds and 456 million pounds, respectively. At the same time, the ratio of imports to consumption rose from 12.9 to 17.5 percent for unwrought aluminum during 1954-82, and from 1.3 to 5.0 percent for wrought aluminum.

U.S. imports of unwrought aluminum from Japan have been insignificant, averaging less than 1 percent of total unwrought aluminum imports during 1954-82. Imports of wrought aluminum from Japan rose from 112,000 pounds in 1954 to a peak of 178 million pounds in 1982. The bulk of the increase occurred during 1978-82, when the U.S. aluminum market expanded as a result of the growth of aluminum use in containers and packaging (89 percent of all beverage cans are now made with aluminum). Imports from Japan as a percent of total U.S. wrought aluminum imports rose from less than 1 percent in 1954 to 38 percent in 1982, which accounted for 2 percent of domestic consumption. Growth in Japanese imports thus occurred both in absolute terms and relative to domestic and other foreign producers shipments to the U.S. market. The primary import item was aluminum sheet for use in making beverage cans, the largest U.S. aluminum growth market. Presently, Japan's exports account for about 10 percent of the U.S. aluminum sheet market. 1/

Table 41.--Aluminum: U.S. production/shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, by specified years, 1954-82

Year	Production/ shipments	Exports	Imports	Apparent consump-	Ratio of imports to consumption
	Million pounds				Percent
Unwrought:					
1954	2,921.1	8.1	430.5	3,343.5	12.9
1958	3,131.1	105.4	510.6	3,536.3	14.4
1963	4,626.0	330.7	831.3	5,126.6	16.2
1967	6,538.0	418.0	899.4	7,019.4	12.8
1972	8,244.0	216.6	1,322.1	9,349.5	14.1
1977	9,078.0	195.5	1,340.4	10,222.9	13.1
1982	7,218.0	802.3	1,358.8	7,774.5	14.1
Wrought:					
1954	2,086.6	13.4	27.3	2,100.5	1.3
1958	2,597.1	21.7	55.9	2,631.3	2.1

1/ Berk, Lax, Prast, Scott, op. cit., 1982: Aluminum: Profile of the Industry.

Table 41.--Aluminum: U.S. production/shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, by specified years, 1954-82--Continued

Year	Production/ shipments	Exports	Imports	Apparent consump-	Ratio of imports to consumption
	Million pounds				Percent
1963	4,257.2	110.6	82.5	4,229.1	2.0
1967	6,350.6	205.4	116.7	6,261.9	1.9
1972	9,246.3	309.5	162.3	9,099.1	1.8
1977	10.442.9	423.0	150.9	10,170.8	1.5
1982	9,098.9	492.3	455.6	9,062.2	5.0

Source: Compiled from official statistics of the U.S. Department of Commerce.

Conditions of competition in the U.S. market

Price, quality, and service are the principal competitive factors in the aluminum market. Domestic firms are strong competitors due to their diversified raw material resources, extensive plant facilities, relatively inexpensive energy supply, skilled personnel, and extensive research and development activities, which enable them to offer quality aluminum products with reliable customer service at competitive prices.

The entry of the Japanese aluminum industry into the U.S. wrought aluminum market, and consequent growth in its U.S. market share (particularly in the aluminum sheet market) is largely attributed to the Japanese producers' marketing foresight in projecting rolled products as the largest growth sector and the subsequent actions taken by these producers to expand capacity in this product area.

International markets

Industrialized nations have always been both the leading exporters and users of aluminum. Both production and consumption of aluminum are highly concentrated in Western Europe, the United States, Canada, and Japan. Significant amounts of aluminum are shipped to newly developed countries (i.e., Venezuela, and Brazil) and the developing nations that are industrially oriented (i.e., South Korea and Taiwan). Nonindustrial nations are almost wholly dependent on developed countries for their unwrought and wrought aluminum supplies. The Communist countries are also active in world aluminum trade, but to a lesser extent than Western nations, as their internal aluminum industry services a captive domestic market, with world trade supplementing their particular supply/demand situations.

The United States accounts for 8 percent of non-Communist unwrought aluminum exports to world markets. Conversely, Japan's exports of unwrought aluminum to other world markets are almost nonexistent. However, in the case of wrought aluminum, U.S. exports account for 11 percent of non-Communist world markets; Japanese exports account for 9 percent.

U.S. exports

Although the United States has traditionally been a net importer of aluminum, it is also a major source of aluminum in world trade. The United States ranks fourth in exports of both unwrought and wrought aluminum to non-Communist world markets. Most U.S. aluminum exports are semifabricated products.

U.S. exports of aluminum rose significantly during 1954-82. Unwrought aluminum exports increased from 8 million pounds in 1954 to 802 million pounds in 1982; wrought aluminum exports increased from 13 million pounds in 1954 to 492 million pounds in 1982. U.S. exports of both unwrought and wrought aluminum peaked in 1980 at 1.4 billion pounds and 763 million pounds, respectively. U.S. exports as a percent of domestic production/shipments rose from 0.3 percent in 1954 to 11.1 percent in 1982 for unwrought aluminum and from 0.6 percent in 1954 to 5.4 in 1982 for wrought aluminum. The principal export markets for U.S. aluminum during 1954-82 were Mexico (1954), the United Kingdom (1958 and 1963), Japan (1967), Canada (1972 and 1977) and Japan (1982) for unwrought aluminum. Canada was consistently the major market for wrought aluminum.

During 1980, U.S. exports of aluminum became price competitive with Japanese aluminum in the Japanese market. In 1982, energy/cost differentials enabled U.S. ingot to sell in Japan at prices 20 percent lower than ingot produced in Japan, and American exports attained a 20-percent share of the Japanese primary aluminum market.

Japanese exports

Japan has traditionally been a net importer of aluminum; however the country ranks fifth in exports of wrought aluminum to non-Communist world markets. Overall, Japanese exports of aluminum rose during 1954-82. Declines in unwrought aluminum exports (from 19 million pounds in 1954 to 15 million pounds in 1982) were more than offset by increases in wrought aluminum exports, which rose, from 13 million pounds in 1954 to 344 million pounds in 1982. Japanese exports of unwrought aluminum, as a percent of domestic production/shipments, declined from 16.2 percent in 1954 to 1.9 percent in 1982, and from 10.1 percent in 1954 to 9.1 percent in 1982 for wrought aluminum.

The significant export markets for Japanese aluminum during the 28 year-period 1954-82 were Argentina (1954), Brazil (1958), the United States (1963-67), China (1972-77) and Australia (1982) for unwrought aluminum. The United States was consistently the major market for wrought aluminum.

Conditions of competition in international markets

In the international arena, U.S. and Japanese aluminum producers compete on equal terms with regard to servicing, product quality, and marketing. However, the United States has a clear pricing advantage because of its access to relatively low-cost energy. Also, the United States has longstanding supplier relationships in aluminum with other major consuming countries, and an edge in research and development.

Japan's share of the international aluminum market has risen during 1954-82, though not at the expense of U.S. firms, as both U.S. and Japanese exports to world markets rose significantly during the period. In international competitiveness, the United States and Japan generally do not compete against each other in the same markets. Japan's major markets for unwrought aluminum are in Australia and Asia, in contrast to the United States, whose major markets (excluding Japan) are in North America, South America, and Europe. In the case of wrought aluminum, Japan's major markets (excluding the United States) are in Asia; the major markets for the United States are in North America, South America, and Europe. The only areas in which both countries compete are the unwrought aluminum markets in Thailand, the Republic of Korea, and China. These three countries account for 17 percent of Japanese unwrought aluminum exports and 6 percent of U.S. unwrought aluminum exports.

The one international market in which Japan and the United States do compete is in Japan itself (in unwrought products). The aluminum markets in Japan are highly competitive and dynamic. Japanese firms vie for authorization to use the "JIS" (Japan Industrial Standard) mark on their products in recognition that the quality complies with stringent Government requirements. The "JIS" mark is not mandatory but is highly desirable in the Japanese market. No U.S. aluminum firms have been granted "JIS" rights; however, U.S. aluminum imports have been generally certified as "JIS" quality on a product-by-product basis via import testing. New products are constantly being introduced in Japan, and manufacturers compete aggressively for market share.

In response to increased competition from U.S. unwrought aluminum imports, Japanese aluminum producers and trade unionists have appealed to their Government to protect the domestic industry and convince the United States to restrict aluminum exports to Japan voluntarily. Some Japanese producers have called for an increase in tariffs to protect Japan's ailing aluminum industry. A delegation from the Japanese Aluminum Smelter Workers visited the United States in April 1981 to ask the Reagan Administration and American industry to limit aluminum shipments to Japan. To date no U.S. government or industry action has been taken on either of these proposals. 1/

1/ Berk, Lax, Prast, Scott, op. cit.

Automobiles and Trucks

Description and uses

The products covered in this section include new and used passenger automobiles, and all automobile trucks and truck tractors. Buses, special-purpose vehicles such as fire engines and off-the-road trucks, and all other miscellaneous motor vehicles are not included. New automobiles and light-weight trucks will receive the principal emphasis since these two types of vehicles have traditionally accounted for more than 95 percent of the motor-vehicle trade between the United States and Japan.

Lightweight trucks are usually defined by the motor-vehicle industry as trucks having a gross-vehicle-weight (GVW) rating of 10,000 pounds or less. Trucks with a GVW of more than 10,000 pounds, but less than 19,500 pounds, are normally classified as medium-weight trucks, and trucks with a GVW of over 19,500 pounds are classified as heavyweight trucks. Virtually all lightweight trucks are either compact/standard-sized pickup trucks or van-type vehicles. Many lightweight trucks are used primarily for personal transportation, but virtually all medium- and heavyweight models are used for commercial purposes. In recent years, pickup trucks and vans have replaced the second automobile in many households, and in some it is the only means of transportation. Also, compact pickup trucks (virtually all were imported into the United States from Japan until late 1981) have become very popular, and compact vans have been introduced in the U.S. market by one U.S. motor-vehicle manufacturer. All compact trucks have a GVW of less than 6,000 pounds; standard-sized trucks may be either less than 6,000 pounds or more than 6,000 pounds in GVW rating, but almost always under 10,000 pounds.

U.S. Industry profile

Automobiles and trucks are normally distributed through retail dealer outlets located throughout the United States. In the case of Government or some large fleet purchasers, the vehicles typically are shipped directly to the buyer, but the percentage is relatively small in relation to total domestic sales. At the producer level, the vehicles are seldom held in inventory, they are normally shipped to the retail dealer within a few days after production.

There are currently three U.S. wholly owned automobile manufacturers, one primarily U.S.-owned manufacturer, and two foreign-owned subsidiaries operating in the United States. The top three automobile producers (all U.S.-owned) accounted for about 96.0 percent of total U.S. production in 1982. In the case of trucks, there are 5 principal U.S. manufacturers and approximately 10 small producers. In 1982, the five principal truck manufacturers represented about 97.0 percent of U.S. truck production. Some manufacturers purchase their chassis from larger firms and install custom bodies; thus they are not considered producers. (Also, many manufacturers of heavyweight trucks purchase large components such as diesel engines or transmissions from outside suppliers in addition to producing their own engines and transmissions.)

The level of skill of production workers in the motor-vehicle industry ranges from low, or unskilled assembly operators, to highly skilled machinists. In addition, some tasks that were traditionally performed by assembly employees are now accomplished using robots. These robots are used primarily for welding and painting operations, but it is likely that the use of industrial robots will continue to expand into other areas as they become more sophisticated and the initial cost declines.

Employment of all workers and of production workers in the motor-vehicle industry (SIC No. 3711) were as follows (in thousands of workers): 1/

Year	All workers	Production workers
1960	361.2	273.0
1963	360.5	269.4
1967	401.0	296.8
1972	415.2	304.9
1977	443.0	329.6
1978	469.7	349.1
1979	463.0	340.8
1980	368.1	252.8
1981	358.7	251.9
1982	321.3	223.3

The number of workers employed in this industry reached its highest level, 469,700 workers, in 1978 and then steadily declined in each of the following years to 321,300 workers in 1982. This represents a 31.6 percent decline over the 4 years.

To the extent that any loss of domestic and/or international market share results from targeting practices, the corresponding absence of each $1 million in production not undertaken by U.S. automobile and trucks manufacturers would translate into an estimated 23 workers displaced in all sectors of the U.S. economy (based on 1982 production/employment relationships), according to the staff of the U.S. International Trade Commission, using the BLS input-output model, as seen in the following tabulation:

Industry sector	Displaced employment
	Number
Automobile and trucks	8
Other manufacturing	8
All other	7
Total	23

Japanese industry profile

During the last 20 years, Japan has become not only the major motor-vehicle producer in the world, but also the major motor-vehicle exporter in the world. The following tabulation, compiled from data published by the

1/ Based on U.S. Department of Labor data.

Japanese Automobile Manufacturers' Association, shows Japanese production of automobiles and trucks for the specified years (in thousands of units):

Year	Automobile	Truck	Total
1958--------------	51	130	181
1963--------------	408	863	1,271
1967--------------	1,376	1,743	3,119
1972--------------	4,022	2,238	6,260
1977--------------	5,431	3,034	8,465
1981--------------	6,974	4,103	11,077
1982--------------	6,887	3,850	10,737

Production of automobiles and trucks in Japan rose rapidly during 1958-81, then dropped slightly in 1982. Production of both automobiles and trucks increased every year in Japan during 1958-81 except for the year 1973 and 1974 (data not shown) when the entire world experienced a decrease in the production of motor vehicles due principally to the OPEC oil embargo and the resulting increase in petroleum prices. The decrease in 1982 production can be attributed to the persistant worldwide recession, a decline in sales in the Japanese market, and restrictions of motor-vehicle imports from Japan by most industrialized countries.

The end users of Japanese motor vehicles, the level of skill involved in production operations, and the distribution channels for vehicles in Japan are all very similar to those in the United States. There are 10 primary producers of automobiles and trucks in Japan; all but 1 produce both automobiles and trucks. Unlike the three U.S. manufacturers that accounted for over 90 percent of total automobile and truck products, the top three firms in Japan accounted for 62.8 percent of total production in Japan in 1982.

U.S. market

In the United States, demand for automobiles and trucks is concentrated in densely populated areas, primarily urban. Lightweight trucks previously were used primarily in rural areas. When used in urban areas their usage was mostly commercial. However, during the last 10 to 15 years, vans and pickup trucks have become popular in urban and suburban areas, where they are used for personal transportation, as well as for commercial purposes.

At one time, brand loyalty and price were the primary factors considered in the purchase of an auto or truck. But today's consumer is more concerned with quality, mechanical reliability, and fuel efficiency than about brand loyalty. The tendency to purchase the same make as the previously owned vehicle remains a determining factor, but not the determining factor that it was during the 1940's through the 1960's.

Until the early 1960's, virtually all automobiles and lightweight trucks produced domestically were similar in size. U.S. manufacturers began producing smaller automobiles in significant numbers in 1959 (e.g., Falcon and Corvair), and compact trucks in 1981. All three major U.S. lightweight truck manufacturers currently produce compact trucks in the United States, and two foreign-affiliated firms produce a compact pickup truck in the United States.

Automobiles are classified principally by size: subcompact, compact, intermediate, standard, and luxury. In terms of size, consumer preferences have changed during the last 5 years. The following tabulation, based on data compiled from Automotive News, presents retail sales of domestically produced automobiles, by sizes, for 1978-82 (in percent):

Year	Subcompact	Compact	Intermediate	Standard 1/
1978-----	10.7	27.8	32.3	29.2
1979-----	16.4	26.8	30.4	26.4
1980-----	21.0	28.6	29.2	21.2
1981-----	23.5	27.8	28.0	20.7
1982-----	23.1	24.3	26.3	26.3

1/ Includes luxury models.

The above tabulation indicates a significant shift in demand toward subcompact models and away from the other sizes during 1978-82. Due to the stabilization of fuel prices during 1982, some consumers switched from compact/intermediate-sized automobiles to larger models.

U.S. shipments

U.S. shipments of automobiles and trucks for selected years, compiled from statistics supplied by the Motor Vehicle Manufacturers Association, were as follows:

Year	Automobile	Truck and bus	Total
1954------------	5,559	1,042	6,601
1958------------	4,258	877	5,135
1963------------	7,638	1,463	9,101
1967------------	7,437	1,539	8,976
1972------------	8,824	2,447	11,271
1977------------	9,201	3,442	12,643
1978------------	9,165	3,706	12,871
1979------------	8,419	3,037	11,456
1980------------	6,400	1,667	8,067
1981------------	6,255	1,701	7,956
1982------------	5,049	1,905	6,954

Automobile shipments reached the highest level in 1973 when 9.7 million units were shipped, and the peak year for truck and bus shipments during 1954-82 was 1978; when 3.7 million units were shipped. U.S. shipments of automobiles and trucks have declined each year since 1978, due principally to the increase in the price of petroleum and the recessionary trends over the past years. As can be noted from the preceeding tabulation, U.S. shipments of motor vehicles in 1954 were almost the same in 1982, yet total U.S. registrations of autos and trucks rose from 62.4 million in 1955 to an estimated 160.0 million in 1982.

U.S. imports

U.S. imports of automobiles and trucks increased from $46.1 million in 1954 to $20.2 billion in 1982, or by 438 percent. The principal source of imports in 1954 was the United Kingdom, from which the United States imported 25,632 automobiles, valued at $33.7 million. The primary source in 1982 was Japan. In fact, the United States imported 1.8 million automobiles, valued at $9.6 billion, and 354,586 lightweight trucks, valued at $1.5 billion, from Japan in 1982. The following table 42 presents the number of automobiles, lightweight trucks, and cab/chassis imported from the six principal sources of U.S. imports for the specified years.

The increase in demand for Japanese autos and lightweight trucks was caused by a combination of factors. U.S. manufacturers produced few fuel-efficient autos and lightweight trucks in the early 1970's, when the large increase in the price of gasoline occurred; but the Japanese did. Also, the quality of Japanese autos was high causing some U.S. consumers to switch from domestic autos to competitively priced Japanese-built autos.

The following tabulation, based upon official statistics of the U.S. Department of Commerce, shows the ratio of the value of imports of automobiles and trucks (total and Japan) to U.S. consumption (in percent):

Year	Ratio of imports to consumption	Ratio of imports from Japan to consumption
1954	0.5	1/
1958	5.4	1/
1963	3.5	1/
1967	14.8	0.9
1972	18.6	3.8
1977	23.6	7.8
1978	23.5	9.6
1979	25.6	11.1
1980	31.6	15.2
1981	31.2	16.4
1982	37.2	17.7

1/ Less than 0.05 percent.

In 1954, less than 1 percent of U.S. consumption of automobiles and trucks was accounted for by imports, but by 1982 this percentage had increased to 37.2 percent.

The ratio of imports from Japan to total U.S. imports increased from less than 0.05 percent in 1954 to a peak of 52.7 percent in 1981, then declined to 47.6 percent in 1982 (table 42). The ratio of imports from Japan to total U.S. consumption was less than 1 percent until 1972 when it registered 3.8 percent. Japanese import penetration increased to the highest level during the period in 1982, when it reached 17.7 percent. Part of the increase in imports from Japan was offset by a decrease in imports from European countries, primarily West Germany, Italy, and the United Kingdom. However, most of the increase resulted in a loss in the share of the U.S. market held by domestically produced automobiles and trucks.

Table 42.--New automobiles and trucks imported by 6 principal sources and all other countries, by specified years, 1964-82 1/

(In thousands of units)

Year	Japan	Canada	West Germany	United Kingdom	Sweden	Italy	All Other	Total
1964	16	9	365	77	18	10	41	2/ 536
1967	81	455	472	68	43	17	29	2/ 1,165
1972	857	1,014	677	72	64	64	70	2,818
1977	1,570	1,139	423	57	39	55	36	3,319
1978	1,931	1,202	416	54	56	70	38	3,767
1979	2,015	950	495	47	66	72	37	3,682
1980	2,473	848	338	32	61	46	65	3,863
1981	2,367	840	3/ 234	12	68	22	46	3,589
1982	2,156	966	3/ 259	13	89	9	54	3,546

1/ Includes cab/chassis from Japan and Canada.
2/ Partially estimated by staff of the U.S. International Trade Commission
3/ Data for 1981-82 do not include vehicles assembled in foreign trade zones.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Conditions of competition in the U.S. market

Prices of Japanese automobiles and trucks are competitive with U.S.-produced vehicles. There are almost 400 different makes and models of domestically built autos and trucks, and over 75 different makes and models of Japanese autos and trucks available in the United States.

According to consumer surveys conducted by consumer magazines, independent survey firms, and professional engineering associations, imported automobiles and lightweight trucks from Japan are perceived by both U.S. consumers and automotive engineers to be higher in quality than domestically produced models. However, though Japanese imports are perceived to be of higher quality than U.S. vehicles, domestically built autos are generally perceived to be superior in terms of safety, parts' availability, and passenger comfort. In 1978, Japanese autos achieved a much higher fleet average in fuel economy, but the gap in fuel efficiency has been significantly narrowed since then.

International markets

Prior to 1980, the United States was the world's dominant producer of motor vehicles, however, Japan's production of motor vehicles surpassed that of the United States in 1980-82. The success of U.S. motor-vehicle manufacturers has been primarily due to their success in the U.S. market. Little emphasis has been placed on exporting, except to Canada. The primary reason the major U.S. motor-vehicle manufacturers have not pursued a more aggressive export policy is that they have production/assembly facilities in most of the major world markets, except in Japan. The three major U.S. motor-vehicle manufacturers participate in joint ventures with Japanese motor-vehicle manufacturers in Japan.

The other major motor-vehicle-producing countries are Brazil, Canada, and certain European countries, primarily West Germany, France, Italy, Spain, the United Kingdom, and Belgium. Some countries of secondary importance that produce a substantial volume of motor vehicles are Sweden, Mexico, and Australia.

The following tabulation, compiled from Ward's Automotive Year Book, 1983, lists the production of motor vehicles in 1981 and 1982 for the major and secondary motor-vehicle-manufacturing industrialized countries (in thousands of units):

Country	1981	1982
Japan	11,180	10,737
United States	7,942	6,985
West Germany	3,897	4,062
France	3,019	3,149
Italy	1,433	1,453
Canada	1,323	1,236
United Kingdom	1,184	1,156
Spain	987	1,069
Belgium	894	997
Brazil	780	861

(Continued)

Country	1981	1982
Mexico----------------	597	472
Australia-------------	392	409
Sweden----------------	314	345
Republic of Korea----	133	163
Portugal--------------	119	118
All others------------	42	373
Total-------------	34,636	33,585

All of the above countries are free-market countries; the data do not include Soviet-bloc motor-vehicle production.

A major indication of demand for motor vehicles is the number of motor vehicles registered in a country. The following tabulation, sourced from the Motor Vehicle Manufacturers Association, shows 1980 registrations of automobiles, trucks, and buses, by areas (in thousands of units):

Area	Automobile	Trucks and buses	Total
North and Central America----------------	136,450	39,088	175,538
Europe----------------------------------	124,200	21,330	145,530
Asia------------------------------------	31,883	20,368	52,251
South America---------------------------	14,234	4,553	18,787
Africa----------------------------------	7,414	2,043	9,457
Oceania---------------------------------	6,332	3,181	9,513
World total-------------------------	320,513	90,563	411,076

The preceding tabulation shows that North and Central America and Europe are currently the two major world market areas for motor vehicles. However, these two markets, along with Japan, have a relatively low-predicted growth rate for the next decade compared with other areas of the world.

U.S. exports

U.S. exports of automobiles and trucks increased from $616 million in 1954 to peak at $4.8 billion in 1977, before dropping to $2.9 billion in 1982. In 1963, the principal export market for U.S.-produced automobiles and trucks was Mexico, followed by Venezuela and Canada. However, since 1965, Canada has been the principal market for U.S. vehicles. In fact, automobile and truck exports to Canada accounted for more than 60 percent of total U.S. exports during each of the last 5 years. In 1982, the category "not disclosed" was the second leading market for U.S. exports; these were primarily trucks and truck tractors for military use in various countries throughout the world. Kuwait, Venezuela, Mexico, Colombia, and Japan represented the other major markets for U.S. exports of automobiles and trucks.

Of the top 10 markets for U.S. motor vehicles, the value of U.S. exports increased in five of the areas, and decreased in the other five areas when comparing 1978 with 1982. The decline in exports during the last 3 years was caused by a decrease in worldwide demand for U.S. vehicles brought about chiefly by the worldwide recession of 1980-82. Third-world developing countries, major purchasers of U.S. vehicles, have been especially hard-hit by the recession.

Japanese exports

In two decades, Japan has become not only the major motor-vehicle producer in the world, but also the major motor-vehicle exporter in the world. The following tabulation, sourced from data published by the Japanese Automobile Manufacturers Association, depicts Japanese production of automobiles and trucks exports, and the ratio of exports to production for specified years:

Year	Production (1,000 units)	Exports (1,000 units)	Ratio of exports to production (Percent)
1958----------	181	10	5.5
1963----------	1,271	97	7.6
1967----------	3,119	359	11.5
1972----------	6,260	1,954	31.2
1977----------	8,465	4,329	51.1
1978----------	9,213	4,570	49.6
1979----------	9,572	4,525	47.3
1980----------	10,951	5,901	53.9
1981----------	11,077	5,964	53.8
1982----------	10,737	5,590	52.1

As shown in the preceeding tabulation, exports rose at a much more rapid rate from 1967 to 1982 than did production. Production increased from 3.1 million units in 1967 to 10.7 million in 1982, or by 245 percent, on the other hand, exports increased from 359,000 units to 5.6 million units, or by 1,460 percent during the corresponding period. The ratio of exports to production increased from 5.5 percent in 1958 to 51.1 percent by 1977, and has remained at approximately half of total production each year since 1977. (In comparison, the ratio of exports to production for the United States ranged from a low of 7.3 percent to a high of 9.8 percent during 1977-82.)

In terms of value, Japanese exports of automobiles and trucks increased from an estimated $543,000 in 1954 to $25.3 billion in 1981. Since 1972, Japanese exports rose by 722 percent, to $25.3 billion in 1981. In 1963, Australia represented the primary export market for Japanese-built autos and trucks, followed closely by South Africa. By 1967, the United States was the leading market for Japanese vehicles and has been ever since. (U.S. exports increased by 130 percent during the corresponding period.)

Conditions of competition in international markets

The Japanese have steadily taken a larger share of the world automobile and truck market since 1954 due primarily to lower production costs and high quality. The U.S. manufacturers established assembly plants in many of the EC countries, Central/South American, and Australia in the late 1940's and 1950's, whereas Japan has established very few assembly plants outside of Japan.

Since U.S. automotive manufacturers have production facilities in most major motor-vehicle markets, and Japan does not, it is difficult to compare the conditions of competition in the international markets. However, the penetration of Japanese imports has grown dramatically since 1970. This growth has caused U.S. foreign subsidiaries to lose market share in practically every country where they currently produce motor vehicles.

Japanese automobiles and trucks are perceived worldwide as being fuel-efficient, reliable, and of high quality. The Japanese have been aggressive marketers and have built vehicles that meet the needs of various types of consumers in almost every major industrialized country. Their rates of productivity growth have exceeded all other major motor-vehicle-producing countries since 1954. Even the real productivity rate is thought to be currently higher than any other major motor-vehicle-producing country. At the same time, the average wage rate of a Japanese auto worker has been below the U.S. and West Germany worker, although the gap is gradually narrowing. Thus, it has been estimated that the Japanese enjoy a cost advantage of between $500 to $1,500 per automobile, giving them a product that competes well in international markets throughout the world.

Drugs and Related Products

Description and uses

Drugs and related products include numerous chemicals and natural products. Many drugs are organic chemicals that are found in plants or secreted by various animal glands. Other drugs, such as the antibiotics, are chemicals produced in part by fermentation processes. Also, many drugs are now produced entirely by chemical synthesis. Lastly included in this description are related products such as vaccines, toxoids and analogous products, serums, plasmas, and other blood derivatives.

The drugs and related products are sold in a variety of forms--(1) crude natural products, (2) chemically pure bulk drugs, (3) pharmaceutical preparations such as tablets, capsules, vials, ointments, medicinal powders, and (4) various other medicinal products that are suitable for retail sale.

U.S. industry profile

The production of drugs and related products takes place in two major manufacturing stages. The first stage is the production of pure pharmacologically active chemicals in bulk form; the second stage is the formulation of these concentrated pharmacologically active components into pharmaceutical preparations. Pharmaceutical preparations are typically the pure chemicals plus diluents or extenders.

The purchasers or users of bulk drugs are, for the most part, the establishments that produce pharmaceutical preparations, many of which produce bulk drugs for their own captive use in the production of their brand name pharmaceutical preparations. Ultimately, the drugs and related products are consumed by the general populace in the form of pharmaceutical preparations, used in animal feed additives, or used in veterinary medicine.

Distribution channels for drugs and related products vary with the markets or users being served. For example, substantial amounts of bulk drugs move in international trade and a significant part of these shipments are believed by industry sources to be intracompany product transfers by multinational drug firms. In addition, producers of bulk drugs ship products directly to producers of pharmaceutical preparations. Also, some medicinals, such as vitamins, are shipped in bulk form directly to customers who add these products to animal feeds. Prescription pharmaceutical preparations are dispensed through pharmacies, and "over-the-counter" products are sold to consumers through numerous retail outlets. Thus, distribution of pharmaceutical preparations varies with the type of product.

There were 174 establishments in 1980 (compared with 177 in 1977 and 140 in 1972) that produced bulk medicinals and botanicals. 1/ 2/ This bulk medicinal and botanical industry employs a substantial number of highly

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1/ U.S. Department of Commerce, County Business Patterns-1980, September 1982, p. 28.
2/ U.S. Department of Commerce, Census of Manufactures, 1972 and 1977.

trained individuals with high skill levels. Total employment in this industry was 16,000 in 1982, up 11 percent from the 14,400 employees in 1977 and up 105 percent from the 7,800 employees in 1972. 1/

Also, in 1980 there were 631 establishments producing pharmaceutical preparations compared with 756 in 1977 and 1972. Thus, over the past few years, the pharmaceutical preparations industry has become somewhat more concentrated. A wide range of skill levels is required. Industry employment totaled 138,500 in 1982, up 10 percent from the 126,400 employees in 1977 and up 24 percent from the 112,000 employees in 1972.

Also, in 1980, there were 287 establishments, compared with 310 in 1977 and 182 in 1972 producing biological products. The labor force in the biological products industry is not so highly skilled as those in the bulk drugs and pharmaceutical preparations industries, if wage rates are used as an indicator. Total employment in the industry producing biological products was 22,600 in 1982, up 44 percent from the 15,700 employees in 1977 and up 124 percent from the 10,000 employees in 1972.

A limited amount of data is available for other related chemicals. At least 20 firms produce other products and employment is estimated at between 2,000 and 3,000.

In total, an estimated 1,112 establishments produced drugs and related products in 1980; 1,263 in 1977; and 1,098 in 1972. Total employment was estimated at 180,000 workers in 1982; 159,000 in 1977; and 132,000 in 1972.

To the extent that any loss of domestic and/or international market share results from targeting practices, the corresponding absence of each $1 million in production not undertaken by U.S. drugs manufacturers would translate into an estimated 26 workers displaced in all sectors of the U.S. economy (based on 1982 production/employment relationships), according to the staff of the U.S. International Trade Commission, using the BLS input-output model, as seen in the following tabulation:

Industry sector	Displaced employment
	Number
Drugs and related products	9
Other manufacturing	5
All other	12
Total	26

1/ U.S. Department of Commerce, U.S. Industrial Outlook, 1983, January 1983, p. 14-3.

Japanese industry profile

The production of drugs and related products in Japan is estimated to have been about $10 billion in 1981. Capacity data cannot be estimated with an acceptable degree of accuracy. Employment data are also unavailable.

According to industry sources, Japan has the world's highest per capita consumption of drugs. Drugs and related products are also used in animal feed and in veterinary medicine, although these markets are smaller in Japan than in the United States.

There is a major difference in Japanese distribution channels for drugs and related products compared with U.S. distribution channels. In Japan, doctors and hospitals sell drugs (at the retail level) to patients, and substantial amounts of the Japanese physicians' incomes are derived from these sales. 1/

There are approximately 100 Japanese producers of drugs and related products. The majority of the Japanese companies are associated in some way with major multinational drug firms. The types of arrangements include marketing agreements to market imported drugs in Japan, joint ventures, and subsidiaries of foreign firms. Frequently, the Japanese have marketing agreements with several firms, and most often the agreements are with major U.S. and European drug firms. 2/

The skill level of labor in the Japanese pharmaceutical industry is believed to be similar to that of the U.S. pharmaceutical industry.

U.S. market

As previously mentioned, purchasers or users of bulk drugs are, for the most part, establishments that produce pharmaceutical preparations. And many of these firms produce bulk drugs for their own captive use in the production of their brand name pharmaceutical preparations. For those producers of pharmaceutical preparations which purchase bulk drugs, price is the major determining factor in their selection of a supplier, and reliability of supply is the second most important consideration. New product development also plays an important role in the success of a competing firm in the market.

Likewise, the aging of the population has influenced the demand for drugs. The average age of the U.S. population has been increasing. The occurrence of many human diseases, especially chronic ones, is a function of age, and consequently, this is a major factor affecting increased demand for pharmaceutical preparations, along with increased demand for health services.

Apparent U.S. consumption of drugs and related products is estimated to have increased 85 percent during 1977-82, from about $13 billion in 1977 to $25 billion in 1982. Previously, U.S. apparent consumption increased about 74 percent during 1972-77. In part, the increase in value of consumption is

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1/ Sally Urang, "Banzai! Here Come Japanese Pharmaceuticals," Chemical Business, Sept. 20, 1982, p. 10.
2/ World Directory of Pharmaceutical Manufacturers, 3d ed., IMS World Publications, London, England, 1980.

accounted for by inflation, because the same products cost more in 1982 than in preceding years. The introduction of new and more costly prescription drugs during the period has also contributed to the increase in value. Pharmaceutical preparations accounted for a significant part, 83 percent, of the value of consumption in 1982.

U.S. shipments

U.S. shipments of drugs and related products are estimated to have increased 83 percent during 1977-82 and 78 percent during 1972-77, from $8 billion in 1972 to $14 billion in 1977 and $26 billion in 1982. As with consumption, the increase in value is largely accounted for by inflation and the introduction of new and more costly prescription drugs.

U.S. imports

U.S. imports of drugs and related products increased 67 percent during 1977-82, from $657 million in 1977 to $1.1 billion in 1982. Major sources of U.S. imports were the United Kingdom, West Germany, and Japan, each of which exported more than $100 million in drugs and related products to the United States in 1982. The rate of increase in imports during 1978-82 was lower than that for U.S. shipments, including products for export, because much of the imports contained relatively low-cost medicinal chemicals in bulk form, whereas U.S. shipments included substantial amounts of higher valued pharmaceutical preparations.

Imports from Japan increased 53 percent during 1977-82, from $72 million in 1977 to $110 million in 1982. The ratio of imports from Japan to total imports of drugs and related products was almost constant during 1977-82, ranging from 9.6 to 11.2 percent. Increased U.S. imports from Japan during 1972-82 were matched by equivalent increases in U.S. exports to Japan during that period.

The ratio of total U.S. imports to U.S. consumption was virtually constant during 1977-82, ranging from 4.4 to 5.8 percent, and the ratio of imports from Japan to U.S. consumption was less than 1 percent during 1977-82.

Conditions of competition in the U.S. market

Most imported drugs are like or directly competitive with domestically produced drugs. All drugs, domestic and foreign, must meet minimum Food and Drug Administration (FDA) requirements for safety and efficacy in order to be marketed in the United States. Most imported drugs enter the United States in bulk form. There are two reasons for this: (1) it is less costly to ship material in its pure concentrated form, and (2) there is a preference for domestically produced pharmaceutical preparations among physicians who prescribe drugs and retail consumers. Thus, most imported drugs are either imported by multinational firms that have U.S. subsidiaries or are sold to U.S. producers of pharmaceutical preparations or other users of bulk drugs.

During the last 5 to 10 years, a tactic used by Japanese producers to market their drugs (in addition to selling to purchasers of bulk drugs) has been to form joint ventures with U.S. drug firms. Concurrently, during the last 5 to 10 years, the Japanese have opened their home markets, allowing U.S. firms to establish wholly owned or majority owned subsidiaries in Japan. This has a number of advantages for the partners. First, the arrangement gives Japanese producers access to U.S. markets through established marketing channels, and second, it gives U.S. firms additional new drugs to enhance their product lines. If the Japanese follow the example of the large European pharmaceutical firms, then they will probably establish subsidiary companies in the United States.

International markets

The United States was the world's largest ($11.3 billion) market for pharmaceutical preparations in 1979, followed by Japan ($8.3 billion), West Germany ($5 billion), France ($4 billion), Italy ($2.4 billion), the United Kingdom ($1.8 billion), and Spain ($1.6 billion). 1/

National firms are quite prevalent in the drug industry, and these firms tend to view their markets as world markets and their firms as world firms. Thus, there are significant amounts of intracompany product transfers in pharmaceuticals owing to varying economies of scale in plant operations, tax advantages, and other advantages related to multinational operations.

According to the United Nations trade statistics, world exports of medicaments--Standard International Trade Classification (SITC) No. 541.7--were $9.9 billion in 1980. Of the 1980 world exports of medicaments, West Germany accounted for 18 percent; the United Kingdom, 15 percent; France, 15 percent; Switzerland, 13 percent; and the United States, 9 percent. Developed market economy countries accounted for 97 percent of exported medicaments in 1980 and 63 percent of world market economy imports. Developing market economy countries accounted for the balances. 2/ Although the United States is the world's largest market for drugs, it is only the fifth largest exporter of these products. This clearly illustrates the competitive strength of the European drug producers.

Medicaments, which roughly approximates pharmaceutical preparations, represent only a portion of the drugs and related products trade. Comparable world data for all drugs and related products are not available. However, United Nations data are available for certain drugs (such as antibiotics, hormones, and alkaloids) in bulk form. But international data for SITC No. 541 medicinal and pharmaceutical products only cover part of the drugs and related products, because many of the drugs in bulk form are classified as organic chemicals in the SITC classification system.

Japan ranked 14th among world exporters of medicaments, 3d, after Germany and Switzerland, as an exporter of bulk vitamins, and 8th as an exporter of bulk antibiotics.

1/ U.S. Department of Commerce, U.S. Industrial Outlook, 1982, January 1982, p. 135.

2/ United Nations, 1980 Yearbook of International Trade Statistics, vol. II, 1981, p. 441.

U.S. exports

U.S. exports of drugs and related products increased 59 percent during 1977-82, from $1.5 billion in 1977 to $2.3 billion in 1982. Principal U.S. export markets in 1982 were Japan (21 percent), France (8 percent), Canada (7 percent), West Germany (6 percent), and Belgium (5 percent). The United States had a positive trade balance in these products in 1982, with U.S. exports approximately double U.S. imports. Exports accounted for about 9 percent of estimated U.S. shipments in 1982. United States exports to world markets increased more rapidly than did Japanese exports to world markets during 1972-81. The United States also had a favorable trade balance with Japan and, in 1982, U.S. imports from Japan were $110 million whereas U.S. exports to Japan were $495 million. The United States maintained a favorable trade balance with Japan during 1972-82.

The United States has maintained a positive growth in the exports of drugs and related products, because many U.S. production facilities are large enough to supply world markets in addition to supplying the domestic market. Another factor influencing the continued export growth is that most large U.S. drug firms have established impressive reputations as suppliers of safe and effective pharmaceutical preparations. Additionally, many multinational firms ship drugs in bulk form to the United States, and then export pharmaceutical preparations made from the bulk drugs.

Japanese exports

As discussed in the section on international markets, Japanese export data are not directly comparable with official U.S. import data compiled by the Department of Commerce, owing to substantial differences in the U.S. classification systems, the Standard International Trade Classification system, and the Customs Cooperation Council Nomenclature (CCCN) system used by Japan. Nevertheless, the SITC data are relied on for the examination of trends, even though these data do not include all trade in bulk drugs, the predominant form in which drugs and related products are imported into the United States. These data are believed to reflect historical trends in total trade.

On the basis of SITC data, the United States was Japan's largest, (28 percent), export market for drugs and related products in 1981, followed by West Germany, (9 percent); Hong Kong, (5 percent); France, (5 percent); the Republic of Korea, (4 percent); Belgium, (3 percent); Denmark, (3 percent); and Switzerland (3 percent). These statistics show that Japanese exports of drugs and related products to the United States increased 253 percent during 1972-77 and further increased 101 percent during 1977-81. Total Japanese exports to all markets of these products increased 114 percent during 1972-77 and 83 percent during 1977-81.

The Japanese have been highly competitive in certain product markets for bulk drugs. For example, Japan was the principal source of U.S. imports of vitamins during 1977-82. Indeed, in 1982, imports from Japan accounted for almost 50 percent of total U.S. imports of vitamins.

Conditions of competition in international markets

The United States is currently in a favorable competitive position in terms of raw material cost and availability of organic chemicals used to produce drugs and related products. Still, in general, all major industrialized countries have access to the requisite raw materials used to produce drugs and related products. However, in most instances, raw material cost is not the principal factor in determining the location of manufacturing facilities. More important factors are proximity to major markets, compliance with government drug regulations, tax advantages and other inducements for capital investments, skill levels of available workers, and corporate structure.

Furthermore, basic and process technologies are both important for a competitive edge. The high-profit margins of the drug industry, compared with other segments of the chemical industry, are directly related to a constant flow of significant drug discoveries. An individual drug that is a significant new therapeutic development can be immensely profitable for a drug firm, though to discover, test, produce, and market the new drug requires large expenditures. For these reasons, major U.S. drug firms employ some of the most advanced "state-of-the-art" technology in the world. As previously mentioned, these leading firms are multinational corporations, and there is considerable technology transfer between the parent company and its foreign subsidiaries. Advanced drug technology, therefore, is not the exclusive purview of U.S. firms, but is generally available to most major competitors. In 1982, for example, West Germany ranked first in new drug introduction; Spain, second; Italy, third; and Japan, sixth. The United States was not among the top 10 countries on the basis of new drug introductions in 1982. 1/

Reportedly, the Japanese Government has been encouraging Japanese pharmaceutical firms to become more aggressive in marketing their products in foreign markets by lowering the price of Japanese drugs. At the same time, foreign companies were encouraged to market their drugs in Japan in order to increase competition. In addition, Japanese firms have formed joint ventures and licensing agreements with numerous established multinational drug firms to gain inexpensive access to world markets and to gain international marketing experience. 2/

1/ "Ciba-Geigy ousts Hoechst from top of drug launch league table," European Chemical News, July 18, 1983, p. 19.
2/ Urang, loc. cit., pp. 9-14.

Iron and Steel Mill Products

Description and uses

Steel is a generic term used to describe a variety of iron-carbon alloys which are malleable as first cast. Although steel may contain other elements intended to enhance one or more properties (such as hardness, strength, or corrosion resistance) and may contain certain elements retained from raw materials, iron must predominate by weight. The different grades of steel are generally classified in four categories: carbon, stainless, tool, and other alloy.

After production, steel is generally solidified into semifinished shapes prior to rolling, drawing, and/or welding into such products as sheets and strip (used widely by the automotive industry), plates (used in construction, machinery, and industrial equipment), and so forth wire and wire products, rails and accessories, and pipe and tubing (used in the oil and gas industries). Steel products are used in virtually all sectors of an industrial economy; their use far exceeds that of any other metal.

U.S. industry profile

In the U.S. market, sales of steel mill products are made either directly to end users or to service centers/ distributors, which subsequently sell to end users. In 1982, about 20 percent of domestically produced steel was shipped to service centers and distributors; 80 percent was shipped directly to end users.

Steel importers have traditionally sold their steel to independent U.S. steel service centers/distributors. In recent years, however, many foreign steel producers (particularly those in the EC) established wholly owned or affiliated service centers/distributor networks. In contrast, only three U.S. steel companies currently operate subsidiary service centers.

The seven largest steel producers in the United States accounted for about 70 percent of total raw steel production in 1982. These firms not only operate blast furnaces, steelmaking furnaces, rolling and finishing facilities, but also own and operate mines which provide iron ore, coal, and limestone for the production of iron. In addition to the 7 largest firms, there are over 80 other U.S. steel producers, many of which are relatively small, nonintegrated companies which produce steel in electric furnaces, using recycled iron and steel scrap as their primary raw material. These small nonintegrated plants are known as minimills.

According to a study conducted by the Office of Technology Assessment, 1/ slightly more than half of all technical personnel in the industry are employed in production and quality control, with somewhat less than one-fifth in engineering and R&D Vertically integrated firms typically employ large numbers of technical people in production positions, whereas alloy/specialty firms typically employ a high proportion of technical people in quality control and marketing areas. These differences in the use of technical

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1/ Office of Technology Assessment, Technology and Steel Industry Competitiveness, Washington, D.C. 1980, p. 363.

personnel are, to some extent, a reflection of the relative importance of these areas to the two industry segments. The nonintegrated segment employs the fewest technical people, due in part to the greater simplicity of both that segment's processes and its products.

Employment levels during the 1950's and 1960's were higher, on average, than during the 1970's. Between 1952 and 1960, the peak employment year was 1953, with 650,000 employees. According to Bureau of Labor Statistics data, 1/ output per man-hour rose slightly during this time period. During the 1960's, productivity grew more rapidly and by the late 1960's, a 36-percent increase in output per man-hour had been achieved from the 1952 level. Peak employment of 548,000 workers was attained in 1965. Growth in productivity continued throughout the 1970's, with employment declining from a high of 531,000 workers in 1970.

Sharp declines in the number of employees have occurred since 1979. During that year, an average of 453,000 persons were employed in the industry, versus a 1982 average of 289,000. The reduction reflects a number of factors, including reduced production in 1982, and increased productivity (which has resulted from structural and technological changes in the industry). An example of the degree to which productivity has increased is illustrated in a comparison of steel production in 1971 and 1981. In 1981, the industry produced 120.8 million tons of steel with 391,000 employees, which compares with a total of 487,000 employees in 1971, when a comparable tonnage was produced.

To the extent that any loss of domestic and/or international market share results from targeting practices, the corresponding absence of each $1 million in production not undertaken by U.S. iron and steel manufacturers would translate into an estimated 21 workers displaced in all sectors of the U.S. economy (based on 1982 production/employment relationships), according to the staff of the U.S. International Trade Commission, using the BLS input-output model, as seen in the following tabulation:

Industry sector	Displaced employment
	Number
Iron and steel	8
Other manufacturing	4
All other	9
Total	21

1/ U.S. Department of Labor, Bureau of Labor Statistics as reported by American Iron & Steel Institute.

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	Number
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Other manufacturing	4
All other	9
Total	21

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Japanese industry profile

With the outbreak of the Korean War in June 1950, the Japanese steel industry received the added impetus it needed to reach pre-World War II capacity levels. The timing of the war was opportune for the Japanese steel industry as the Occupation program to reduce inflation and end subsidies (Dodge Policy) had been implemented. The Japanese steel industry faced operational and financial difficulties, as it depended heavily on Government subsidies and Reconstruction Finance Bank loans. The elimination of these sources of funds coincided with a worldwide recession. Though the wartime surge in production was brief, it resulted in increased crude steel production. In 1950, production reached 5.3 million short tons; by 1951, when the first 5 year rationalization plan was adopted, it had risen to 7.2 million tons.

During the first rationalization plan (1951-55), crude steel production doubled, to 10.4 million tons in 1955. A second rationalization plan (1956-60) immediately followed. Its focus was to increase capacity to meet growing domestic demand. Home market demand had increased to the point where the Government decided to restrict steel exports in 1955 in order to supply domestic demand. During 1956-60, integrated iron-steel works were built, plants were remodeled, and new equipment was installed at existing works. As a result, crude steel production increased from 10.4 million tons in 1955 to 24.2 million tons in 1960. Capacity more than doubled from 13.7 million tons to 27.7 million tons during these years. Accompanying these changes came improvements in competitiveness. Raw material costs per ton of pig iron dropped $10 during the period. Likewise, labor productivity continued to improve; the required man-hours per ton of output dropped from an average of 12.2 hours at the beginning of the first 5-year period to 9.7 hours in 1955, and 6.2 hours in 1960. 1/

By 1960, Japan had established its iron and steel industry as a viable international competitor. Japanese steel was cost competitive and the quality was comparable with that of Western firms. Morever, steel had become the largest foreign-exchange earner in Japanese trade. 2/

Growth in the Japanese steel industry was rapid during the 1961-77. Capacity grew annually, from a level of 33.1 million tons in 1961 to 173.9 million tons in 1977, as shown in table 43. Following 1977, growth came to a standstill, reflecting lower expectations for growth in demand for steel worldwide and excess world steelmaking capacity.

1/ Kiyoshi Kawahito, The Japanese Steel Industry p. 36, 37, 42, and 46. Council on Wage and Price Stability, Report to the President on Prices and Costs in the United States Steel Industry, October 1977, p. 145.

2/ Kiyoshi Kawahito, The Japanese Steel Industry, p. 48.

Table 43.--Capacity and Capacity Utilization in Japanese Steel Industry
1955-82

Year	Usable capacity	Capacity utilization
	Million net tons	Percent
1955	13.7	75.9
1960	27.7	88.0
1961	33.0	94.2
1962	37.8	80.3
1963	42.0	82.7
1964	47.6	92.1
1965	54.3	83.5
1966	62.3	84.4
1967	74.0	92.5
1968	85.4	86.3
1969	98.7	91.7
1970	114.3	90.0
1971	121.4	80.4
1972	131.0	81.6
1973	142.3	92.0
1974	154.5	83.6
1975	165.3	68.2
1976	166.4	71.1
1977	173.9	64.9
1978	173.2	65.0
1979	172.3	71.5
1980	175.3	70.1
1981	175.3	63.9
1982	171.5	64.0

Source: Council on Wage and Price Stability, Report to the President on Prices and Costs in the United States Steel Industry, October 1977 p. 145, and World Steel Dynamics, The Steel Strategist, #8, July 1983.

End users of Japanese steel have shifted over time, reflecting the changing structure of the Japanese economy. Table 44 illustrates the principal end users in 1959, 1968, and 1982.

Table 44.--Japanese shipments of ordinary steel by market classification, 1959, 1968, 1982

Market classification	1959	1968	1982
	1,000 net tons		
Merchants 1/	2,385	15,780	22,079
Construction	1,242	3,928	5,263
Iron and Steel	1,808	7,518	10,543
Shipbuilding	1,337	3,745	3,279
Metal Processing (not cans and containers)	350	1,579	4,043
Automotive	525	2,480	6,371
All others	5,223	18,096	32,181
Total	12,873	53,129	83,759

1/ Comparable to distributors in the U.S. market.

Source: Kiyoshi Kawahito, The Japanese Steel Industry, p. 60 and 63, and Japan Iron and Steel Federation, Monthly Report, March 1983.

The principal market for Japanese ordinary steel (largely carbon steel) has consistently been the merchant sector, which resells steel to various users such as small steel firms and construction companies. Growth in this market in large part reflects a rise in spending for consumer goods (e.g., automobiles and refrigerators) in Japan. The construction, iron and steel, and automotive industries have been the other primary end users.

In addition to these domestic markets, exports were an increasingly important market for the Japanese steel industry. Exports rose from an average 18-percent share of production in the early 1960's to 32 percent in the late 1970's and 1980's.

Approximately 90 percent of domestic and export sales of Japanese iron and steel products are handled by trading companies which buy and sell thousands of commodities worldwide. In addition to trading companies, other wholesalers handle distribution to medium and small firms. Special contract houses purchase steel for distribution and, based on their size, deal directly with the steel companies or buy from affiliated wholesalers to fill small quantity orders. Only a small share of Japanese steel sales, however, are shipped directly to end users, compared with a much larger figure for the United States.

The Japanese industry is composed of five large integrated manufacturers, four smaller integrated companies, and numerous small nonintegrated firms that produce steel in electric furnaces. In 1982, the five largest producers accounted for about 69 percent of total raw steel production in Japan.

U.S. market

U.S. demand for steel over the past three decades has grown, albeit at a relatively low rate. Steel consumption per capita remained at approximately the same level during the period, whereas consumption per dollar of real GNP fell. With respect to the steel markets, about 60 percent of steel shipments are made to the capital goods sector of the economy, making steel demand highly sensitive to capital spending levels. The largest markets for steel are the automotive and construction industries, followed by the container and packaging industry and the machinery and equipment industry.

During the 1950's, U.S. demand for steel averaged 72 million short tons per year; demand increased during the 1960's to an annual average exceeding 100 million tons during 1965-69. Growth continued in the 1970's, reaching a peak of 123 million tons in 1973. In the following years, demand fell, averaging 108 million tons during 1977-81. In 1982, the economic recession in the United States had a severe impact on the industry, as demand fell to 76 million tons, the lowest level since the early 1960's.

U.S. shipments

The growth in demand in the U.S. steel market during the past three decades was accompanied by a corresponding increase in shipments. To accommodate this growth, steelmaking capacity was added, primarily during the 1950's, so that by 1960, the United States had reached 140 million tons, an increase of 59 million tons over the 1950 figure of 90 million tons. By 1974 capacity had increased to 155.5 million tons. Those sectors which accounted for growth in domestic shipments during the past three decades are presented in the following table.

Table 45.--Domestic shipments of steel products by market classification, 1954, 1964, 1974, and 1981

Market Classification	1954	1964	1974	1981
	1,000 net tons			
Distributors	11,999	15,564	23,179	17,637
Automotive	11,793	18,387	18,928	13,154
Construction	11,605	15,638	18,519	11,666
Containers	5,871	6,552	8,218	5,292
Machinery (industrial equipment tools)	3,517	5,338	6,440	4,624
All others	10,368	23,466	34,188	34,638
Total 1/	63,153	84,945	109,472	87,014

1/ Because of rounding figures may not add to the total shown.

Source: Compiled from statistics of the U.S. Department of Commerce.

Throughout the period, until the 1980's, the five largest markets for steel accounted for approximately 70 percent of total steel shipments. In 1981, however, the share of the top five declined to 60 percent of total shipments, reflecting weakness in the construction and automotive markets. Although some of the weakness is cyclical in nature, structural changes in demand for steel in certain segments have affected steel usage rates. Steel, for example, has encountered competition in the container and packaging industries from aluminum and plastics. In the automotive industry, smaller cars are requiring less quantities of steel per vehicle; in addition, various materials are being used in place of steel in some applications.

U.S. imports

During most of the 1950's the United States was a net exporter of steel. In 1959, however, the United States became a net importer when a 4-month strike cut domestic production and consumers sought alternate sources of supply. In that year, imports accounted for 6 percent of the market, as opposed to less than 3 percent in previous years. While import levels fell somewhat in subsequent years, imports maintained an increased share of the U.S. market.

In 1965, another year of labor contract negotiations, consumers hedged against a possible strike (which did not materialize) by increasing foreign purchases by over 60 percent, to more than 10 million tons (10 percent of the market). These imports, competitively priced and of good quality, gained market acceptance as evidenced by increases in imports in the next 2 years. In the following year of labor contract negotiations, 1968, imports increased by 57 percent and accounted for 17 percent of the market despite the fact that no strike occurred.

After an increase in imports during the 1971 contract year, steel management and labor worked out an experimental negotiation agreement (ENA) in 1973 which eliminated the threat of a general strike with binding arbitration in the event of negotiating difficulties. While the ENA may have helped reduce the tendency toward increased imports in contract negotiation years, imports have continued to make inroads in the U.S. market as is evident by the record 21.8 percent market share achieved in 1982.

Japan has been the single largest source of U.S. steel imports for over a decade. Accounting for less than 10 percent of imports in the early 1950's, Japanese imports grew in importance to represent an average of 36 percent of total U.S. steel imports during the 1960's. Penetration grew during the 1970's, when Japanese imports accounted for over 40 percent of total imports. Growth came to a halt in the latter part of the 1970's as domestic steel trade problems developed (addressed in the following section), which resulted in the implementation of the trigger-price mechanism in 1978. Japanese steel imports fell that year, both on a quantitative basis and relative to total imports, to 6.5 million tons, representing a 17-percent decline from that of 1977. Imports in 1978 accounted for 31 percent of total steel imports, versus 41 percent in 1977. With respect to market share, Japanese steel imports increased their share of U.S. consumption from less than 1 percent in the 1950's to an average of about 6 percent during 1978-82.

The composition of Japanese steel imports has shifted over the past two decades. In earlier years, imports were primarily the simpler steel products, such as bars and rods. As the Japanese steel industry developed, however, the composition changed to higher value sheet and strip, and pipe and tube products.

Conditions of competition in the U.S. market

Service, reliability, product quality, and price are four relatively important competitive factors in the steel market. During the 1960's, the Japanese were able to establish themselves in the U.S. market as reliable suppliers of quality steel products at competitive prices. Various explanations have been advanced as to how penetration was achieved. Some steel analysts have alluded to the growing competitiveness of the Japanese steel industry over the past several decades, during which time large-scale steel plants were constructed at coastal sites during the 1960's. Plant location facilitated both low transportation costs of raw materials into Japan and the shipment of finished products to foreign markets. Adding to this competitive advantage was access to substantial quantities of newly developed high-grade-iron ore reserves in Australia.

Other analysts have contended that Japanese steel was discounted in the U.S. market in the 1960's at price levels designed to gain market share. The discounted prices are alleged to have been below both Japanese domestic prices and the full cost of production. The Japanese export strategy is believed to have been based on the principle of reducing average production costs by increasing the volume of sales.

During the past several decades, a number of actions were taken in the trade area which affected the conditions of competition in the United States. In 1968, certain European countries and Japan agreed to voluntary restraints (VRA's) on steel exports to the United States for a 3-year period beginning January 1, 1969. The VRA's were agreed to and subsequently extended, in modified form, through 1974. In 1976, quotas were imposed on specialty steel imports (i.e., stainless and alloy tool steel) for a 3-year period which was subsequently extended to early 1980. In 1978, in response to trade problems in steel, the U.S. Government established the trigger-price mechanism (TPM) to monitor the price of steel imports (not including specialty steel) for possible violations of U.S. antidumping laws. The TPM was suspended in March 1980, reinstated in October 1980, and suspended a second time in January 1982 when steel companies filed antidumping and countervailing duty petitions. Specialty steel imports were again subject to quotas or increased tariffs for a 4-year period starting in mid-1983, as a result of import relief granted by the President under section 201 of the Trade Act of 1974.

Comparative analysis prepared by World Steel Dynamics (July 1983) indicates that the Japanese have enjoyed a cost advantage over U.S. producers during the past decade. This cost advantage has fluctuated due to a number of factors, including varying operating rates in the two industries and changes in exchange rates. The following tabulation compares costs in the two industries at both a standard operating rate (SOR) of 90 percent and actual operating rates during 1973-82 (per ton):

Year	Standard operating rate		Actual operating rate	
	United States	Japan	United States	Japan
1973	$199	$171	$194	$167
1974	245	210	243	210
1975	287	240	300	251
1976	306	250	314	266
1977	332	275	342	308
1978	356	325	359	378
1979	399	312	401	352
1980	448	348	473	395
1981	488	384	507	451
1982	523	369	623	431

Of the $154 difference in 1982 costs (at SOR), $117 reflects lower labor costs, a function of higher Japanese productivity (approximately 16 percent higher in 1982) and lower wage rates. The yen, it should be noted, was at a 5-year low versus the dollar in 1982 (249Y/$ in 1982, compared with 221Y/$ in 1981).

International markets

The major markets for steel over the past three decades have been in Europe (East and West), North America, and Japan. As presented in table 46, these areas accounted for about 90 percent of consumption from 1955-1965. By 1970, the share of these areas had fallen to about 80 percent, as areas such as Latin American and Asia (excluding Japan) increased their steel use. Consumption of steel by the principal consuming countries has remained at the 80 percent level during the 1970's with slight annual variation.

Table 46.--Apparent world steel consumption, 1/ by region, 1955-82

Region	1955	1960	1965	1970	1978	1982 2/
	1,000 short tons					
Western Europe	63,911	96,716	126,952	167,373	146,075	135,500
Eastern Europe	80,468	106,603	129,752	174,185	234,094	221,800
North America	118,387	105,027	154,212	151,643	176,334	104,800
Latin America	7,727	9,623	13,746	20,139	36,418	35,600
Africa	4,232	4,828	7,584	9,987	14,988	16,400
Middle East	1,884	2,524	3,451	5,489	17,004	17,100
Asia	17,681	50,430	61,310	107,091	156,804	167,500
Oceania	3,869	5,092	7,407	8,245	6,696	7,000
Total	298,159	380,843	504,414	644,152	788,413	705,700

1/ Crude steel equivalent.
2/ Estimate.

Source: International Iron & Steel Institute, Commission on Economic Studies," Projection on Economic Studies," March 1972 and IISI, Steel Statistical Yearbook, 1982.

On a country basis, the largest markets in recent years have been the U.S.S.R., the United States, and Japan. Two other country markets, West Germany and the Peoples' Republic of China, although not as large as the first three, have also been large steel consuming countries. 1/

In terms of the volume of steel traded, exports, as a percent of world steel production, have increased over the past three decades from 10 to 15 percent during the 1950's, from 15 to 20 percent in the 1960's, and from 20 to 25 percent in the 1970's. Japan's share of world steel exports over the period increased from about 1 percent in the 1950's, to an average of about 22 percent during 1977-81. In contrast, the share of U.S. steel exports in the world total fell from an average of about 15 percent in the first half of the 1950's, to less than 2 percent during 1977-81.

1/ IISI, Steel Statistical Yearbook, 1982.

U.S. exports

Exports have accounted for 3 to 4 percent of domestic steel industry shipments over the past three decades. Canada has traditionally been the largest foreign market; products exported there basically complement Canadian production in certain product areas. In recent years, Mexico has also been a major foreign market with trade there resulting in part from the country's proximity to the United States.

During the 1950's and the first half of the 1960's, exports were assisted substantially by a Government program managed by the U.S. Agency for International Development (AID). Under the program, U.S. foreign aid to developing countries was given to encourage structural development in the countries. Whereas the importance of AID in steel exports has diminished since the mid-1960's, possibly due to relatively high U.S. prices, greater involvement in these markets by other competitors, and the growing competitive status of steel industries in certain developing countries, AID continues to be a factor in U.S. export sales.

Industry sources indicate that about one-third of steel exports can be characterized as "continuity" sales, whereby foreign companies with U.S. ties or U.S. ownership purchase steel for their foreign plants. The balance is more on the line of "opportunistic" sales. In 1969-70, for example, U.S. producers exported significant quantities of semi-finished steel to Europe and other areas in light of shortages. Also, in the 1960's and 1970's, certain domestic producers were suppliers of steel used in the construction of Mexican railroads. In recent years, mini-mills (i.e., nonintegrated steel producers) have developed export markets for certain products such as wire rod. The strength of the dollar in 1982, however, was probably an important factor in these exports falling 88 percent from that of 1980.

Japanese exports

Throughout the past three decades, Japanese shipments to foreign markets have risen faster than shipments to domestic markets. In 1955, exports accounted for 25 percent of production, versus 31 percent in 1965 and 35 percent in 1975. By 1981, however, the export share had dropped to 31 percent, reflecting increased competition from developing countries and unsettled conditions in world trade.

During the 1950's, Japan's largest export markets were in Asian countries. In 1955, the Far East received 46 percent of Japanese steel exports of 2.0 million tons, followed by Latin America with 31 percent. The United States received only 2 percent of Japanese iron and steel exports that year. By 1965, the U.S. share of Japanese exports had risen to 42 percent of the 10.7 million tons of exports; the Far East's share had fallen to 26 percent and Latin America had declined to 8 percent.

In 1975, the Middle East had become an important Japanese export market, accounting for a 16-percent share of Japan's exports of 31.9 million tons. This development led to a decline in the U.S. share of Japanese exports to 18 percent, whereas the Far East's share increased to 30 percent. During the 1970's, China and the U.S.S.R. emerged as major country export markets. By 1981, the percentage of Japanese steel shipped to the Far East reached 40 percent of the 31.4 million tons exported; the U.S. market accounted for 21 percent of Japanese steel exports and the U.S.S.R. accounted for 7 percent.

Conditions of competition in international markets

There are several reasons underlying Japan's success in international markets. First, Japanese steel industry capacity is of recent vintage and strategically located at coastal ports to facilitate low-cost transportation of steel exports worldwide. Second, the Japanese steel industry has for decades enjoyed a labor cost advantage over the United States and has developed an advantage in certain raw material costs. Third, the Japanese steel industry has developed a presence, through trading companies, in numerous countries to facilitate sales. In contrast, the U.S. steel industry does not compete on a large scale with the Japanese in international markets, as the industry has developed primarily to meet the needs of the U.S. market. Facilities are, with few exceptions, located inland close to major consuming regions, making transportation costs a formidable barrier to exports.

While Japan competes in international markets successfully, it faces increased competition from developing countries, such as Brazil, Taiwan and the Republic of Korea. These countries compete effectively both in the international and Japanese domestic markets. For example, Japanese imports of LDC steel have risen from approximately 300,000 tons per year in the first part of the 1970's, to over 2 million tons in 1982.

Table 47.--Iron and Steel Mill Products: U.S. and Japanese exports to world markets, specified years 1954 to 1981

Year	U.S. exports		Japanese exports	
	Quantity	Value 1/ 2/	Quantity	Value 1/ 2/
	1,000 metric tons	1,000 dollars	1,000 metric tons	1,000 dollars
1954	2540.5	433,128	1109.2	154,830
1958	2675.7	527,500	1547.8	223,070
1963	1951.8	477,142	5282.5	691,414
1967	1548.4	476,976	8707.0	1,263,871
1972	2631.2	578,469	20,922.0	3,544,321
1977	1857.1	1,240,854	33,627.9	10,377,780
1981	2736.2	2,611,758	28,455.4	16,423,257

1/ Value does not include wheels, tires and axles.

2/ Value for 1954 and 1958 are estimates from Department of Commerce statistics.

Source: Compiled from official statistics of the United Nations 1963-1981; U.S. Department of Commerce 1954 and 1958.

Machine Tools

Description and uses

Metalworking machine tools are machines used for shaping or surface-working metals. These machine tools are generally classified as one of two types--metal-removing or metal-cutting, and metal-forming. Metal-removing machine tools are those that "shape or surface-work metal by removing metal either in the form of chips, dust, swarf, or similar forms or by spark-erosion, ultrasonic, electrolytic, or other chipless methods." 1/ Examples of such tools include machines for boring, drilling, gear cutting and finishing, grinding (special-purpose, surface, and tool and cutter grinding), polishing, lapping, honing, milling, planing, shaping, slotting, broaching, sawing, filing, turning, threading, and for multiple functions (machining centers). In contrast, metal-forming machine tools are "metal-working machine tools other than metal-removing (metal-cutting) machine tools." 2/ Examples of metal-forming machine tools include machines for punching, pressing, shearing, bending, forging, forming, and other special tasks.

U.S. industry profile

Major U.S. consumers of machine tools are manufacturers of transportation equipment--especially the automobile and aircraft industries. U.S. automobile and aircraft manufacturers, and their suppliers, account for approximately 40 percent of the U.S. market for metalworking machine tools. Other important customers include manufacturers of fabricated metal products, nonelectrical machinery, and electronic or electrical machinery.

Products are sold predominantly through distributors or directly to end users, although a limited number of manufacturers sell their products through agents or by other means. Major purchasers of machine tools tend to buy directly from the producer because of the sophisticated nature of the machine tools and the close working relationship that must be maintained between buyer and seller. Small job shops and other purchasers of metalworking machine tools generally buy from distributors because they are buying standard, "off-the-shelf," machine tools which do not require the engineering changes that typically necessitate a close association between buyer and manufacturer.

The U.S. metalworking machine tool industry has declined both in number of firms and in employment since 1977. In 1982, there were approximately 1,140 establishments producing metalworking machine tools in the United States, representing a 15-percent drop from the 1,343 establishments reported in 1977. In addition to the primary producers, there are a small number of establishments in other industries that manufacture machine tools as secondary products. During 1977-82, there were 19 mergers in the metalworking machine tool industry. The number of mergers increased through 1981, but declined in 1982. The following tabulation shows merger data obtained from the Federal Trade Commission and various editions of the Yearbook on Corporate Mergers, Joint Ventures, and Corporate Policy:

1/ As defined in the Tariff Schedules of the United States Annotated, 1983.

2/ Ibid.

Year	Number of mergers
1977	1
1978	2
1979	2
1980	5
1981	6
1982	3

Four of the 19 mergers involved foreign firms taking over U.S.-owned firms; whereas 1 merger involved a U.S.-owned firm acquiring a foreign firm. There is a consensus among manufacturers and purchasers of metalworking machine tools and industry analysts that mergers, acquisitions, and closings will accelerate in the 1980's. 1/

The average U.S. metalworking machine tool establishment employs 77 people, of which 48 are production workers. The majority of U.S. establishments employ fewer than 20 people, and less than 1 percent of the establishments employ 1,000 or more people. As technological advances are applied to the manufacturing process, fewer skilled machinists will be required to run production equipment. For example, advances in numerical control have made it possible for one skilled machinist to run two or more machine tools where before one machinist was required for each machine tool. The application of new technology in the manufacturing process will probably continue to effect employment levels in the industry.

To the extent that any loss of domestic and/or international market share results from targeting practices, the corresponding absence of each $1 million in production not undertaken by U.S. machine tool manufacturers would translate into an estimated 28 workers displaced in all sectors of the U.S. economy (based on 1982 production/employment relationships), as seen in the following tabulation:

Industry sector	Displaced employment
	Number
Machine tools	16
Other manufacturing	6
All other	6
Total	28

Source: Estimated by the staff of the U.S. International Trade Commission, using the BLS input-output model.

U.S. market

The United States is the largest single market for metalworking machine tools in the world. U.S. consumption increased from $1.0 billion in 1958 to $4.8 billion in 1978 and to $6.0 billion in 1982. Major factors influencing

1/ According to Commission staff interviews with manufacturers and purchasers in Ohio, Illinois, and Michigan, and "Foreign Competition Stirs U.S. Toolmakers," Business Week, Sept. 1, 1980, pp. 68-70.

the dramatic increase in metalworking machine tool consumption in the United States were the retooling of the U.S. automobile industry and the aircraft industry in the 1970's and demand for machine tools by producers of oil and gas equipment. The automobile and aerospace industries were developing new, fuel-efficient motor vehicles and aircraft, while the oilfield machinery industry was trying to satisfy increased worldwide demand for threaded oil well casings and related products.

U.S. shipments

U.S. shipments of metalworking machine tools (including parts) increased from $1.0 billion in 1958 to $2.8 billion in 1967, before decreasing to $1.9 billion in 1972. Shipments increased until 1981; then decreased to $5.5 billion in 1982.

As shown in figure 1, U.S. shipments of metalworking machine tools (reported in millions of 1982 dollars) peaked in 1967, 1975, and 1980 at $5.6 billion, $4.1 billion, and $5.4 billion, respectively. Low points in shipments occurred in 1971 and 1976. In 1982, U.S. shipments were valued at $3.7 billion. Industry sources predict 1983 shipments will be approximately 30 percent less than 1982 shipments. 1/

U.S. imports

U.S. imports of metalworking machine tools and parts from Japan increased significantly after 1958, when imports were valued at only $43,000. By 1967, the value of imports had increased to $26.6 million. After declining in the early 1970's, they again increased; this time to $116.3 million in 1977. Since then, the value of imports has continued to increase until 1981. However, in 1982, the value of imports declined once more, to $576.8 million. (As a percent of total imports, U.S. imports from Japan increased from 0.2 percent in 1958 to 42.6 percent in 1981, before declining somewhat to 38.5 percent in 1982.)

U.S. imports of metalworking machine tools, as a percent of consumption, increased from 3.1 percent in 1958 to 24.8 percent in 1982. At the same time, U.S. imports from Japan, as a percent of consumption, increased from less than 0.05 percent in 1958 to 9.6 percent in 1982.

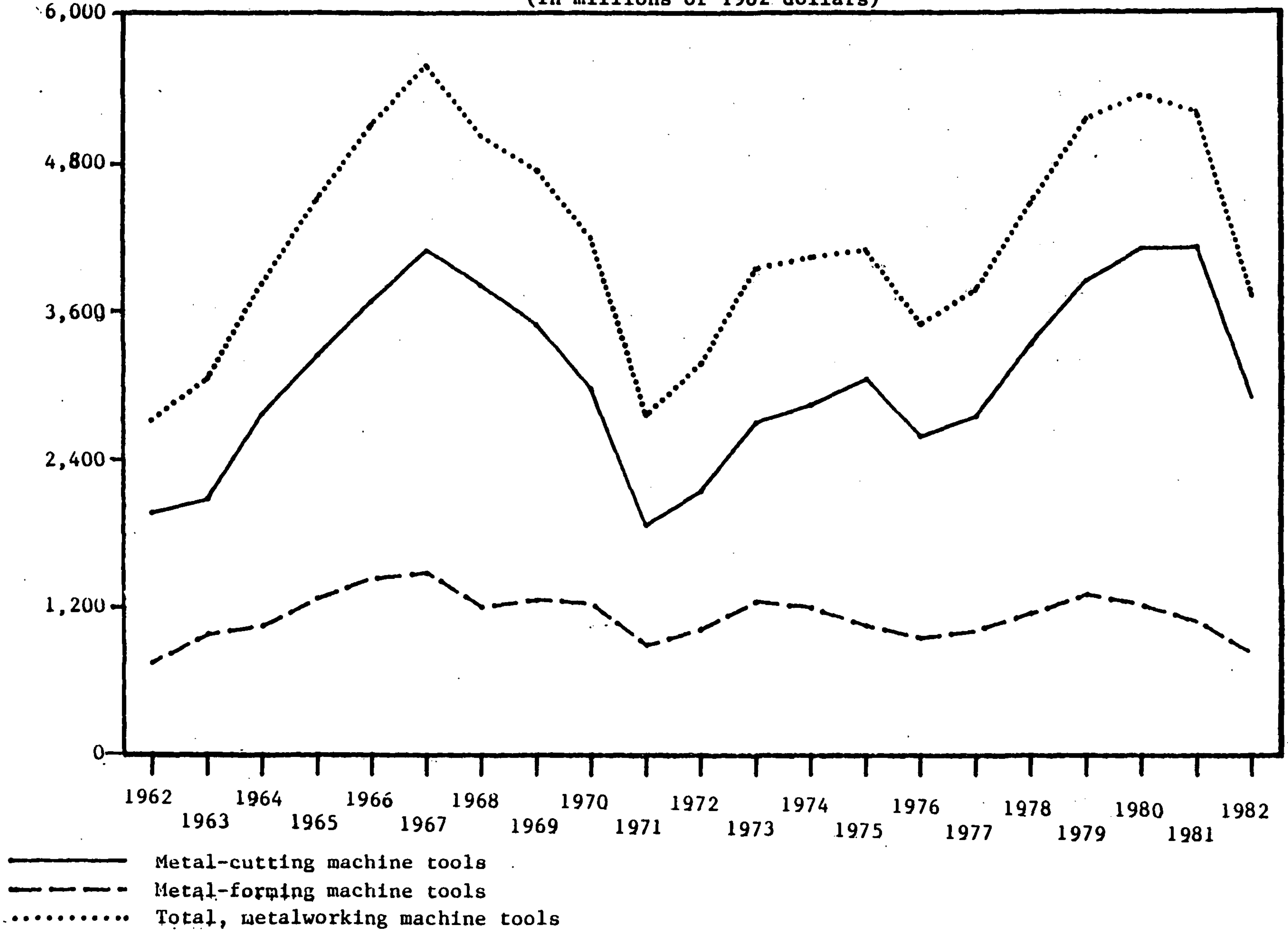
Conditions of competition in the U.S. market

Four factors are important to a company's ability to compete effectively in the machine tool industry--(1) labor cost (wages); (2) availability of capital; (3) technological knowhow and design ability; and (4) in the case of certain types of machines, low sales price. Wages paid to production workers in the United States are estimated to be higher than those earned in Japan. 2/ Wages paid to production workers in Japan, on average, amount to two thirds of

1/ U.S. Department of Commerce, U.S. Industrial Outlook, 1983.
2/ U.S. Department of Labor, Bureau of Labor Statistics.

Figure 1.--Metalworking machine tools: U.S. shipments, 1962-82.

(In millions of 1982 dollars)



Source: Current Industrial Reports, Metalworking Machinery, U.S. Department of Commerce.

those paid to the American counterpart. 1/ These wage differences may be a significant factor when considering manufacturing costs in the United States vis-a-vis Japan. Because of the cyclical nature of the industry, due principally to the instability of the market, sources of financing are critical for survival.

It has been historically difficult for the U.S. machine tool industry to generate capital. Since machine tool companies' profits are generally only on par with those of other manufacturing industries during upswings and are much lower during downturns, and since the majority of U.S. companies are small and privately held, few domestic financial institutions will lend, given the risks involved. (Debt to equity ratios in the U.S. industry are typically below 50 percent.) Therefore, profits earned in good years are generally held as a buffer for the downside of the cycle. In contrast, the Japanese industry has been able to generate capital with relative ease. Japanese firms' debt to equity ratios have been reported to range from 150 to 560 percent. 2/ Availability of funds allows Japanese machine tool manufacturers to maintain a highly skilled workforce and invest in plant and equipment, even in times of weak demand.

The emerging technologies of computer-aided-design and computer-aided-manufacture (CAD/CAM) are beginning to play an important role in the competitiveness of machine tool companies. Machine tool builders which now utilize CAD/CAM techniques in their own manufacturing operations are believed to be in a more favorable competitive position than those that do not. However, the diffusion of new technology in the U.S. machine tool industry has generally been slow. 3/ One reason for this may be the difficulty in obtaining capital for U.S. machine tool builders, as compared with foreign machine tool builders.

One barometer of the diffusion of manufacturing technology in the U.S. machine tool industry is the number of NC machine tools in use in machine tool plants. A study by the U.S. Army in 1978 revealed that a sample of 25 percent of all U.S. manufacturing companies with 20 or more production workers, only 4 percent of the machine tools in use were numerically controlled.

According to industry sources, the Japanese and U.S. machine tool producers are on equal ground when considering the technology of flexible manufacturing systems (FMS). Where the Japanese have an advantage is in practical experience in using FMS because there are so many more in operation in Japan than in the United States. This gives the Japanese firms an advantage in terms of the application of FMS, which could prove to be a significant advantage in terms of market penetration. However, product technology of U.S. machine tool producers is generally held to be competitive

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1/ Asian Wall Street Journal Weekly, Jan. 10, 1983, p. 11.

2/ George P. Sutton, "Trip Report on the Technology of Machine Tools in Japan," Visiting Team, Machine Tool Task Force (Lawrence Livermore, National Laboratory, February 1980).

3/ The Competitive Status of the U.S. Machine Tool Industry, National Academy Press, Washington, D.C., 1983, p. 25.

internationally. 1/ For certain products, the United States has superior technology because U.S. producers have concentrated on their development. These products include large sophisticated NC machine tools for use in the production of aircraft, military equipment, and other specialized products. Foreign producers, for the most part, do not currently compete in these product lines. 2/

In a 1982 survey, U.S. purchasers of both U.S.-made and foreign-made machine tools were asked to rate producers regarding the engineering of their products. 3/ Purchasers rated U.S. producers only slightly higher than Japanese producers. 4/ Thus, it appeared that U.S. producers have a slight overall edge in product technology over their foreign competitors, at least in the U.S. market. However, when the machine tool categories were broken down into types of machine tools used, U.S. products were rated first and Japanese products second in the metal-cutting category, and vice versa in the metal-forming category.

Generally, Japanese standard-type machine tools are priced lower than comparable American-made machine tools. Additionally, Japanese prices for specialized machine tools are often priced lower than specialized U.S machines. However, some U.S. producers are starting to produce certain types of machine tools for markets they have previously neglected. These machine tools are standard, instead of custom, products and will be price competitive with foreign-made products. Despite these recent developments, U.S. machine tool producers still claim that sales have been lost to Japanese competitors due principally to price.

International market

Apparent world consumption of metalworking machine tools by the 10 largest consuming countries increased dramatically to $19.1 billion in 1981, or by 193 percent, from the $9.9 billion consumed in 1977 (fig. 2). Consumption by these 10 countries dropped to $16.3 billion in 1982. During 1978-82, the United States was the largest consumer of machine tools. But, Japan's consumption growth was the most significant of the 10 largest consuming countries. In fact, during 1977-81, Japan increased its consumption of machine tools more than 200 percent. In 1982, the four largest machine-tool-consuming countries were the United States, the Soviet Union, Japan, and West Germany, which together accounted for 50 percent of the total consumed by the 10 major countries.

1/ Ibid, p. 67.

2/ Industry Week, Aug. 9, 1982, p. 47, and American Machinist, Sept. 1979, p. 117.

3/ Hitchcock Marketing and Research Services, Three Views of Machine Tool Marketing, December 1982.

4/ Ibid.

The demand for machine tools increased during 1977-81 primarily because of the retooling that was occurring in the automotive, aircraft, defense, and oil and gas equipment industries. In 1982, with a world oil glut, and with the major purchasing industries essentially retooled, the world experienced a decline in consumption.

U.S. exports

The major markets for U.S. exports of metalworking machine tools and parts have shifted during 1963-81. In 1963, Japan was the major U.S. export market, accounting for $25.4 million, or 13 percent, of total U.S. exports. In 1967, 1972, and 1977 Canada was the leading export market. In 1981, Mexico was the principal U.S. export market, accounting for $261.3 million, or 25 percent of U.S. exports. Other important markets for U.S.-made machine tools and parts during 1963-81 were the United Kingdom, West Germany, France, Brazil, and Australia.

Japanese exports

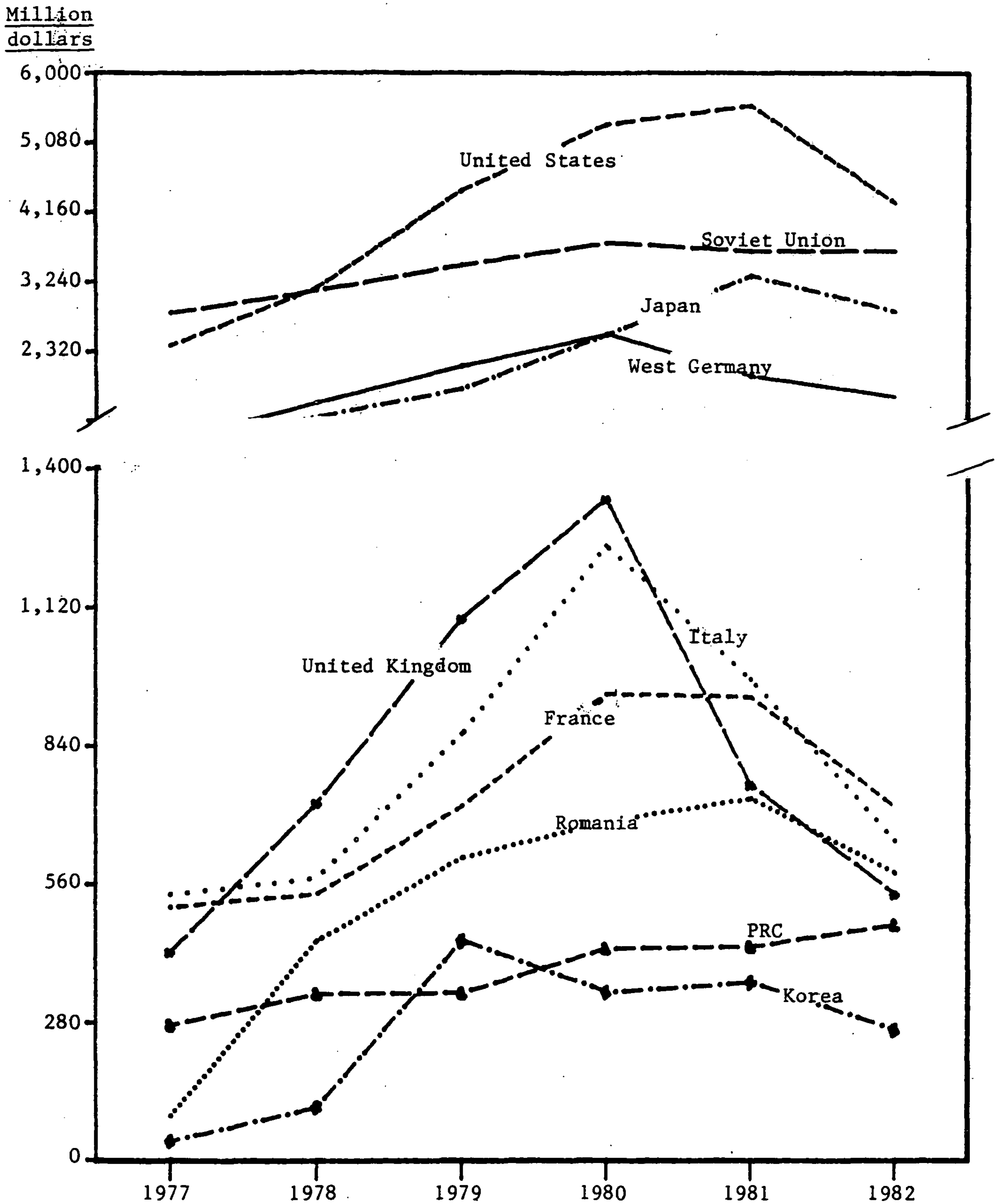
Japanese exports of metalworking machine tools and parts to the major world consuming nations have increased dramatically since 1963, the earliest year for which data are available. In 1963, total Japanese exports were $16.9 million. In 1981, these exports reached $1.7 billion, an increase of nearly 10,000 percent over that of 1963. From 1977 to the present, Japan has ranked as the second major exporting country of metalworking machine tools and parts, surpassed only by West Germany. Major markets for Japanese exports are the United States, West Germany, developing Asian countries, Australia, and the U.S.S.R. The United States was the major market for Japanese machine tools and parts in 1967, but slipped to the second major export market for Japan in 1972 and 1977. In 1981, the U.S. market accounted for $752 million, or 44.6 percent, of total Japanese exports. The next largest market in 1981, West Germany, accounted for $94 million, or 5.6 percent. Japan's share of total world exports increased from 9.5 percent in 1977 to 13.4 percent in 1982. 1/

Conditions of competition in international markets

Standard-type Japanese metalworking machine tools, such as NC lathes and machining centers, are generally more price competitive in overseas markets than comparable U.S.-made machine tools. The Japanese have developed economies of scale to enable them to sell their machine tools for a low price. The Asian market price of machine tools is somewhat lower than the U.S. price. In addition, Japanese-made standard-type machine tools in the European market generally are priced lower than their U.S-made counterparts. However, a number of U.S. producers have European subsidiaries, licensing agreements, or joint ventures with European manufacturers, enabling them to keep their standard-type machines price-competitive with those typically offered by the Japanese.

1/ Data from American Machinist.

Figure 2 .--Metalworking machine tools: Major coutries' consumption, by values, 1977-82.



Source: American Machinist.

U.S.-made specialized machine tools used in the automobile and aircraft industries generally are considered superior to the comparable Japanese-made machine tools. The price of specialized machines is not such a critical competitive factor; the technology and quality of the product is more important. In these areas, U.S. manufacturers with superior technology are competitive internationally.

Like their U.S. counterparts, Japanese manufacturers have established subsidiaries, joint ventures, and have arranged licensing agreements with firms in a number of countries. Both U.S. and Japanese builders can serve international markets through subsidiaries and distributor networks. Industry sources report that U.S. service capabilities and performance in foreign markets are comparable to Japanese efforts. In some instances reciprocal serving contracts are established--U.S. producers or subsidiaries service Japanese-made machine tools in return for like service in Japan. However, this type of arrangement is usually at the discretion of the purchaser and occurs only when the situation calls for the most expedient service.

The Japanese share of total world exports increased during the period 1963-82, and most significantly in the period 1977-82. This increase was mostly at the expense of West Germany, East Germany, Switzerland, and France. U.S. industry exports, as a percent of total world exports, declined slightly during 1963-82, but not to the same extent as in the previously named countries.

Noncellulosic (Synthetic) Fibers

Description and uses

Noncellulosic (synthetic) fibers are produced as long, fine, individual continuous filaments from petrochemical derivatives. They are converted into usable textile products either by cutting into short fibers (usually 1 to 4 inches in length) or by direct insertion of the continuous filaments into various textile manufacturing processes. 1/ Noncellulosic fibers are of four major types: polyester, nylon (including polyamide 2/ and aramid 3/ types), acrylic, and olefin (polypropylene and polyethylene). Polyester and nylon are the most important types and accounted for 49 percent and 31 percent, respectively, of the 6.4 billion pounds of noncellulosic fibers produced in the United States in 1982.

Noncellulosic fibers are used in numerous consumer and industrial applications. Polyester fibers are commonly employed in apparel, homefurnishings, and industrial products such as tires and machinery belts. Also, nylon fibers are used extensively in hosiery and carpets, and acrylic fibers are used predominantly in sweaters, blankets, and socks. In addition, olefin fibers, especially the polypropylene type, are of significant importance in the manufacture of carpets, homefurnishings, and baler twine.

U.S. industry profile

The typical end user of noncellulosic fibers is the consumer who purchases these products from retail stores in the form of apparel and homefurnishings. Another important end user is the industrial consumer who uses noncellulosic fibers in the manufacture of such products as filtration goods, conveyor belting, liquid- and air-carrying hoses, electrical wire insulation, and reinforced plastic components for liquid-holding tanks, containers, and construction materials.

The chief intermediate consumers of fibers manufactured by the noncellulosic fiber producers are manufacturers of textiles and apparel, and manufacturers who use these fibers in the production of industrial goods. Approximately 1,000 firms purchase fibers; many of them are primarily engaged in producing and processing yarn, the major intermediate product manufactured from fibers. Few products made by noncellulosic fiber producers are sold directly to the resident consumer.

1/ The short filaments or fibers are spun into yarn used in the same way as cotton and wool. Much of the continuous noncellulosic filaments is also textured by special machinery before being used mainly for knit or woven fabrics. "Texturizing" gives continuous filaments bulk, a more natural feel, stretch, and greater comfort qualities.

2/ Polyamide is the generic term for nylon fibers in many countries outside the United States.

3/ Aramid is a nylon or polyamide fiber given separate treatment under the Textile Fiber Products Identification Act in the United States because of its variation in fiber properties when compared with other nylon fibers.

The United States is the world's largest producer of noncellulosic fibers, accounting for about one-fourth of world production in 1982, followed by the European Community, with one-fifth of the total. The domestic industry consists of nearly 80 firms, many of which are large, publicly owned companies. 1/ Four firms account for about three-fourths of U.S. production of noncellulosic fibers which took place in 148 plants in 1982, down from 166 plants in 1977. Most of the plants are located in the Southern States.

The growth that characterized the U.S. noncellulosic fiber industry during the 1970's came to a halt in the 1980's, as stagnant textile consumption, and more recently, weak economic activity both here and abroad reduced demand for fibers. U.S. production of all noncellulosic fibers, after more than doubling during the 1970's to a record 8.4 billion pounds in 1979, declined somewhat in 1980 and 1981, and then decreased significantly in 1982, as shown in the following tabulation:

Item	1978	1979	1980	1981	1982
Production--------------million pounds--	7,768	8,418	7,874	7,982	6,449
Capacity--------------------------do----	9,571	9,804	9,647	9,716	9,364
Capacity utilization-----------percent--	81	86	82	82	69

As a result, the industry's capacity utilization rate in 1982 fell to 69 percent from more than 80 percent during 1978-81 and the lowest since 1970. In addition, production capacity, which expanded annually during the 1970's to 9.8 billion pounds in 1979, contracted somewhat during the 1980's.

Employment in noncellulosic fibers generally corresponded to production trends, peaking in 1977, and then declining significantly during 1980's, as shown in the following tabulation:

Year	Number of employees	Hourly wages
1977----------------------	74,000	$5.83
1978----------------------	72,400	6.42
1979----------------------	70,800	7.00
1980----------------------	65,300	7.74
1981----------------------	58,000	8.53
1982----------------------	54,700	9.10

1/ Some of the larger firms produce a broad range of products from petrochemicals other than fibers for textile use. The share contributed by textile fibers to the total sales of each of these companies varies and ranges from 15 to 60 percent.

Hourly wages of production workers in the manmade fiber industry are relatively high, averaging $9.10 compared with $8.40 for all manufacturing.

Noncellulosic fiber production is capital intensive relative to other manufacturing industries. During 1977-81, payroll accounted for 33 percent of the value added in this industry, compared with 44 percent for all manufacturing. In addition, annual capital expenditures averaged $4,600 per employee, compared with $2,900 for all manufacturing. Producers expected the consumption of manmade fibers to continue to grow and, as a result, increased capital expenditures even into 1980. Capital expenditures in the noncellulosic fiber industry increased 48 percent during 1977-80, totaling $503 million in 1980. Because of soft markets and excess production capacity, producers restricted capital outlays in 1981 and 1982.

To the extent that any loss of domestic and/or international market share results from targeting practices, the corresponding absence of each $1 million in production not undertaken by U.S. synthetic fiber manufacturers would translate into an estimated 24 workers displaced in all sectors of the U.S. economy, according to the staff of the U.S. International Trade Commission, using the BLS input-output model, (based on 1982 production/employment relationships), as seen in the following tabulation:

Industry sector	Displaced employment
	Number
Noncellulosic fibers	9
Other manufacturing	6
All other	9
Total	24

Japanese industry profile

Japan's production of noncellulosic fibers was only 0.1 billion pounds in 1958, but increased consistently in the following years to reach over 1.0 billion pounds by 1966. Production doubled to 2.3 billion pounds by 1972, however, the rate of increase slowed in the following years with production reaching 2.8 billion pounds in 1977 and about 3.0 billion pounds in 1982. Production capacity has remained constant from 1981 at 3.5 billion pounds. In 1982, there were less than 20 Japanese firms, down from approximately 35 in 1972. Most production in 1982, as in 1972, was accounted for by less than a dozen firms.

Japanese noncellulosic fiber production is used chiefly in the apparel industry, although significant quantities are also consumed by homefurnishing and industrial manufacturers. Principally, noncellulosic fiber production in Japan is converted into yarn by manufacturers other than the fiber producers. Afterwards, the yarn mills distribute the yarn to the fabric apparel mill, and to the homefurnishing and industrial manufacturers. As in the United States, the Japanese noncellulosic fiber producing process is highly automated and requires both unskilled labor and some well-educated operating engineers.

U.S. market

In addition to general economic conditions, the demand for noncellulosic fibers in the U.S. market is dependent on three basic factors: price, promotion, and technological improvements. Prices of noncellulosic fibers have been more stable than cotton in the last decade; their pricing stability has caused many consumers to shift from natural fibers which have shown greater variation in price. Promotion of noncellulosic fibers, especially by the fiber producers, has made the consumer more aware of the benefits of nylon and polyester. Because a fiber producer will provide much of the advertising for his customers, industrial consumers have been encouraged to use more of these fibers. Technological improvements that strengthen the demand for noncellulosic fibers include the ability to produce textured yarns (a process which makes noncellulosic fibers more like cotton or wool), the automated process of converting continuous filaments directly into short fibers like cotton and wool, improved dyeability, and development of fibers which impart a less shiny appearance in finished products. In addition, government regulations limiting the amount of cotton dust in the air in plants processing cotton have encouraged a shift to manmade fibers.

U.S. shipments

U.S. shipments of noncellulosic fibers were 0.5 billion pounds, valued at $0.7 billion, in 1958, but increased to 2.3 billion pounds, valued at $2.0 billion, in 1967. Shipments continued to rise throughout the next decade, reaching 7.2 billion pounds, valued at $6.4 billion, in 1977; by 1982, they totaled 7.3 billion pounds, valued at an estimated $8.0 billion. Early increases were attributed to (1) prices that exhibited greater stability than cotton prices; (2) a population demanding easier care of their garments; and (3) improvements in durability of products made from these fibers. Later increases in shipments were principally attributed to both the ability of noncellulosic fibers to be tailored for specific uses and their special characteristics. These special characteristics include the fact that (1) they can be blended with virtually all other textile fibers; (2) they can be molded or shaped into desired forms with application of high temperatures; (3) they are able to withstand surface wear and rubbing; (4) they are relatively nonabsorbent; (5) the fibers spring back when they are crushed; (6) they are strong; and (7) they are resistant to sunlight, mildew, and moths.

U.S. imports

U.S. imports of noncellulosic fibers were estimated at 4.7 million pounds, valued at $6.1 million, in 1958, then progressively increased throughout the 1960's. In the early 1970's, imports increased, but, in the middle 1970's, decreased to 107.3 million pounds, valued at $100.4 million, in 1977. In 1982, the downward trend continued, though at a reduced pace. U.S. imports in 1982 totaled 95.5 million pounds, valued at $110.7 million. In most years since 1958, imports of noncellulosic fibers have been very small compared with U.S. consumption. They represented the largest share of consumption during the early 1970's, accounting for roughly 4 percent. In this period, U.S. consumption of noncellulosic fibers was increasing rapidly, and U.S. producers were unable to satisfy the domestic market demand. Since 1978, imports accounted for generally less than 2 percent of the annual U.S.

consumption of these fibers. During this period, U.S. demand for noncellulosic fibers was amply supplied by U.S. production which had been increased to meet domestic needs.

Japan was only a moderate supplier of noncellulosic fibers to the U.S. market before the 1970's. In the middle 1970's, however, Japan became an important source for noncellulosic fiber imports. Imports from Japan reached a peak in 1977 when they accounted for almost half (about 51 million pounds) of U.S. imports for that year. Since then Japan's exports of noncellulosic fibers to the United States have diminished, dropping to 24 million pounds, or about one-fourth of U.S. noncellulosic imports in 1982. One should note that at their peak, Japanese imports of noncellulosic fibers accounted for less than 1 percent of U.S. consumption.

Conditions of competition in the U.S. market

U.S. and Japanese noncellulosic fibers are equal in quality and are generally offered in the same varieties for similar end uses. Japan became an important U.S. supplier of noncellulosic fibers in the late 1960's when it was able to supply products at competitive prices. However, when petrochemical prices began to escalate in the middle 1970's, Japan's raw-material costs for noncellulosic fibers also rose since it had no important petroleum deposits of its own. On the other hand, the United States had an adequate supply of petroleum in those years and was able to hold down big increases in noncellulosic fiber prices. Elsewhere prices were rising rapidly, particularly among the petroleum importing countries. In this period of rising raw-material costs, U.S. producers of noncellulosic fibers sufficiently expanded their production capacities so they were able to furnish competitively priced fibers to many of Japan's principal U.S. customers. In the last 2 years Japan has made a slight comeback as an important supplier, furnishing high-quality, special-purpose noncellulosic fibers.

International markets

In 1982, the principal world markets, exclusive of the nonmarket economies, for noncellulosic fibers were the United States, which consumed over 6 billion pounds, Japan, which used over 2 billion pounds, the Republic of Korea, which absorbed 1.2 billion pounds, Taiwan, which consumed about 0.9 billion pounds, and West Germany, which used about 0.7 billion pounds. In all of these countries (with the exception of West Germany) most of the demand is supplied by the domestic industry. All of these major markets (with the exception of West Germany) are relatively small importers of noncellulosic fibers. In West Germany, imports accounted for over one-half of the domestic consumption of these fibers in 1982. On the other hand, Japan exports over one-fourth of its production and West Germany over three-fourths, whereas the United States exports only about one-seventh of its noncellulosic fiber production.

In most foreign countries where noncellulosic fiber consumption is important, the factors affecting such consumption are about the same as in the United States; however, in countries where natural fiber consumption is dominant (such as India, the People's Republic of China, and Brazil) the factors affecting noncellulosic fiber consumption are slightly different, depending more on government policies which in some cases restrict and in others promote manmade fiber consumption, and natural fiber abundance and prices.

The United States and Japan have generally retained their same principal markets for several years. Usually, the United States and Japan do not compete directly in world markets. In 1982, Japan's export markets for noncellulosic fibers were the People's Republic of China, Hong Kong, and Iran. In the same year, the United States was a top supplier in the People's Republic of China, Canada, and Belgium. The two countries did compete directly in China due to the inability of China to produce enough noncellulosic fiber to satisfy demand. The principal factor of competition there was price. In the other nations where U.S. and Japanese exports dominate the market, both countries were eminent because of location, long-standing trade relations, political factors, and lack of domestic facilities in those markets to produce the required types of noncellulosic fibers.

U.S. exports

U.S. exports of noncellulosic fibers were estimated at 19.5 million pounds, valued at $32.0 million, in 1958, then rose quickly in the 1960's. U.S. exports continued to increase significantly throughout the 1970's. In the last few years, mainly because of the People's Republic of China's sudden interest in noncellulosic fibers, U.S. exports rose significantly and in 1982 totaled 729.4 million pounds, valued at $733.6 million.

Traditionally, principal regional U.S. export markets have been North America, Latin America, and the European Community. Chief countries in these groups have been Canada, Argentina, Brazil, Colombia, Belgium, and the United Kingdom. In recent years, exceptionally large shipments have been made to the People's Republic of China ($205.6 million in 1982), Australia ($37.1 million in 1982), and Taiwan ($34.5 million in 1982). Most large U.S. export markets have remained important markets for U.S. producers since the late 1960's; newer markets have been the developing countries which are just beginning to utilize more noncellulosic fibers. The large exports to the People's Republic of China are presently declining as China increases its production capabilities. Of interest is the large U.S. exports of noncellulosic fibers to Japan in 1982. The $24.6 million exported that year were special types of noncellulosic fibers which were not being produced in Japan in sufficient quantities to meet demand.

Japanese exports

The value of Japan's exports of noncellulosic fibers has generally expanded since 1963 when it amounted to only $14.1 million. By 1967, the value of Japanese exports had risen to $123.0 million; then tripled to $360.3 million in 1972. Exports slowed during the late 1970's. In 1980 and 1981 they increased about $100 million annually, reaching $819.9 million in 1981.

Japan's traditional markets include the People's Republic of China, Hong Kong, India, Indonesia, Iran, the Republic of Korea, Pakistan, and the Republic of the Philippines. Other important markets have been Australia, South Africa, and the United States. Many of these markets became noteworthy during the 1970's when the world demand for noncellulosic fibers was expanding at a rapid rate. Japanese exporters serviced most of these growing markets before other suppliers, including the United States, and retained large market shares in the succeeding years through competitive pricing, delivery dependability, knowledge of customer needs, and possibly most important of all, personal supervision in the processing and use of the fibers in the foreign countries.

Japan's largest market in 1981 was the People's Republic of China which imported $233.1 million of noncellulosic fibers. China will likely remain a larger market for Japanese exports of noncellulosic fibers than the United States for a long time because: (1) traditionally, China has been an important Japanese market since the 1960's, whereas the United States is only a recent arrival; (2) the Japanese have set up plants to manufacture noncellulosic fibers and textiles in China and (3) the Japanese are closer in location and in culture to the Chinese than the Americans and more familiar with how to do business with the Chinese.

Conditions of competition in international markets

The United States and Japan have a competitive edge over European and other Asian countries in noncellulosic fibers in international markets because of factors such as productivity and cost-efficient operations, rather than cheap petrochemical feedstocks. Both countries have larger and more modern noncellulosic-fiber producing plants and higher operating ratios relative to capacity. In the years prior to the middle 1970's, the Japanese have had an advantage of lower labor costs relative to U.S. producers; however, this asset became minor when the raw-material costs for producing noncellulosic fibers soared during the late 1970's. The Japanese exporters have a slight advantage in the Far East whereas the United States has a favored position among Occidental countries.

Generally, however, the United States and Japan are close competitors. Both countries have large sophisticated noncellulosic fiber producers familiar with market conditions. Both countries' producers service their customers adequately. Both offer a variety of fibers that appeal to customers. And most important of all, producers in both countries have knowledgeable representatives in these markets.

Semiconductors

Description and uses

Semiconductors are solid-state, crystal devices whose electrical properties are characteristic of materials which are neither conductors nor insulators. These electrical properties in the semiconductor materials (principally silicon) are created through the introduction of small amounts of impurities or dopants. The principal types of semiconductors are transistors and diodes (discrete semiconductors) and integrated circuits.

Semiconductor production involves a complex fabrication process requiring a large investment in plants and equipment. The major steps in production are wafer fabrication (including the fabrication of the raw wafer), assembly, and testing. Wafers are fabricated from high purity silicon slices whose surfaces are etched, implanted, and metallized. The etched patterns (each a semiconductor chip) are produced by using photographic masks whose precise alignment are necessary to deliver close tolerances. These operations are performed in dust-free, clean rooms to avoid device failure through surface contamination. After fabrication of the wafers (which can contain hundreds of unscored integrated circuit or transistor chips) is completed, an initial probe test is performed and defective chips are separated out. The wafers are sectioned and usually exported to developing countries for package assembly, wire bonding, and encapsulation. Although these assembly operations are performed by low-cost labor, a high degree of dexterity is required to produce consistently error-free devices.

The finished semiconductors are returned to the United States for final testing and marketing. Because of this rationalization, developing countries account for a large share of both U.S. imports and exports. However, two of the largest U.S. firms which produce semiconductors for internal consumption have not rationalized production abroad, but instead have automated their final assembly and encapsulation operations in the United States.

U.S. Industry profile

The semiconductor industry is an outgrowth of the point-contact transistor developed at Bell Laboratories in 1948. This discovery was followed by the development of the integrated circuit during the early 1960's. Initial uses of semiconductors were limited to operational amplifiers, logic circuits, and shift resistors which were incorporated into computers and other electronic products displacing vacuum tubes. At present, semiconductors are complex devices containing thousands of components and performing hundreds of electrical functions.

Semiconductors are produced by 112 firms operating about 545 establishments in the United States, with four of these firms accounting for about 60 percent of U.S. shipments. This concentration in the industry remained relatively unchanged during 1978-82, although captive firms became more important as independent semiconductor firms were merged with large end-product producers. Independent semiconductor firms including Intersil, Mostek, Fairchild Semiconductor, and American Microsystems, among others were acquired by large end-product producers during the period. Major semiconductors establishments are located in Texas, New York, and California.

Persons employed in the semiconductor industry represent some of the highest skilled engineers, scientists, and technical personnel found in the U.S. electronics industry. Manufacturing operations including the design and fabrication of masks and the production of wafers and semiconductor products require not only unusual engineering skills, but also a thorough knowledge of complex machines and processes. A high degree of skill is also required for the design of software packages which serve as instructions for product use. Employment in the semiconductor industry increased from an estimated 134,000 persons in 1978 to 197,000 persons in 1982.

To the extent that any loss of domestic and/or international market share results from targeting practices, the corresponding absence of each $1 million in production not undertaken by U.S. electronic component manufacturers would translate into an estimated 38 workers displaced in all sectors of the U.S. economy (based on 1982) production/employment relationships), according to the staff of the U.S. International Trade Commission, using the BLS input-output model, as seen in the following tabulation:

Industry sector	Displaced employment
	(Number)
Electronic components	20
Other manufacturing	8
All other	10
Total	38

U.S. market

The U.S. market for semiconductors includes virtually all domestic producers of electronic end products. Producers of digital computers are the largest market accounting for about 35 percent of domestic semiconductor shipments. Computer producers have accounted for this share of domestic shipments over a period of years even as the market showed a multibillion-dollar expansion. A large share of the computer market is served by vertically integrated computer producers. Following computer producers, producers of consumer and military electronics are the next largest markets, accounting for about 20 percent of domestic shipments. The remainder of the domestic market is accounted for by various end-product producers including producers of communications equipment, process control equipment, and automobiles.

U.S. shipments

U.S. producers' shipments of semiconductors increased from $5.4 billion in 1978 to an estimated $10.4 billion in 1982. During the period, apparent U.S. consumption increased even faster, rising from $5.2 billion to $10.8 billion. Much of the growth in shipments of semiconductors was related to a strong growth in demand for integrated circuits. In 1982, integrated circuits accounted for about 80 percent of the value of total domestic shipments.

More than half of U.S. shipments of semiconductors are transfers (captive shipments) to end-product divisions within the same firm. As a result, marketing and distribution are usually determined by decisions which are related to the production of the end product. Typical distribution problems concerning final price, delivery, and quality are minimized, and the division producing the end product is assured of a controlled source of supply. Captive producers often purchase semiconductors in the open market, however, during periods of strong internal demand. Shipments to the open market (merchant market) on the other hand are largely determined by negotiated contracts with large, original-equipment manufacturers, or by purchases made by independent distributors. Much of the competition from Japanese producers in the United States is found in the merchant market.

U.S. imports

Imports of semiconductors are a growing and important item of trade. During 1978-82, imports increased from $1.7 billion to $4.2 billion, representing an average annual increase of 28 percent. The largest increase occurred in 1980 when imports rose by $898 million. Malaysia was the largest supplier during the 5-year period, accounting for 21 to 26 percent of imports. Singapore, Japan, and the Philippines were also large suppliers, and when combined with Malaysia, accounted for 68 percent of U.S. imports in 1982. About 78 percent of U.S. imports are accounted for by U.S. semiconductor producers which operate assembly plants in developing countries principally in the Far East. As a share of apparent U.S. consumption, imports increased from 26.9 percent in 1978 to an estimated 39.1 percent in 1982.

Imports of semiconductors from Japan showed the largest increase during the period, rising from $139 million in 1978 to $608 million in 1982. As a share of total imports, imports from Japan increased from 7.8 percent to 14.4 percent; as a share of apparent U.S. consumption, imports from Japan increased from 2.7 percent to 5.7 percent. Imports from Japan declined only once during the period falling from $409 million in 1980 to $403 million in 1981.

Conditions of competition in the U.S. market

Although competition from Japanese producers has been directed to the merchant market, such competition is segmented and largely concentrated in the production of memory devices, random access memory (RAM's). RAM's are produced in large quantities and are incorporated into digital computers and other products requiring memory storage. As the demand for these devices increased, Japanese producers gained a reported 70-percent share of the U.S. market for the most advanced devices offered for sale. This significant share of the memory market was gained through product availability and from low prices reportedly resulting from production economies of scale. With the concentration in the production of memory devices, however, Japanese producers have failed to develop the extensive semiconductor product lines offered by large U.S. producers. With the narrower product line, Japanese producers have been less competitive in the production of such specialty devices as microprocessors and microcomputers.

During 1978-80, the quality of the devices produced by Japanese firms may also have played a modest role in the sale of memory devices although some

U.S. producers at that time questioned whether such quality differences existed. Today, there is general agreement in the industry that even if such quality difference did exist, such is no longer the case.

International markets

Principal markets for semiconductors are located in the United States, Japan, and Western Europe where a large share of end products incorporating semiconductors are produced. Developing countries such as Malaysia, Taiwan, and Singapore are also emerging and growing markets. In relative market consumption by region in 1979, North America accounted for about 42 percent of the value of world semiconductor consumption followed by Japan and Europe with 26 and 24 percent, respectively. The rest of the world accounted for the remaining 8 percent.

The U.S.-based industry is characterized by strong technological leadership in all semiconductor markets and, along with its foreign subsidiaries, accounted for more than 60 percent of the value of world semiconductor shipments in 1981. The Japanese-based industry is also characterized by a strong technological base, but one which is more narrowly focused in the production of semiconductors for computer applications and consumer electronics. The Japanese-based industry accounted for 25 to 30 percent of the value of world semiconductor shipments in 1981.

The European industry also has a strong technological base, although the European market is considered 15 distinct geographical markets. This fragmentation of the European market has repeatedly proved a greater problem for individual European producers than for U.S. multinational producers that have served these markets longer. U.S. producers account for a major share of the European markets either through local production or through exports.

U.S. exports

During 1978-82, U.S. exports of semiconductors and parts increased by about 95 percent, rising from $2.0 billion to $3.8 billion. Malaysia, Singapore, and the Philippines accounted for the largest share of exports. These countries reflect the growing level of U.S. exports of chips and wafers (73 percent of the value of U.S. exports in 1981) transferred to plants in these countries for wire bonding, encapsulation, and testing. West Germany is considered the largest export market when exports under items 806.30 and 807.00 are not considered. West Germany is also an entry point into the European Community from which semiconductors can be transshipped to other Community members.

Exports of semiconductors from the United States do not reflect the substantive share of world markets served by U.S.-based semiconductor producers. U.S. producers have made extensive investments in plants and equipment in Western Europe for semiconductor production, and two of the largest U.S. semiconductor producers have established production plants in Japan. Markets in Western Europe and Japan are more easily served by U.S. producers with the establishment of local production plants. Semiconductors produced and sold in Western Europe and Japan reduce the level of U.S. exports to those areas.

Japanese exports

Japanese exports of semiconductors increased from 101 billion yen in 1978 to an estimated 270 billion yen in 1982. 1/ Using a conversion rate of 225 yen to the dollar, exports in dollar terms increased from $449 million to $1.2 billion during the period. In 1980, integrated circuits accounted for about 74 percent of Japanese semiconductor exports.

	Value (Yen (Billions))	Value (Million dollars)
1978	101	449
1979	165	734
1980	246	1,095
1981	2/ 240	1,065
1982	2/ 270	1,200

1/ Estimated by the staff of the U.S. International Trade Commission.
2/ Yen/dollar conversion: 1978-82, 225/1.

Principal markets for Japanese exports in 1978-82 were those located in Asia and North America, principally those in the United States. In 1980, 44 percent of Japanese exports were sent to Asia to support Japanese end-product production in countries such as Taiwan, Hong Kong, and Singapore, and to support end-product production by local firms in those countries. In 1980, North America accounted for about 34 percent of Japanese exports followed by Western Europe with 18 percent. North America and Western Europe offer similar markets for Japanese exports with producers of computers and communications equipment being the largest market.

Conditions of competition in international markets

The principal strengths of U.S. semiconductor firms in international markets are related to an extensive semiconductor product line and a large investment in plants and equipment in Western Europe. During 1978-82, U.S. firms were dominant in international markets for advanced devices such as microprocessors and microcomputers; Japanese producers were more segmented, producing semiconductor devices for consumer electronics and memory devices for computers. U.S. firms were also dominant in the European market during the period largely as a result of producing semiconductors locally both to avoid the Economic Community's 17 percent rate of duty and to serve certain end-product firms which give more favorable consideration to local producers. Since about 1978, in order to become more competitive, Japanese firms began extensive investment in semiconductor plants in Europe, largely in Ireland.

The principal strengths of Japanese firms are related to the production of commodity products such as computer memory devices and to their close relationship with producers of consumer electronics in the Far East. Japanese firms are generally regarded as process-intensive producers, which have the ability to manufacture at low cost, devices which are required in large

1/ Japan Electronics Almanac, 1982, pp. 9, 29.

quantities. By concentrating in these product lines, Japanese firms have been strong international competitors and have increased their market share for these products. In the Far East, numerous end-product producers provide markets for Japanese firms as a result of technology transfer and license and joint-venture agreements entered into with Japanese end-product producers. These agreements were largely entered into with Japanese firms producing consumer electronic products.

Telecommunications Apparatus

Description and uses

In the United States the manufacturers of "telecommunications apparatus" 1/ comprise a number of separate, distinct and nonhomogeneous industries. Although a common thread connecting the industries might be the electrical and electronic nature of the products manufactured, the industries themselves have little else in common. The industries which comprise the telecommunications group include: 2/

- o Telephone and telegraph apparatus,
- o Commercial radio and television apparatus; radar, navigation search, and detection apparatus, and
- o Consumer audio, radio, and television apparatus.

Due to the distinct character of each of the industries, and for purposes of presentation, the following discussion will be separated into three industry groupings based on the four digit SIC numbers under which most of the industries are classified--telephone and telegraph apparatus, radio and television communication equipment, and radio and television receiving sets.

Telephone and telegraph apparatus, (SIC No. 3661).--The telephone and telegraph apparatus covered in this heading are those electrical and electronic products used to transmit, route, and receive information principally by wire. 3/ The information may be forwarded by means of analog or coded signals. The coded signals may be telegraph, teletype, or most recently, digital in format. Telephone and telegraph equipment includes, but is not limited to, the ubiquitous telephone set (instrument), teletypewriters, switching equipment (both central office and private), and wire transmission and reception apparatus. Special-purpose business machines used for billing and accounting of toll fees are also included. However, products not covered by this heading include such items as radio links (both land and satellite), 4/ tape recorders used as telephone answering devices, telephone poles, cable and wire, hardware, or individual components such as transistors, resistors or capacitors.

Radio and TV communications equipment, (SIC No. 3662).--This group of industries principally produces commercial and military electronics products. The major industrial subheadings under SIC No. 3662 are:

1/ Group 724, Standard International Trade Classification, Revised.

2/ Not included in telecommunications, SITC group 724, are the industries which produce computers, calculators, and other automatic data processing machines, the industry producing magnetic tape recorders and tape players; or the industry producing components such as resistors, capacitors, wire, coils, or semiconductor products.

3/ The distinction between wire transmission and radio transmission apparatus is sometimes imprecise, since electronic apparatus can be used for either wire or radio transmission or reception.

4/ Included with "Radio and television communication equipment, (SIC No. 3622)".

- o Communications systems and equipment, (except broadcast) including microwave and mobile communication equipment,
- o Broadcast, studio, and related electronic equipment,
- o Intercommunication equipment, alarm systems, and traffic control equipment,
- o Search and detection, and navigation and guidance systems and equipment, and
- o Electronic systems and equipment, n.e.c.

Alarm systems, components, and traffic control apparatus are not included in SITC No. 724, and will not be included in the following analysis.

Communications apparatus includes radio communication equipment used for radiotelephonic, radiotelegraphic, and radiobroadcasting transmission and reception and is divided into three categories--radio receiver, radio transceivers, and other radio apparatus and parts. 1/

Radio receivers are designed to receive signals on one or more bands in the radiofrequency spectrum. The commercial entertainment bands, AM and FM, are popular bands found on radio receivers. Many receivers are also able to intercept frequencies in the short-wave frequency range, 1.6 MHz to 30 MHz. Special-purpose receivers can intercept signals on other bands, such as the fire, police, ambulance, aviation, or military bands.

Radio transceivers are combinations of transmitters and receivers, which share electronic components and circuits. Transceivers allow for two-way communication (transmitting and receiving) using a single unit; however, these units operate in only one mode at a time and are not capable of simultaneously receiving and transmitting. Many consumer-type tranceivers are for use in the Citizens Band (CB). They provide short-distance radio communication service for the business or personal activities of licensees. Commercial- and military-grade transceivers are used for land mobile, aviation, public safety, and military communications.

Other radio apparatus includes transmitters, antennas, and parts of radio apparatus. Transmitters emit the radio signals which are intercepted by radio receivers. Transmitters may be used in communications systems where there is one source of intelligence and many, widely dispersed reception sites. An example of such systems is commercial radio transmission wherein many receivers can tune into one radio station.

Antennas are used in both the transmission and reception of radio signals. They act as the transducer between the transmitter or receiver and free space. Since radio communications systems are generally designed to

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1/ Radio communication is the transmission of intelligence through the use of electromagnetic waves propagated through the medium of free space. It is accomplished by impressing sound or coded data onto a radiofrequency electromagnetic wave which is then radiated by a radio transmitter through its antenna. When tuned to the proper frequency, a radio receiver detects this electromagnetic wave, separates the intelligence from the wave, and converts the intelligence back into the original form.

transmit or receive on a limited segment of the radiofrequency spectrum, so are antennas. This allows them to function more efficiently in either transmitting or receiving radio signals.

Radio communication apparatus has many uses due to the almost instantaneous contact between a transmitter and many, widely dispersed receivers without any physical link such as a cable. Some of the more important uses are in commercial radio (AM and FM), public safety (police, fire protection, and ambulance service), transportation (land, sea, and air carriers), and military and space communications.

Also included under this telecommunication heading are special-use military electronics such as electronics countermeasures (ECM) equipment, electronics intelligence and intercept (ELINT) equipment, and sonar equipment.

Radio navigational aids (NAVAIDS) are electronic systems which assist the navigator or surveyor in determining position. Radar is an electronic transmitter and receiver which can determine the distance from its antenna to objects around it. The general applications of NAVAID's are both navigational (in aircraft and ships) and early warning or detection (radar).

This report also includes radio remote control equipment. Such apparatus is used to electrically control the actions of a machine at a distance without interconnecting wires. Certain classes of guided missiles as well as garage door openers use radio remote control apparatus.

Television cameras are used to convert optical images into coded electromagnetic signals for a number of purposes. The electrically coded image may be amplified and transmitted for immediate use, it may be stored, or it may be analyzed. Typically the television camera is used to originate live programs for entertainment broadcasters, as a surveillance monitor, as a teaching aid (also originating live programs), and more recently by consumers as a substitute for motion-picture film cameras.

Commercial television apparatus is covered by SIC No. 3662 and consists of broadcast and studio equipment, transmitting equipment, cable television equipment, and other miscellaneous equipment, including closed-circuit televison systems and video players. Broadcast and studio equipment and transmitting equipment make up the bulk of this group and are used principally in commercial establishments.

Radio and TV receiving sets, SIC No. 3651.--This group of industries generally produces consumer electronics products. In addition to radio and TV receivers, SIC No. 3651 includes consumer high-fidelity components, including audio and video recorders and players (not included in SITC No. 724), stereo compact systems, tuners, amplifiers, receivers, TV chassis and other home-type audio equipment, as well as speakers, including loudspeaker systems and loudspeakers sold separately, microphones, home-type electronic kits, and commercial sound equipment.

Complete television receivers include both color and monochrome receivers which are fully assembled and ready to function when purchased by the consumer. These television receivers range in screen size from about 2 inches for small battery-operated portable units to 25 inches for console televisions and up to 6 feet for projection-type televisions. Consumers use television receivers principally for entertainment either by watching broadcasts directly off the air or by using their sets with newer devices such as video games or video tape recorders. Television receivers may also be used as display units for home computers. Combinations of television receivers and radio receivers, and combinations of TV receivers or radio receivers and other electronic products such as clocks, tape players, or tape recorders are also covered in this SIC grouping.

"Microphones, loudspeakers, and related equipment" consists of microphones, loudspeakers, audiofrequency electric amplifiers, electric sound amplifier sets, headphones, and parts of the foregoing. Microphones convert sound waves into electrical signals which may then be used as an input for sound recording devices or audiofrequency amplifiers. They are used in conjunction with home entertainment tape recorders, professional sound studio recording systems, and public-address systems for live performances. They are also used extensively in industrial applications as sound-sensing devices.

Loudspeakers and headphones convert electrical signals into sound. Loudspeakers are used in consumer entertainment appliances, consumer high-fidelity stereophonic systems, public address or sound re-enforcement systems, musical instrument amplifiers, and automobile radio sets. Head phones are used with consumer audio products, in professional sound studio recording, and in radio and television broadcasting stations.

Audiofrequency electric amplifiers boost weak electric signals from an input source to levels which can drive a loudspeaker or headphone at a useful sound level. Such amplifiers are used with many kinds of consumer audio products, such as radios, high-fidelity stereo equipment, and public-address systems.

Electric sound amplifier sets are principally composed of the foregoing items and are designed to operate together. Amplifier sets are used in public-address and sound reenforcement systems where there is a need to communicate with groups of people in large areas such as auditoriums, airports, railway and bus stations, and sports stadiums.

U.S. industry profile

Telephone and telegraph industry.--The telephone and telegraph apparatus manufacturing industry has existed since the invention of the telephone in the 1880's. The industry is very concentrated; the two largest manufacturers are owned by the two largest operating companies.

Until recently the phone system in the United States was a privately owned, legally franchised monopoly. Recently, there has been a Government directed shift from publicly regulated monopoly to a deregulated, competitive market. In the manufacturing and supplying industry, the four largest U.S. firms have an estimated 85 percent concentration ratio. With the deregulation of the terminal equipment market and the proposed divestiture of the large telephone operating companies there has been a significant increase in imports and in the number of U.S. suppliers of telephone and telegraph apparatus. Until the divestiture is completed, the largest U.S. manufacturer is prohibited from selling on the open market. After the breakup of the parent company, this manufacturer will be free to sell any products in any market, as well as to continue to supply products to it's former affiliates.

It is estimated that the number of establishments supplying telephone and telegraph apparatus has increased from 90 in 1963 to 270 in 1981. Although the largest manufacturer is closing down and consolidating inefficient, older plants in anticipation of a competitive market place, new companies are being established to supply new and innovative products to the deregulated market.

Persons employed in the manufacture of telephone and telegraph apparatus include the most highly skilled engineers and scientists in the world. The manufacturing segment of the industry employs moderately to highly skilled workers with a diminishing use of unskilled labor. In the manufacture of telephone and telegraph products there is some large volume production such as the telephone instrument. Employment is estimated to have risen only moderately from 90,000 persons in 1963 to 148,000 in 1981, or 2.8 percent per year. The efficient use of new manufacturing processes and automation have kept quality high, cost low, and contributed to the moderate increase in employment.

Radio and TV communication industry.--It is estimated that the number of establishments producing commercial electronics products in the United States has increased from 1,100 in 1963 to 2,300 in 1981. The size of the firms engaged vary from multinational conglomerates to the smallest firm producing specialty parts.

Employment is estimated to have increased from 385,000 persons in 1963 to 425,000 in 1981. Skill levels range from scientific and engineering graduate degrees to the moderately skilled technician level. There is little use of unskilled labor in these industries. The products produced are technically complex and are produced in low volume (when compared with consumer electronic products).

Radio and TV receiving sets industry.--These products are purchased for consumption by the general population or consumer. Included are consumer high-fidelity apparatus and audio components, e.g., loudspeakers, radios (clock and regular), automobile radios, radio-phonograph-tape recorder-TV combinations, TV receivers (monochrome and color), and special parts of all of the foregoing. Not included are such products as video and audio tape recorders, since these products are not included in the definition of telecommunications, SITC No. 724. 1/

Prior to and just after World War II, the U.S. radio manufacturers formed a viable and healthy industry. In 1954, there were 84 establishments engaged in the manufacture of radios, of which 53 were specialized at more than 90 percent.

Although television was invented in the United States and tested before World War II, it was not until after the war that final standards were set and commercial, revenue operation commenced. In 1954, there were 59 establishments engaged in the manufacture of TV receivers with 36 of these specialized at more than 90 percent. No dominant producer has emerged, although two U.S. firms have achieved for 20 to 25 percent each of the U.S. market for many years.

1/ Magnetic tape recorders were invented and developed in the United States toward the end of World War II. By 1950, a significant U.S. industry had developed. High-quality reel-to-reel recorders were available for consumer as well as commercial use.

(Continued)

Of the 15 U.S.-owned firms manufacturing television receivers in the United States in 1971, 5 remain under U.S. ownership (two of these are a very small regional manufacturer and a private label manufacturer); 3 were bought by Dutch interests; 5 have gone out of business; and 2 were bought by Japanese firms. In addition, 6 Japanese firms, 2 Taiwan firms, and 1 Korean firm have established TV final asssembly operations in the United States. Only one foreign firm (Japanese) established and operates a picture tube manufacturing plant in the United States.

The remaining industries which make up this sector of the overall telecommunication heading are those which make audio high-fidelity products and loudspeakers. As with radio receivers, there was a viable U.S. industry in high-fidelity products until the invention of the transistor. Today, there are no known producers of consumer audio amplifiers, although there are a few manufacturers of commercial grade and special effects amplifiers and apparatus.

Employment is estimated to have decreased from 81,300 personss in 1963 to 60,600 in 1981, after having peaked at 116.700 in 1967. The skill level required for the production of consumer electronic products range from semiskilled to skilled.

To the extent that any loss of domestic and/or international market share results from targeting practices, the corresponding absence of each $1 million in production not undertaken by U.S. telecommunication apparatus manufacturers would translate into an estimated 101 workers displaced in all sectors of the U.S. economy (based on 1982 production/employment relationships), according to the staff of the U.S. International Trade Commission, using the BLS input-output model, as seen in the following tabulation:

(Continued)

1/ In 1954 there were 88 establishments (67 of which were 90 percent specialized) manufacturing tape recorders. The value of shipments was $26 million (which is significant when compared with the $41 million of table model radios shipped in the same year).

In the late 1950's, Japan began to export reel-to-reel tape recorders. In the middle 1960's the cartridge tape deck was introduced in Europe and subsequently the cassette recorder in the early 1970's. These newer machines simplified the handling of the magnetic tape and became very popular.

In the United States today there are no manufacturers of consumer audio tape recorders or players. There are several manufacturers of commerical equipment. These producers, however, also make machines for other applications such as scientific data recording and digital data.

In the mid-1950's, the video tape recorder (VTR) was invented and developed in the United States. These machines have revolutionized the television program production industry. No U.S. firms have manufactured a consumer VTR in the United States. Japan began production of consumer VTR's in the mid-1970's and currently dominates the world market. U.S. imports of VTR's amounted to $478 million, $1,000 million, and $1,032 million in 1980, 1981, and 1982, respectively. U.S. firms are not expected to enter this market.

Industry sector	Displaced employment
	Number
Telecommunications	40
Other manufacturing	30
All other	31
Total	101

Japanese industry profile 1/

In the Japanese electronics industry there are approximately 20 major companies doing business in excess of $500 million per year. Some large companies produce electronics products exclusively but most are members of large conglomerates. It is reported that most companies are leveraged from 75 to 85 percent. All companies have strong ties to banking institutions which participate in corporate policymaking.

The Japanese electronics industry accounted for 21 percent of all production in Japan in 1980. In 1979, there were 13,000 establishments engaged in electronics manufacture and another 13,000 engaged in production of electrical apparatus. The electrical-electronics industry combined accounted for 6 percent of all manufacturing establishments in Japan. In 1979, the electrical and electronics manufacturing industries employed 1.3 million workers, or 12.3 percent of the workforce. Dividing the number of employees by the number of establishments yields the figure of 48 employees per establishment. There are claims that considerable electronics production is done by cottage industry and that lifetime employment by the major companies applies only to a small part of the workforce.

The total output of all manufacturing in Japan in 1980 was 42.2 trillion yen. Of this the electrical and electronics industries accounted for production valued at 13.0 trillion yen.

Research and development in 1979 amounted to 6.3 percent of the value of production in the electronics and electrical industries. The investment in R&D in these industries was equal to 28 percent of all industrial R&D expenditures. According to Japanese sources, the electrical and electronics industries employed 32 percent of the total research work standards and requirements, these companies' R&D costs are lowered. In spite of these figures, Japan has the reputation for purchasing basic research in the form of licenses and joint ventures.

Japan's electrical and electronics industries in 1980 accounted for 32.1 percent of the total value of exports of manufactured goods (except ships). One half of these exports were of consumer-type electronics.

1/ The following information and data covers the entire electronics industry. It is not limited to the SITC No. 724 Telecommunications sector.

The Japanese balance of trade for 1980 is presented in the table 48.

Table 48.--Telecommunications equipment: Japanese imports, exports, and balance of trade, 1980

Item	Imports	Exports	Balance of trade	Ratio of exports to imports
	Million dollars			Percent
United States	744	4,198	3,454	5.64
EC	294	3,768	3,474	12.82
World	2,374	16,222	13,848	6.83

Source: Japanese Ministry of Finance.

For 1980, the United States supplied about 31 percent of Japanese imports of telecommunications products and was the market for 26 percent of Japan's exports of such products. Comparable figures for the EC were 12 percent and 23 percent, respectively. The individual balance of trade figures for the EC and the United States with Japan are virtually identical at 25 percent each of Japan's world trade surplus in telecommunications trade.

U.S. market

The market for telephone and telegraph apparatus, until recently was restricted to telephone and telegraph operating companies. These companies provided complete telephone and telegraph service to the consumer with minor exceptions. The customer premises equipment (CPE) was rented to the consumer for his use. 1/ All other apparatus such as switching and transmission was housed in facilities owned by the operating company. In a short period of time CPE has gone from a closed operating company market to an open consumer market. Although this new market is immature, imports have already made significant penetration. Even the largest of U.S. producers are purchasing imports for their own private label.

Telephone and telegraph switching and transmission equipment primarily is supplied by U.S. manufacturers, particularly by those which are currently the captive suppliers of the operating companies.

The diversity of the products covered under radio and TV communication equipment insures a diversity of markets. These markets have one thing in common--they are, with few exceptions, commercial markets. For instance, radio navigational aid and radar apparatus is sold to the commercial aviation and military markets. A second market segment is for the retrofit of new

1/ In 1968, a landmark court case was decided in favor of allowing customers to attach nontelephone company equipment to that owned by the telephone companies. Individual consumers may now own and connect duly registered telephone apparatus to the public switched network.

equipment to extend the life of older airplanes. A third segment would be for surface-mounted equipment used in ships and airports. These markets rise and fall with the aerospace industry and military budgets.

Communications markets are relatively mature. Commercial radio and television broadcasters are a typical market for studio equipment of all types. Land mobile radio equipment is sold to police and fire departments, utilities, delivery and taxi services, and to the general public. (The new cellular, land mobile, frequency reuse, two way, radio telephone systems are expected to create a large commercial market.) In addition, a market segment has developed for cable television apparatus. This market was principally a rural one 25 years ago. Recently, most of the growth has taken place in suburban and urban areas. This market was relatively small until the urban growth. It is now attracting foreign competitors.

The markets for radio, TV receivers, and high-fidelity audio apparatus are mature consumer markets. It is estimated that over 50 percent of the TV market is for replacements, although there is a strong second-set market. In radios, the cheaper portables and table-top models are now disposable, in that the cost of repair usually is far in excess of the replacement cost. In the case of high-fidelity entertainment equipment, purchasers are always in pursuit of that "better sound." Technical innovations from time to time help to increase sales. For example, the digital audio disc (DAD) 1/ is being introduced by Japanese companies with much fanfare.

U.S. shipments

The data in the following three tabulations are based on the official statistics of the U.S. Department of Commerce. The deflation index used is for manufactured goods and is based on the year 1972.

Telephone and telegraph apparatus.--U.S. producers' shipments increased from $1.5 billion in 1963 to $12.2 billion in 1981, as shown in the following tabulation (in millions of dollars):

Item	1963	1967	1972	1977	1981
Shipments	1,538	2,248	3,974	7,095	12,177
Shipments adjusted for inflation (1972)	1,860	2,581	3,974	5,050	6,150

The deflated measure of output shows nearly than a threefold increase in the 18-year period. The compound annual growth rate based on the constant 1972 dollar value of shipments was 6.9 percent per year.

1/ A phonograph like record on which the music has been digitally encoded.

Radio and TV communication equipment.--U.S. producers' shipments increased from $5.9 billion in 1963 to $25.3 billion in 1981, as shown in the following tabulation (in millions of dollars):

Item	1963	1967	1972	1977	1981
Shipments 1/	5,936	7,302	8,040	13,048	25,299
Shipments 1/adjusted for inflation (1972)	7,177	8,383	8,040	9,287	12,777

1/ The value of shipments may not be completely accurate between 1963 and 1977 since it is believed that classified military electronics was not shown in these figures during the Vietnam conflict.

The deflated measure of output shows that output increased 1-3/4 times during the 18-year period. The compound annual growth rate during this period based on the constant 1972 dollar value of shipments was 3.3 percent per year. This is consistent with the type and maturity of products produced.

Radio and TV receivers.--U.S. producers' shipments increased from $1.9 billion in 1963 to $5.6 million in 1981, as shown in the following tabulation (in millions of dollars):

Item	1963	1967	1972	1977	1981
Shipments	1,853.2	3,316.1	3,465.1	4,584.4	5,634.5
Shipments adjusted for inflation (1972)	2,240.9	3,807.2	3,465.1	3,262.9	2,997.2

As can be seen, the output in constant dollars of the industry which produces radio, televisions, and audio consumer products has been declining since 1967. This is consistent with the demise of the radio industry and the decline in TV and audio manufacture in the United States.

Telecommunications.--Summing all of the values of shipments from the preceding subparagraphs gives the total value of telecommunications product shipments and is shown in the following tabulation (in millions of dollars):

Item	1963	1967	1972	1977	1981
Shipments	9,327	12,866	15,479	24,728	43,110
Shipments adjusted for inflation (1972)	11,278	14,771	15,479	17,600	21,924

Total telecommunications shipments increased from approximately $9.3 billion in 1963 to $43.1 billion in 1981. Using the constant 1972 dollar value of shipments, output of all of the industries included in the telecommunications sector increased 1.9 times between 1963 and 1981. The compound annual growth rate based on the constant dollar value of shipments was 3.8 percent per year.

U.S. imports

The value of imports of telecommunications products increased 87 percent in the period from 1963 to 1981, as shown in table 43. During the same period, the value of imports of telecommunications products from Japan has risen over 55 times, and the value of U.S. shipments has risen almost five fold. The apparent decline in Japan's import market share, as shown in table 44, is discussed in the following subsections.

Telephone and telegraph apparatus.--Imports of telephone and telegraph apparatus have increased rapidly during the period from 1963 through 1981. During this period, the compound annual growth rate was 29 percent per year. However, the largest growth occurred during the years from 1977 through 1981, when the compound annual rate rose to 40 percent per year. The growth rate in imports of telephonic and telegraphic products from Japan exceeded the rate of increase for imports from all sources during the period 1963 to 1981. By 1981, Japan had achieved nearly a 50-percent market share of imports of these products.

In absolute values, imported telephone and telegraph products amounted to nearly one-half billion dollars in 1981. The increased imports vividly reflect the rapidly expanding U.S. consumer market for telephone terminal equipment which has been created by the deregulation of the telephone industry. (Note particularly the increased imports since 1972.) Although the market for telephone CPE was deregulated in 1972 there was considerable initial hesitancy on the part of the consumer to buy and connect telephones. No such inhibition exists now. Note also that some imports of telephone and telegraph apparatus type are classified elsewhere and not included in these data. For instance, cordless handset telephones are being imported on the order of several hundred million dollars' worth per year. These are classified, for import purposes, as radio apparatus rather than telephone apparatus. Also, certain types of electronic apparatus, which one might otherwise consider to be telephone or telegraph apparatus may be reported for import purposes under office machines. Such imports will therefore create a distortion in the general perception of what might be considered to be the telephone and telegraph industry statistics.

As shown in the section on "U.S. Shipments," the output of the U.S. industry has been expanding significantly. The ratio of imports to U.S. shipments has therefore been relatively small, rising to 4 percent, its largest value, in 1981. It is too early to discern the effects of competition in the U.S. market place with respect to import penetration.

Radio and TV communications equipment.--Imports of commercial radio, television, and navigation systems, and components, subassemblies, and parts thereof have increased rapidly from 1963 through 1981. During that period, the compound annual growth rate for imports was 31.5 percent per year. However, the growth rate has been declining. Between 1977 and 1981, the compound rate of growth was 16 percent. The growth rate of imports of commercial radio, TV, and navigation systems and components from Japan closely parelleled the overall import growth rate trend for telecommunications products. From 1977 through 1981, however, imports from Japan grew at a compound rate of only 6 percent. This growth rate is low and is probably due to the very large surge in imports of citizens band radios in 1977. 1/ The Citizens Band craze peaked in 1976-77, and in 1977, U.S. imports of CB radios from Japan were $402 million. If this anomaly is removed from the data, then the compound annual growth rate for commercial-type telecommunications electronics from Japan would have been 26.6 percent per year between 1977 and 1981 rather than actual 6 percent per year. Also included in this commercial electronics sector are parts and subassemblies of television receivers since these are sold to manufacturers of consumer products and not to the general public. Therefore, the demand for consumer products will produce significant changes in the imports of commercial products and components. It must be noted that, as trade flow reaches a billion dollars for a single or a narrow range of manufactured electronics commodities, high or widely fluctuating growth rates do not appear.

As shown in the section on "U.S. Shipments," the output of the U.S. industries which produce commercial radio, TV, and navigation products has been expanding at the rate of 8.3 percent per year from 1963 through 1981. The ratio of imports to shipments increased during this period from 0.3 percent in 1963 to 11.4 percent in 1977 before declining to 10.4 percent in 1981.

Radio and TV receiving sets.--Imports of radios, television receivers, audio and high-fidelity products, and combinations have increased steadily from 1963 through 1981. During that period the compound annual growth rate for imports was 26.3 percent per year. In the most recent period from 1977 through 1981, the annual growth rate was nearly 14 percent per year. During the overall period, the annual growth rate of imports from Japan was 22.5 percent per year; in the most recent period from 1977 through 1981, the growth rate stands at a deceiving 3.3 percent per year. This apparent slowing of the growth of Japanese imports is due to several factors. Firstly, video tape recorders, audio recorders, and phonographs are not included in the statistics due to the definition of "telecommunications." Imports of magnetic recording equipment from all sources were in excess of $1.7 billion in 1981. Imports of tape recording equipment and phonographs from Japan were $1 billion, $1.6 billion, and $1.6 billion in 1980, 1981, and 1982, respectively. Secondly, there have been orderly marketing agreements in effect during this time period, 1977-82, which have restrained the imports of color television receivers from Japan, Korea, and Taiwan. Thirdly, in the last 5 years, most Japanese major producers of television receivers have instituted TV assembly operations in the United States. And, fourthly Japanese companies now supply a large part of the U.S. consumer electronics market from their subsidiaries in the LDDC's.

1/ Although citizens band radios are consumer products, they are classified with commercial radio apparatus.

Table 49.--Telecommunications 1/ markets: U.S. producers' shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, by commodities, and by specified years, 1963-81

Commodity and year	Producers' shipments	Exports	Imports: From Japan	Imports: Total	Apparent consumption	Ratio of imports to consumption: From Japan	Ratio of imports to consumption: Total
	1,000 dollars					Percent	
Telephone and telegraph:							
1963	1,538,000	33,611	305	5,188	1,509,577	2/	0.3
1967	2,248,000	50,676	1,679	30,630	2,227,954	0.1	1.4
1972	3,974,000	85,481	37,111	89,274	3,977,793	.9	2.2
1977	7,095,000	270,373	44,371	129,360	6,953,987	.6	1.9
1981	12,177,000	653,215	242,994	494,570	12,018,355	2.0	4.1
Commercial radio, TV, and navigation apparatus:							
1963	5,936,000	466,210	8,265	19,391	5,489,181	.2	.4
1967	7,302,000	372,948	43,100	144,033	7,073,085	.6	2.0
1972	8,040,000	482,723	126,836	338,518	7,895,795	1.6	4.3
1977	13,048,000	1,566,465	797,846	1,485,002	12,966,537	6.2	11.5
1981	25,299,000	2,135,329	1,016,574	2,702,135	25,865,806	3.9	10.4
Consumer radio, TV, and audio apparatus:							
1963	1,853,200	29,057	41,711	51,212	1,875,355	2.2	2.7
1967	3,316,100	48,563	269,149	322,523	3,590,000	7.5	9.0
1972	3,465,100	130,339	924,004	1,346,266	4,681,027	19.7	28.8
1977	4,584,400	286,673	1,427,528	2,044,248	6,341,975	22.5	32.2
1981	5,634,500	811,886	1,626,249	3,446,922	8,269,536	19.7	41.7
Total:							
1963	9,327,200	528,928	50,281	75,791	8,874,063	.6	.9
1967	12,866,100	472,188	313,928	497,186	12,891,098	2.4	3.9
1972	15,479,100	698,541	1,087,951	1,774,058	16,554,617	6.6	10.7
1977	24,727,400	2,123,512	2,269,745	3,658,010	28,385,410	8.0	12.9
1981	43,110,500	3,600,430	2,885,817	6,643,627	46,153,697	6.3	14.4

1/ Telecommunications as defined in SITC Rev. 1, item 724.
2/ Less than 0.05 percent.

Source: Compiled from official statistics of the U.S. Department of Commerce.

By supplying much of the mature consumer electronic products from subsidiaries in lesser developed countries, Japanese home island resources are free to produce the less mature and higher technology consumer products such as video cassette recorders, personal computers, and peripherals. These products are not included in the telecommunications sector. Thus the decline in the Japanese consumer telecommunications export growth rate may be attributed to increased production of electronics products other than telecommunications products.

Import penetration from all countries and from Japan.--The import penetration ratio for telecommunications products has increased consistently from 0.9 percent in 1963 to 14.4 percent in 1981. Penetration by imports from Japan increased 0.6 percent in 1963 to 8.0 percent in 1977 before declining to 6.8 percent in 1981. Table 51 shows penetration by commodity group for the period.

Import penetration in telephone and telegraph equipment increased in each period covered by this report except 1977. In that period, U.S. shipments grew at a faster rate than imports, causing the decline in penetration. Penetration by Japanese imports followed the same trends as the total import penetration, increasing over the period to a high of 2.0 percent in 1981. The reasons for the doubling of penetration between 1977 and 1981 were discussed in the "U.S. Imports, telephone and telegraph" section above.

Import penetration by commercial radio, TV, and navigation equipment increased over the period from 0.4 percent in 1963 to 11.5 percent in 1977 before declining to 10.4 percent in 1981. The largest increase in penetration occurred between 1972 and 1977 as U.S. firms began moving off-shore to countries with lower labor rates. Import penetration by Japanese imports increased from 0.2 percent in 1963 to 6.2 percent in 1977 and then declined to 3.9 percent in 1981. This decline is believed to reflect the collapse of the CB market between 1977 and 1981.

Import penetration in consumer radio TV, and audio apparatus has increased from 2.7 percent in 1963 to 41.7 percent in 1981. This large increase in penetration is the result of low-priced imports driving U.S. firms off-shore or out of this line of business. Import penetration from Japan increased from 2.2 percent in 1963 to 22.5 percent in 1977 and then declined to 19.7 percent in 1981. The factors accounting for this decline were enumerated in the "U.S. imports, radio and television sets," section.

Conditions of competition in the U.S. market

Competition in the U.S. market is predicated on vigorous antitrust and anticartel enforcement, and strong consumer advocacy. The United States is the world leader in all facets of electronics technology and the production thereof. The finest research laboratories in the world, which are privately owned and operated, exist in the United States. Most of the recent electronic technological progress rests on the invention in a private U.S. research laboratory, funded by the private sector, of the transistor and subsequent solid state electronics technology.

Penetration by Japanese imports over the years is attributable, in part, to good market research and development of products (usually based on U.S. patents and licenses) which appeal to the consumer. Investigations conducted by the United States International Trade Commission indicate that the penetration of Japanese products has been principally based on price. There are allegations that the Japanese use unfair import business practices to sustain the low prices for their products. It is alleged that such pricing has led to the extinction of the U.S. consumer radio, audio tape recorder, and high-fidelity equipment industries. The Commission has recently found injury due to dumping of commercial electronics products from Japan (high-powered amplifiers, and pagers). In addition, cases now before the Commission allege dumping of consumer electronic products from other countries (such as dumping of TV receivers from Korea and Taiwan).

International markets

Telephone and telegraph apparatus markets.--As noted in the section on the "U.S. Industry," except for the United States, telephone and telegraph systems are Government owned and operated. This results is essentially closed markets for the hardware used by the operating companies in developed countries. The operating companies, if they do not own the producers, have established long-term relationships with their local suppliers. U.S. firms which supply foreign countries with telephone and telegraph products have usually done so from subsidiaries within the procuring country. Establishment of close relationships with embryonic postal telephone administrations is crucial to long-term supply contracts. Telephone systems in general must have long-term logistic support and a fixed set of design criteria and specifications in order to make the logistic support economical. That is, all parts of the system must be integrated and designed to work reliably over long periods of time with all other parts of the system. Thus, initial suppliers have the opportunity to use the learning curve over long-term contracts.

Terminal equipment is more easily designed to interface with the telephone systems than other types of telephone equipment such as central office switching equipment. Terminal equipment by its very nature is hung on the ends of the network, not integrated into the network. Therefore, there is a more open global market for terminal equipment than for other equipment. The United States is currently negotiating with other countries to deregulate or open up their markets for such equipment in order to increase the flow of trade.

The United States has two natural markets for telephone and telegraph products--Canada and Mexico. English-speaking countries such as the United Kingdom and Australia are also in the top 10 U.S. export markets. In addition, countries which are engaged in massive expansion and upgrading of their telephone and wire telecommunications systems are also good markets for the U.S. manufacturers. Two examples of such countries are Korea and Saudi Arabia.

Radio and TV communications markets.--The variety of the products which comprise this group of commercial electronics products and systems do not allow a single description of market structure. For instance about one-third of U.S. exports of commercial electronics systems and components are of navigational aids (navaids), radar, and radio remote control apparatus. The United States is a worldwide supplier of aviation electronics (avionics) apparatus; the EC is also a strong supplier. Japan, not yet having a strong aviation or defense industry, does not seem to be a major source for avionics or navaids except for specific isolated instances, such as, small boat radars for commercial fishing vessels, yachts, and pleasure boats.

In commercial communications products Japan is gaining a worldwide reputation. In areas such as satellite earth stations and cellular, land-mobile systems Japanese firms are well known. For commercial television and studio apparatus, both Japan and the EC countries are very competitive.

Radio and TV receiving set markets.--Once certain technical standards have been established, it becomes difficult if not impossible to make major changes in the market. For instance, Japan and the United States use a fully compatible set of TV transmission standards. Europe uses several different standards which are not compatible with those used in the United States and Japan. It is unlikely due to the huge consumer investment in television receivers (not to mention the commercial investment in broadcast equipment) that the United States or Japan will ever adopt the European transmission system or vice versa.

Therefore, worldwide markets for consumer radios and TV receivers tend to be technically segregated. However, there are no technical reasons why consumer products cannot be produced to foreign specifications and standards and sold outside of the producing country.

Japan has the largest worldwide market share in consumer electronics products. The Japanese are willing to produce equipment to any set of technical specifications. According to Japanese statistics, Europe is the largest purchaser of consumer electronics produced in Japan; the United States a close second, and all of Asia a close third. 1/

Telecommunications equipment markets.--The United States is the largest importer of Japanese telecommunications products. On the other hand, the United States is only the fifth ranked supplier to Japan. The United States imports 19 times the amount of telecommunications products from Japan compared with what Japan imports from the United States. In 1963, U.S. exports to Germany were $14.4 million or nearly twice the Japanese exports of $8.1 million. By 1981, Japanese exports to Germany of $657 million were nearly twice the U.S. exports of $362 million. In 1963, the United States exported to the United Kingdom four times as much as Japan did. In 1981, Japan exported twice as much to the United Kingdom as did the United States. Japan is rapidly gaining market share in Canada which has traditionally been a U.S. market. Finally, in 1963 the United States exported $472.5 million of telecommunications products, or 67 percent more than Japan. In 1981 Japanese telecommunications exports of $9.8 billion were 2.8 times (180 percent) U.S. exports of the same products.

U.S. exports

In 1963, the United States exported $529 million of telecommunications products, and $3.5 billion in 1981. The compound annual growth rate over the

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1/ As noted before, however, Japanese subsidiaries supply the U.S. market with consumer electronics products from Taiwan, Korea, Hong Kong, Singapore, and other Southeast Asia nations.

period of 18 years was 11.0 percent per year. In the most recent period, 1977-81, the compound annual growth rate was 13.3 percent per year. Considering that there was an 11-percent decline in the value of exports, when comparing the value of exports in 1967 with that in 1963, the low 18-year growth rate is not unexpected. The U.S. export ratio, defined as the value of exports of telecommunications products divided by the value of shipments, has shown some improvement in the past 18 years. This ratio was lowest at 3.7 percent in 1967, and highest at 8.6 percent in 1977. In 1981, the export ratio was down slightly to 8.1 percent.

Telephone and telegraph apparatus.--The United States in 1981 exported telephone and telegraph apparatus to 134 different countries (or customs territories). Of these 134, only Canada purchased more than $100 million, and only 13 other countries purchased more than $10 million each. The 1981 exports of $653 million were very widely distributed.

The overall compound annual growth rate for exports of telephone and telegraph apparatus was 17.9 percent per year from 1963 to 1981. In the most recent period, 1977-81, the compound growth rate was 24.7 percent per year. As the absolute value of exports continues to increase, however, it may be difficult to sustain this high an export growth rate. The export ratio is low but showing some improvement. In 1963, the export ratio was 2.2 percent, and, in 1981, 5.4 percent. However, since all of the world's telephone networks remain under strict Government regulation, if not Government control or ownership, U.S. exports are not expected to gain significant worldwide market share in these essentially closed markets.

U.S. exports of telephone and telegraph apparatus have shown a slight improvement in the past several years due to exports to Korea. The Republic of Korea embarked on a massive improvement program to upgrade its telephone and data networks. A large U.S. firm was chosen as the principal architect and supplier for this program. The Korean experience is somewhat different from the modernization programs in the Middle East. In such modernization programs, U.S. firms have generally shared the design and construction awards with foreign firms. U.S. firms have also tended to supply material from their off-shore subsidiaries, thus not improving the U.S. export figures.

Radio and TV communications equipment.--The United States exported commercial electronics systems and components to 156 different countries (or customs territories) in 1981. Of these 156 countries, Canada, Mexico, West Germany, and the United Kingdom purchased more than 100 million dollars' worth of electonics systems and components. Approximately 35 other countries purchased more than $10 million each. In 1981, one third of the $2.1 billion in exports were for radar, radio navigational aid, and remote control apparatus. The compound annual growth rate for exports of commercial electronics products and systems was 8.8 percent per year from 1963 to 1981. During 1977-81, the compound growth rate was 8.0 percent per year. The export ratio has fluctuated from a low of 5.1 percent in 1967 to a high of 12 percent in 1977. In 1981, exports were 8.4 percent of shipments.

Radio and TV receiving sets.--In 1981, the United States exported consumer-type electronic products to 128 countries (or customs territories). Of these 128 countries, only Canada and Mexico purchased more than 100 million dollars' worth; about 15 other countries purchased more than $10 million each. In 1981, audio products accounted for one-third of the value of consumer electronics product exports.

The compound annual growth rate for exports of consumer electronics products was 20.3 percent per year from 1963 to 1981. During 1977-81, exports nearly tripled and the growth rate was 29.7 percent per year. In 1981, Canada and Mexico purchased consumer electronics products valued at $350 million, or 43 percent of U.S. exports of these products. It is believed that a large amount of the exports to Mexico were unfinished products sent across the border into the 10 kilometer zone for finishing and later returned to the United States under the provisions of item 807.00 of the Tariff Schedules of the United States. The export ratio has grown from a low of 1.5 percent in 1967 to a high of 14.4 percent in 1981.

Japanese exports

In 1981, Japan exported $9.8 billion of telecommunications products to 180 countries (or customs territories). The compound annual growth rate of Japanese exports during 1963-81 was 21.8 percent per year for all types of telecommunications products. In the most recent period, the compound growth rate had slowed to 13.6 percent per year. However, in view of the $9.8 billion in exports this recent growth rate is phenomenal. In 1981, one third of Japan's telecommunications exports went to the United States. The $3.1 billion in exports to the United States was larger than the combined total of exports to the next nine top ranked Japanese export markets.

Separate Japanese export data are not available for the same product groupings that were used to examine the U.S. shipments, exports, and imports. Japanese production data is not collected on the same basis as that of the U.S. industry and is available only through 1980. It is estimated that, in 1980, Japan's export ratio for manufactured products was about 39 percent. Of all Japanese manufactured exports, electronics accounted for 25.1 percent. These figures include components, tape recorders, and office machines such as computers, none of which are included in U.S. data.

Conditions of competition in international markets

Many U.S. producers have established manufacturing facilities in countries which encumber foreign access to their markets but permit foreign investment in manufacturing facilities for domestic production. U.S. producers have been successful in establishing such facilities in the European Community, but, to date, have not been as successful in establishing themselves in Japan.

In recent years, developing countries have emulated certain developed countries, demanding a specified amount of domestic content in products sold in their markets. However, in developing countries lacking an established production base, foreign manufacturers find market access easier.

The principal strength of U.S. producers of telecommunications equipment in international markets is their technological edge. U.S. manufacturers are unquestionably superior to foreign producers in the designing, manufacturing, and installation of most products.

APPENDIX A

U.S. INTERNATIONAL TRADE COMMISSION NOTICE CONCERNING INVESTIGATION NO. 332-162

AND

SCHEDULE OF WITNESSES AT THE COMMISSION'S HEARINGS

TABLE 2.—MODIFIED WILDERNESS STUDY AREAS—BOUNDARY CHANGED TO DELETE SPLIT ESTATE

Wilderness study area name	Number	Old wilderness study area acreage	Acres split estate	Revised wilderness study area acreage	County
Steep Creek	UT-040-061	22,034	138	21,896	Garfield.
North Escalante Canyon, the Gulch, Escalante Canyons (Tracts 2, 3, 4).	[1]	109,551	452	109,099	Garfield.
Behind the Rocks	UT-060-140A	12,770	135	12,365	Grand.

[1] This area has no number. It consists of a single roadless area contiguous to the three "instant study areas" listed under "Wilderness Study Area Name."

[FR Doc. 83-12418 Filed 5-10-83; 8:45 am]

BILLING CODE 4310-84-M

INTERNATIONAL TRADE COMMISSION

[Investigations Nos. 731-TA-134 and 135 (Preliminary)]

Color Television Receivers From the Republic of Korea and Taiwan

AGENCY: International Trade Commission.

ACTION: Institution of preliminary antidumping investigations and scheduling of a conference to be held in connection with the investigations.

SUMMARY: The United States International Trade Commission hereby gives notice of the institution of preliminary antidumping investigations under section 733(a) of the Tariff Act of 1930 (19 U.S.C. 1673(a)) to determine whether there is a reasonable indication that an industry in the United States is materially injured, or is threatened with material injury, or the establishment of an industry in the United States is materially retarded, by reason of imports from the Republic of Korea and Taiwan of color television receivers, complete or incomplete, provided for in items 685.11 and 685.14 of the Tariff Schedules of the United States, which are alleged to be sold in the United States at less than fair value.

EFFECTIVE DATE: May 2, 1983.

FOR FURTHER INFORMATION CONTACT: Mr. Robert Eninger, Office of Investigations, U.S. International Trade Commission, 701 E St., NW., Washington, D.C. 20436, telephone 202-523-0312.

SUPPLEMENTARY INFORMATION:

Background.—These investigations are being instituted in response to petitions filed on May 2, 1983, by counsel on behalf of the Industrial Union Department, AFL-CIO; the International Brotherhood of Electrical Workers; the International Union of Electrical, Radio and Machine Workers; the Independent Radionic Workers of America; and the Committee to Preserve American Color Television. The Commission must make its determination in these investigations within 45 days after the date of the filing of the petition, or by June 16, 1983 (19 CFR 207.17).

Participation.—Persons wishing to participate in these investigations as parties must file an entry of appearance with the Secretary to the Commission, as provided for in section 201.11 of the Commission's Rules of Practice and Procedure (19 CFR 201.11), not later than seven (7) days after the publication of this notice in the **Federal Register.** Any entry of appearance filed after this date will be referred to the Chairman, who shall determine whether to accept the late entry for good cause shown by the person desiring to file the notice.

Service of documents.—The Secretary will compile a service list from the entries of appearance filed in these investigations. Any party submitting a document in connection with the investigations shall, in addition to complying with § 201.8 of the Commission's rules (19 CFR 201.8), serve a copy of each such document on all other parties in the investigations. Such service shall conform with the requirements set forth in § 201.16(b) of the rules (19 CFR 201.16(b), as amended by 47 FR 33682, Aug. 4, 1982).

In addition to the foregoing, each document filed with the Commission in the course of these investigations must include a certificate of service setting forth the manner and date of such service. This certificate will be deemed proof of service of the document. Documents not accompanied by a certificate of service will not be accepted by the Secretary.

Written submissions.—Any person may submit to the Commission on or before May 31, 1983, a written statement of information pertinent to the subject matter of these investigations (19 CFR 207.15). A signed original and fourteen (14) copies of such statements must be submitted (19 CFR 201.8).

Any business information which a submitter desires the Commission to treat as confidential shall be submitted separately, and each sheet must be clearly marked at the top "Confidential Business Data." Confidential submissions must conform with the requirements of § 201.6 of the Commission's rules (19 CFR 201.6). All written submissions, except for confidential business data, will be available for public inspection.

Conference.—The Director of Operations of the Commission has scheduled a conference in connection with these investigations for 10 a.m. on May 26, 1983, at the U.S. International Trade Commission Building, 701 E Street NW., Washington, D.C. Parties wishing to participate in the conference should contact the staff investigator, Mr. Robert Eninger (202-523-0312), not later than May 24, 1983, to arrange for their appearance. Parties in support of the imposition of antidumping duties in these investigations and parties in opposition to the imposition of such duties will each be collectively allocated one hour within which to make an oral presentation at the conference.

Public inspection.—A copy of the petitions and all written submissions, except for confidential business data, will be available for public inspection during regular business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 701 E Street, NW., Washington, D.C.

For further information concerning the conduct of these investigations and rules of general application, consult the Commission's Rules of Practice and Procedure, part 207, subparts A and B (19 CFR Part 207, as amended by 47 FR 33682, Aug. 4, 1982), and Part 201, sbuparts A thorugh E (19 CFR Part 201, as amended by 47 FR 33682, Aug. 4, 1982). Further information concerning the conduct of the conference will be provided by Mr. Eninger.

This notice is published pursuant to § 207.12 of the Commission's rules (19 CFR 207.12).

Issued: May 5, 1983.

Kenneth F. Mason,

Secretary.

[FR Doc. 83-12646 Filed 5-10-83; 8:45 am]

BILLING CODE 7020-02-M

[332-162]

Foreign Industrial Targeting and Its Effects on U.S. Industries

AGENCY: International Trade Commission.

ACTION: In accordance with the provisions of section 332(b) of the Tariff Act of 1930 (19 U.S.C. 1332(b), the

Commission has instituted, on its own motion at the request of the Subcommittee on Trade of the House Committee on Ways and Means, investigation No. 332–162 for the purpose of obtaining information on foreign industrial targeting so that it may advise the Committee on Ways and Means on the implications of these practices for U.S. industries.

EFFECTIVE DATE: May 3, 1983.

FOR FURTHER INFORMATION CONTACT: Dr. John Suomela, Director, Office of Economics (202) 523–3771.

SUPPLEMENTARY INFORMATION: On March 25, 1982, the Subcommittee on Trade of the House Committee on Ways and Means requested the U.S. International Trade Commission to analyze the issue of foreign industrial targeting and its effects on the competitiveness of U.S. industries.

The Committee described industrial targeting as a "collection of concerted government policies to identify and promote particular industries for success in world markets. These policies are typified by a high degree of government involvement in planning, financing, directing and protecting certain industrial activities. They usually involve intra-company activities which could constitute violations of antitrust laws without government sponsorship and guidance."

The Committee listed the following specific policies or practices as having been frequently mentioned as elements of foreign industrial targeting: (1) Government financial suppport shared by a group of companies; (2) Government-sponsored or government-conducted research and development projects to assist a selected group of companies; (3) industry rationalization programs; (4) suspension of antitrust rules on industrial policy grounds; (5) manipulation of capital markets by government or government-backed entities to benefit certain sectors; (6) administrative guidance to divide markets or allocate products among competing domestic companies; (7) government control of technology transfer; (8) government restrictions on foreign investment in order to limit and control competition within certain sectors; (9) government procurement policies designed to assure demand for certain products; and (10) import protection policies.

The Commission has decided to divide this study into three separate phases. The first phase will consider Japanese industrial targeting. The report on this phase will be submitted to the Subcommittee on Trade no later, than September 30, 1983. Future phases will consider industrial targeting by the European Community and by other major U.S. trading partners.

The first phase will attempt to answer the following questions about Japanese industrial targeting: (1) Which industries has the Japanese government targeted? (2) What specific practices has the Japanese government used to further the international competitiveness of these industries? (3) What is the relationship between these practices and international trade agreements? (4) What is the relationship between these practices and U.S. trade law? (5) What have been the effects of these practices on the competitiveness of the targeted Japanese industries and their U.S. competitors?

Public Hearing

A public hearing in connection with the first phase of this investigation will be held in the Commission Hearing Room, 701 E Street NW., Washington, D.C., 20436, beginning at 10 a.m. on June 15, 1983, to be continued on June 16 if required. All persons shall have the right to appear by counsel or in person, to present information, and to be heard. Requests to appear at the public hearing should be filed with the Secretary, United States International Trade Commission, 701 E Street NW., Washington, D.C. 20436, no later than noon, June 8, 1983.

Written Submissions

In lieu of or in addition to appearances at the public hearing, interested persons are invited to submit written statements concerning the investigation by June 8, 1983. Commercial or financial information which a submitter desires the Commissioin to treat as confidential must be submitted on separate sheets of paper, each clearly marked "Confidential Business Information" at the top. All submissions requesting confidential treatment must conform with the requirements of § 201.6 of the Commission's *Rules of Practice and Procedure* (19 CFR 201.6). All written submissions, except for confidential business information, will be made available for inspection by interested persons. To be ensured of consideration by the Commission, written statements should be submitted at the earliest possible date, but no later than June 30. All submissions should be addressed to the Secretary at the Commission's office in Washington, D.C.

By order of the Commission.

Issued: May 4, 1983.

Kenneth R. Mason,

Secretary.

[FR Doc. 83–12845 Filed 5–10–83; 8:45 am]

BILLING CODE 7020–02–M

[Investigations Nos. 701-TA-201 and 731-TA-133 (Preliminary)]

Forged Undercarriage Components From Italy

AGENCY: International Trade Commission.

ACTION: Institution of preliminary countervailing duty and antidumping investigations and scheduling of a conference to be held in connection with the investigations.

SUMMARY: The United States International Trade Commission hereby gives notice of the institution of a preliminary countervailing duty investigation and a preliminary antidumping investigation under sections 703(a) and 733(a) of the Tariff Act of 1930 (19 U.S.C. 1671b(a) and 1673b(a)) to determine whether there is a reasonable indication that an industry in the United States is materially injured, or is threatened with material injury, or the establishment of an industry in the United States is materially retarded, by reason of imports from Italy of forged components for the undercarriage of crawler-type tractors, provided for in items 664.08, 692.34, or 692.35 of the Tariff Schedules of the United States, upon which bounties or grants are alleged to be paid and which are alleged to be sold in the United States at less than fair value.

EFFECTIVE DATE: April 29, 1983.

FOR FURTHER INFORMATION CONTACT: Ms. Mariam A. Bishop, Office of Investigations, U.S. International Trade Commission, 701 E Street, NW., Washington, D.C. 20436, telephone 202–523–0291.

SUPPLEMENTARY INFORMATION:

Background. These investigations are being instituted in response to a petition filed on April 29, 1983, on behalf of Jernberg Forgings Co., Lindell Drop Forge Co., Portec, Inc., Presrite Corp., Presrite of Jefferson, Inc., Walco Metal Forming Group, and Walker Forge, Inc., U.S. producers of forged undercarriage components. The Commission must make its determination in these investigations within 45 days after the date of the filing of the petition, or by June 13, 1983 (19 CFR 207.17).

Participation.—Persons wishing to participate in these investigations as parties must file an entry of appearance

Those listed below appeared as witnesses at the United States International Trade Commission's hearing:

Subject : Foreign Industrial Targeting and Its Effects on U.S. Industries

Inv. No. : 332-162

Date and time: June 15, 1983 - 10:00 a.m.

Sessions were held in connection with the investigation in the Hearing Room of the United States International Trade Commission, 701 E Street, NW., in Washington.

Government appearance:

Honorable Clyde V. Prestowitz, Deputy Assistant Secretary for International Economic Policy, Department of Commerce

WITNESS AND ORGANIZATION:

Covinton & Burling--Counsel
Washington, D.C.
on behalf of

Houdaille Industries, Inc.

Phillip A. O'Reilly, President and Chief Executive Officer

Richard D. Copaken--OF COUNSEL

The Brookings Institute, Foreign Policy Studies Program, Washington, D.C.

Philip H. Trezise, Senior Fellow

Covington & Burling--Counsel
Washington, D.C.
on behalf of

Electronic Industries Association

John Sodolski, Vice President

Richard D. Copaken--OF COUNSEL

-more-

WITNESS AND ORGANIZATION:

American Iron and Steel Institute, Washington, D.C.

William L. Hoppe, Manager of Economic Studies in the Corporate Planning Department of Bethlehem Steel Corporation

Wender, Murase & White--Counsel
Washington, D.C.
on behalf of

The Japanese Machine Tool Builders' Association,
The Japan Metal Forming Machine Builders' Association,
The Japan Machinery Exporters' Association

Carl J. Green--OF COUNSEL

University of Michigan, Ann Arbor, Michigan

Professor Gary Saxonhouse, Professor of Economics

Collier, Shannon, Rill & Scott--Counsel
Washington, D.C.
on behalf of

A number of clients in various sectors of the U.S. economy in relation to a broad range of trade problems

Paul D. Cullen)
Jeffrey W. King)--OF COUNSEL

Verner, Liipfert, Bernhard and McPherson--Counsel
Washington, D.C.
on behalf of

The Semiconductor Industry Association

Alan Wm. Wolff--OF COUNSEL

APPENDIX B

ESTIMATING SUBSIDY EQUIVALENTS OF TARGETING TECHNIQUES

Estimating Subsidy Equivalents of Targeting Techniques

This appendix describes a methodology for measuring subsidy equivalents of certain targeting techniques, and compares that methodology with the procedures that the Department of Commerce uses to calculate subsidies in countervailing duty cases. 1/ The targeting techniques considered here include most forms of tax and financial assistance. It is much more difficult to measure subsidy equivalents for other targeting techniques, and the Department of Commerce has no established methodology for them. This appendix also discusses the major problems encountered in estimating these subsidy equivalents and provides a starting point for estimating their effects on U.S. producers.

Tax and financial benefits

Tax breaks and financial targeting techniques can be divided into two categories: those whose benefits are realized immediately, and those whose benefits are realized over a series of years. The former includes one-time grants and tax reductions; the latter includes loans at preferential interest rates and tax deferrals. 2/

The determination of subsidy equivalents for immediate benefits is generally straightforward. Suppose, for example, that a targeted firm was given a grant of $1 million and a reduction in its corporate income tax rate from 50 percent to 20 percent. The total subsidy equivalent would be $1 million dollars plus 30 percent of taxable corporate income (the value of the tax reduction). The marginal subsidy equivalent of the tax reduction is equal to 30 percent of the taxable income the firm would realize by selling an additional unit of output. Because the grant is not affected by the firm's level of output, its marginal subsidy equivalent is zero.

It is more difficult to determine the subsidy equivalents for targeting techniques whose benefits are realized over a period of years, because the value of these benefits will depend on their timing and on market interest rates. Targeted firms want to receive benefits as soon as possible and to postpone taxes and other payments for as long as possible. Benefits that are received earlier are worth more than the same dollar amount of benefits received at a later date. Thus, future benefits of a targeting technique should be discounted to the present to determine their current, or present, value. The present value of a series of future payments is equal to a weighted sum of these payments, where payments that are further into the future receive lower weights to reflect their lower value. The present value depends on the size of the future payments, their timing, and the market interest rate. The formula for determining the present value (PV) of a series of future payments (P_t) is--

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1/ The discussion of Commerce's procedures is based on "Final Affirmative Countervailing Duty Determination: Carbon Steel Wire Rod From Belgium," 47 F.R. 42403-42422, Sept. 27, 1982.

2/ The Commerce Department treats grants explicitly tied to the purchase of a specific type of equipment as though their benefits are spread over the life of the equipment. This procedure allows the distribution of the estimated subsidy over time to better conform to the distribution of benefits to the firm.

$$PV = \sum_{t=o}^{N} P_t/(1+r)^t$$

where t is the time period and r is the market rate of interest. The term $1/(1+r)^t$ is called the discount factor. Because the discount factor gets smaller as time passes, payments further into the future are discounted more than earlier payments.

The following simple example illustrates the concept of present value. Suppose a targeted firm is allowed to postpone payment of its corporate income taxes for 5 years. Suppose further that its annual taxable income is $10 million, its tax rate is 50, percent and its market interest rate is 10 percent. Then the present value of the tax liability for each year, given the 5-year postponement, is equal to $(5x10)/(1.1)^5 = \$3,104,607$. Without the postponement, the tax liability for the year would be $5 million. The annual subsidy, therefore, is equal to $1,895,393, or roughly 19 percent of taxable income. Present-value analysis can also be used to determine the subsidy equivalents of preferential interest rates on loans.

The Department of Commerce uses the present-value method to determine the subsidy elements of loans and other financial benefits. First, Commerce determines the present value of the interest rate savings due to the lower rate of interest, PVSE:

$$PVSE = \sum_{i=1}^{N} IS_i/(1+r)^i$$

where IS_i is the interest rate saving in year i, N is the number of periods that the loan is in force, and r is the market interest rate. Commerce then allocates the total subsidy over the life of a loan in equal installments. Thus, Commerce would calculate the annual subsidy element of a loan at a preferential interest rate using the equation--

$$PVSE = \sum_{i=1}^{N} = S/(1+r)^i \text{ or } S = (PVSE + r)/(1-(1+r)^{-n})$$

where S is the average annual subsidy. 1/

1/ Commerce uses the interest rate on long-term government debt in its calculations. A loan to a private firm, however, involves a greater risk of default than a loan to a government. This market valuation of the cost of the increased risk is the difference between the market interest rate paid by the government and the market interest rate paid by private firms. To include this cost in the calculated subsidy, therefore, the market interest rate faced by private firms will be used. If the loan is to buy a specific piece of capital equipment, then Commerce allocates the subsidy over the life of the equipment, not the life of the loan.

Commerce only recently adopted this methodology; previously it had taken the interest savings in each year, IS_i, to be equal to the subsidy in that year. If the loan calls for constant total payments, then the two methods yield the same result, and IS_i is constant and always equal to S. 47 F.R. 42412.

Some loans are made to firms that are not creditworthy and so could not borrow at any market interest rate. Under these circumstances, the interest rate differential involved in the loan cannot be reliably estimated. Because the likelihood that these loans will be paid back is substantially lower than with conventional loans, they are best treated as purchases of equity. Therefore, in its subsidy calculations Commerce treats loans to noncreditworthy borrowers as equivalent to equity. 1/

Equity.--Governments sometimes own all or part of a firm or firms in the targeted industry. These equity investments involve a subsidy if the government offers firms better terms than do private investors. If the government buys a part interest in a publicly traded company, then Commerce may determine the subsidy as the difference between the price the government pays for the shares and their market price. Market price is taken to be the price prevailing at a time when it would not have been affected by the prospect of the government purchase. This method is not feasible if a firm is not publicly traded. In that case, Commerce measures the subsidy as the difference between the rate of return to the government on its equity investment and the average rate of return on equity held by private investors. For example, if the government invested $10 million in equity and realized a return of 10 percent while the average return on private equity was 15 percent, then the measured subsidy is $500,000, or 5 percent of $10 million. 2/

One problem with this methodology is that the return on privately held equity fluctuates over time. An investment that seems very unprofitable in 1 year may be extremely profitable over several years. For example, new firms often realize negative returns on equity in their early years of operation, but they may richly reward investors in later years. Therefore, when computing a subsidy by comparing actual and average rates of return on equity, one should examine the performance of the firm over a number of years.

Another problem with this methodology is that the rate of return private investors require on their equity depends on how risky they believe the investment to be. The riskier the investment, the higher the expected return needed to attract private capital. If the government makes equity investments in particularly risky sectors, the average rate of return for all privately held equity will seriously understate the government subsidy. If possible, the rate of return on government equity should be compared with the rate of return on privately held equity of similar risk.

Purchaser-directed subsidies.--Governments often give tax and financial assistance to a targeted industry's purchasers rather than directly to the industry. A common example would be loans at preferential interest rates to finance purchases of exports. Such assistance to purchasers helps targeted

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1/ In some cases, when there is actually no chance the government will receive any repayment, such loans should be treated as grants.

2/ If this method indicates a subsidy greater than the total amount of equity invested, the equity invested is treated as a grant. 47 F.R. 42413. For a full discussion of the Commerce Department's method of estimating subsidies involved in government equity participation, see C. Barshefsky, A. L. Mattice, and W. L. Mastin, "Government Equity Participation in State-Owned Enterprises: An Analysis of the Carbon Steel Countervailing Duty Cases," Law and Policy in International Business, 14(4), 1983, pp. 1101-1159.

industries by increasing their sales. The amount of the subsidy per unit may be measured by the extent to which the industry would have to decrease prices to increase its sales by the same amount as the targeting technique.

If purchasers receive subsidies over several years, present-value analysis is needed to calculate these subsidies. For example, suppose that purchasers of a piece of equipment receive a low-interest loan. First, the present value of the acquisition cost of the equipment, including loan payments, can be determined. Then the present value of those costs if the acquisition were financed at market interest rates can be determined. This present value will usually be the equipment's price because the present value of a loan at market interest rates is its face value. The reduction in the present value of the acquisition costs due to the low-interest loan will measure the price decrease that would produce the same decrease in the purchasers' acquisition costs. 1/

Science and technology policies

The subsidy equivalent of financial and tax assistance for research and development can be measured using the techniques described in the previous section. However, assigning these subsidies to a time period often involves special problems. Generally accepted accounting principles charge research and development expenditures to the period when they are incurred. 2/ However, firms generally do not benefit from these expenditures until many years after they have been made; one study estimates that the average length of time is between 4 and 6 years. 3/ Furthermore, determining how specific research and development expenditures have affected firms' costs or the products firms offer is often very difficult.

If a government's subsidies for research and development can be measured and related to a specific time period, then a simple formula can often be used to allocate the subsidy to each year within the time period. Suppose the firm controls dissemination of the results of this research in the same way as if it had financed the research totally on its own. In this case the subsidy would be equal to the return on investment that a private investor would require in making the research and development expenditures itself. This return can be calculated using the following formula:

$$RDE = \sum_{t=0}^{N} S_t/(1+r)^t$$

1/ The present-value method of evaluating export credit subsidies was used in an earlier Commission report, The Economic Impact of Foreign Export Credit Subsidies on Certain U.S. Industries: Report to the President on Investigation No. 332-144, January 1983. The Department of Commerce also has used the present-value approach to measure an export credit subsidy. "Preliminary Affirmative Countervailing Duty Determination: Railcars from Canada," Dec. 13, 1982.

2/ Martin A. Miller, GAAP Guide, New York, 1981, p. 35.02.

3/ F. M. Scherer, "Inter-Industry Technology Flows and Productivity Growth," Review of Economics and Statistics, 64(4), Nov. 1982, p. 629.

Here RDE is the government's contribution to the firm's research and development expenditure, N is the useful life of the knowledge gained, and S_t is the subsidy in year t. If the subsidy is assumed to be constant over the useful life of the knowledge gained, then that subsidy can be determined using a relatively simple formula: 1/

$$S = (RDE*r)/(1 - (1+r)^{-N})$$

One problem in using this formula is that it will often be difficult to determine a value for N, the useful life of the knowledge. Furthermore, the calculated subsidy may be quite sensitive to N. For example, if the interest rate is 7 percent, the annual subsidy will be 24 percent of the government's total contribution to research and development if N is 5, 14 percent if N is 10, and 9 percent if N is 20.

If the government controls dissemination of the information but restricts dissemination to the industry, then the same method can be used to determine subsidies. However, in this case the subsidy would be industry, not firm, specific. Furthermore, any fees the industry pays to use the information, such as patent license fees, should be deducted from the subsidy.

If the government makes the information freely available to its industry's international competitors, it might seem that its expenditures do not affect its domestic industry's relative competitiveness. The targeted industry, however, still might benefit disproportionately from its government's financing of research. An industry might find that it is able to take advantage of research done in its own country, with the results reported in its own language, faster than its international rivals. It is difficult, however, to measure this advantage.

Policies involving technology acquisition.--Some targeting techniques benefit industries by improving the terms at which they acquire foreign technology. The effects of these techniques can be measured by comparing terms of technology licenses in targeting countries with terms in other countries. 2/ Terms of international technology licenses, however, are often regarded by firms as highly proprietary information, and are not likely to be made freely available.

Home-market protection

Home-market protection allows domestic firms to charge a higher price for their output. It may also reduce targeted industries' costs if costs decline as output grows due to scale economies, or if costs decline as firms gain experience. This phenomenon is called learning by doing, and firms that gain from experience are said to be moving down learning curves. By increasing production for domestic firms, import restraints might help these firms move down their learning curves faster. Measuring these gains from home-market protection is difficult and requires extensive data. Estimating the learning

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1/ The assumption that subsidies are constant over the period is arbitrary. Other assumptions could be used, but they make computing the subsidy more difficult.

2/ It would be necessary to adjust such comparisons for factors other than Government policy that would make licensing fees vary across countries.

curve, for example, requires firm and product specific data on costs and output over a number of years. 1/

Antitrust exemptions

Antitrust exemptions may both increase a targeted industry's price-cost margin and reduce its costs. As discussed in the section on targeting techniques, the increase in the price-cost margin generally will not make an industry more competitive internationally, but the cost reduction, if it exists, will. 2/ However, it is extremely difficult to measure this cost reduction, because we would need to exclude savings due to measures the firms would have taken in the absence of the antitrust exemption. For example, MITI has worked with a cartel to try to restrict the variety of products that Japanese machine tool manufacturers produce. 3/ MITI apparently feels that by concentrating on fewer products, these manufacturers can reduce their costs. If these cost savings exist, however, the manufacturers might choose to restrict their product variety without MITI's guidance. 4/ Thus, to assess the effects of this action, we would need to determine what products these firms would offer without MITI's guidance.

Measuring the effects of antitrust exemptions on joint research and development would be particularly difficult. First, it would be necessary to determine what research and development would occur without the exemption. Then, the costs and benefits of this hypothetical research program would need to be compared with the costs and benefits of the actual research program. Both costs and benefits should be examined, because although coordination among firms can make research expenditures more effective by reducing duplication, it can also lead to less research. Coordination can reduce an important incentive to do research--fear that a rival firm will discover an advance first and obtain a critical competitive advantage.

Accounting data and econometric analysis can sometimes be used to measure savings from antitrust exemptions. For example, if firms in a rationalization cartel share a joint facility, it might be possible to determine the costs of

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1/ For an example of the econometric estimation of a learing curve see L. E. Preston and E. C. Keachie, "Cost Functions and Progress Functions: An Integration," American Economic Review, 54(1), March 1964, pp. 100-106.

2/ The net effect of an antitrust exemption on an industry's competitiveness will depend on whether the increase in monopoly power and the decrease in costs have a net effect of increasing or decreasing prices. For a discussion of the effect of cost-reducing antitrust exemptions on prices, see O. Williamson, "Economies as an Antitrust Defense," American Economic Review, 58(1), March 1968, pp. 18-36.

3/ Cravath, Swaine, and Moore, (attorneys for Cincinnati Milacron), "Computer-aided Manufacturing: The Japanese Challenge," submitted to the U.S. International Trade Commission in Investigation No. 332-149, December 1982 p. 27.

4/ Caves and Uekusa suggest that because oligopolistic industries may engage in excessive product diversification, MITI's attempts to limit product variety can result in substantial savings. Industrial Organization in Japan, Washington, D.C., Brookings Institution, 1976, p. 152.

operating several different facilities. If antitrust exemptions allow larger scale firms, then econometric analysis might be used to determine the cost savings due to the increased size. The cost savings from antitrust exemptions, however, generally can only be measured if detailed data are available on the costs of individual firms.

APPENDIX C

SUBSIDY EQUIVALENTS FOR JAPANESE TARGETING TECHNIQUES

This appendix estimates subsidy equivalents for specific Japanese targeting techniques as described in appendix B. Such estimates require detailed information; this appendix examines targeting techniques for which this information is available. These techniques include low-interest loans, tax incentives, and research grants given to high-technology industries and to two established industries: shipbuilding and the merchant marine.

Low-interest loans

This section examines the subsidies inherent in low-interest loans from the Japan Development Bank (JDB), the Small Business Finance Corporation (SBFC), and the Japanese Export-Import Bank (JEXIM). Subsidies inherent in these loans are measured by the difference in interest paid on them and on comparable loans at normal commercial terms.

Japanese Government loans have two major advantages over commercial loans: lower interest rates and the absence of compensating balances. 1/ The maximum interest rate on JDB loans is the commercial banks' interest rate for 7- to 10-year loans to highly creditworthy borrowers, the long-term prime rate. The minimum interest rate on JDB loans has ranged from 0.8 percentage point to 1.1 percentage points below the maximum rate. 2/ Targeted industries are likely to receive rates at or close to the minimum. The available evidence suggests that the interest rate differential for JDB loans to targeted industries is approximately 1 percentage point. 3/

Compensating balances are funds firms must leave on deposit with a bank at zero interest as a condition for receiving a loan. These balances are generally 10 percent of the value of a long-term loan. 4/ With a compensating

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1/ JDB loans may be for as long as 30 years, longer than all or almost all commercial loans. JDB loans for the development of technology, however, are generally for 7 to 10 years. Japan Development Bank, "Introducing the Japan Development Bank," 1983. JDB loans will be compared with commercial loans with maturities of 7 to 10 years. The interest rate on Japanese loans is generally the same for loans with maturities from 1 to 15 years. Henry C. Wallich and Mable I. Wallich, "Banking and Finance," in Asia's New Giant, Washington, p. 271.

2/ Japanese Development Bank, Annual Report, 1979, 1980, 1981, 1982.

3/ Loans to the Japanese Electronic Computer Corporation (JECC) are reportedly about 1 percentage point below market rates. Semiconducter Industry Association, p. B-4. Recent JDB loans to develop fourth generation computers will carry the minimum interest rate of 7.3 percent, 1.1 percentage points below the maximum rate. "Fourth Generation Computer Building Will Get JDB Loan," Japan Economic Journal, Nov. 9, 1983, p. 15. JDB loans to the machine tool industry from 1977 to 1981 were at interest rates averaging 0.8 percent below prime. Testimony of Carl J. Green on behalf of the Japan Machine Tool Builders' Association at the Commission's hearing, June 15, 1983, p. 16. The estimated interest rate differential on JDB loans to the steel industry from 1951 to 1975 was 1 percentage point. Federal Trade Commission, The United States Steel Industry and its International Rivals, 1977, pp. 324-325.

4/ Henry C. Wallich and Mable I. Wallich, op. cit., p. 271. Short-term loans require higher compensating balances, but those balances may earn interest.

balance, the firm that wants to borrow a given amount, DB, must have higher total borrowings, TB, to cover its compensating balance requirement:

$$TB = DB/(1-c)$$

where c is the percent of the loan that must be left in a compensating balance. The difference in interest costs between borrowing TB from a commercial bank and borrowing DB from the government can be calculated using the following formula:

$$IS = rTB - r_g DB$$

$$IS = rDB/(1-c) - r_g DB$$

$$IS = DB\ (r-r_g) + cr_g)/(1-c)$$

Here IS is the difference in interest costs, r is the market interest rate, and r_g is the interest rate charged by the government.

Loans for technology development.--The subsidies involved in JDB loans for the improvement of technology from 1975 to 1982 are shown in table B-1. These data are shown in yen, dollars, and inflation-adjusted 1982 dollars. The subsidies range from 1.6 percent to 2.0 percent of the value of the loan, depending on the interest rates in that year. The inflation-adjusted value of subsidies rose from 1975 to 1980 and fell from 1980 to 1982.

Very little industry-specific data are available on JDB loans. However, data are available on the volume of loans to the computer industry. Almost all these loans support the JECC, the industry's joint leasing company. The rest of these loans help finance computer-manufacturing plants and facilities for developing software and data processing systems. Approximately 48 percent of JDB loans for the development of technology go to the computer industry. 1/ If the computer industry received 48 percent of the estimated subsidies shown in table C-1, that would be 0.3 percent of the value of its output in both 1980 and 1981. 2/

Data are also available on JDB and SBFC loans to the Japanese machine tool industry, (table B-2). Interest savings on these loans were calculated on the assumption that each loan was made at the JDB minimum interest rate and at terms typical of JDB loans to the machine tool industry--a 7-year repayment period and quarterly payments. 3/ Subsidies inherent in loans for technology development are charged to the period the loan is in force.

1/ From 1977 to 1981, 48 percent of new JDB loans for the development of technology went to the computer industry. Because industry-specific data on outstanding loans are unavailable, this figure will be used to approximate the computer industry's share of outstanding loans. Japan Development Bank "Facts and Figures About the Japan Development Bank," 1981 and 1982.

2/ Production of electronic computers was 1,292,556 million yen in 1980 and 1,478,094 million yen in 1981. Electronics Industries Association of Japan, "Electronic Industries in Japan, 1982," Tokyo, 1982, p. 5.

3/ Loan terms are from Japan Development Bank, "Introducing the Japan Development Bank," 1983. SBFC loans to the machine tool industry have been at interest rates 0.6 percent to 1.3 percent below the prime rate. These interest rates are similar to the JDB minimum interest rate. Testimony of Carl G. Green, June 15, 1983, p. 16.

Table C-1.--Japanese Development Bank loans and subsidies for the development of technology, 1975-1982

Year	1975	1976	1977	1978	1979	1980	1981	1982
Outstanding loans 1/----(million yen)------	231,837	277,000	308,005	316,332	366,780	401,572	421,025	435,308
Subsidy----(million yen)------------	4,428	5,208	5,421	5,188	6,529	7,112	8,420	8,358
Outstanding loans----(million dollars)-----	781	934	1,147	1,503	1,674	1,771	1,909	1,748
Subsidy----(million dollars)--------	15	18	20	25	30	36	38	34
Outstanding loans 2/----(million 1982 dollars)---	1,360	1,528	1,767	2,149	2,126	1,972	1,949	1,748
Subsidy----(million 1982 dollars)---	26	29	31	35	38	40	39	34

1/ Data are as of March 31 of that year. Data on average annual loan balances are unavailable.
2/ These data are adjusted for inflation using the producer price index. Price indexes, exchange rates, and interest rates used in estimating subsidies are from the International Monetary Fund.

Source: Data on outstanding loans are from official statistics of the Japan Development Bank. Subsidies are estimated by the staff of the U.S. International Trade Commission.

Because the benefits of these loans may actually not be realized until years after they are made, this procedure may overstate the immediate benefits to subsidized firms. As the data in table C-2 show, loans from the JDB and SBFC to the machine tool industry increased dramatically from 1978 to 1982. However, subsidies inherent in these loans never exceeded 0.01 percent of the total value of the industry's production.

Table C-2.--JDB and SBFC loans and subsidies to the machine tool industry, 1978-82

Year	New loans: Industry elevation	New loans: Technology promotion	SBFC, industry elevation	Total	Interest savings 1/: Amount	Interest savings 1/: Share of value of industry production
	Million yen					Percent
1978	-	-	-	-	-	2/
1979	170	-	345	515	5.7	2/
1980	100	-	140	240	8.6	2/
1981	-	1,200	955	2,155	32.3	2/
1982	1,300	2,500	270	4,070	82.9	.01

1/ Interest savings are for all loans outstanding in a given year, including loans issued in that year.
2/ Less than 0.005 percent.

Source: Official statistics of the JDB and SBFC. Machine tool production data are from MITI and interest savings data are estimates by the staff of the U.S. International Trade Commission.

JDB loans to the robotics industry amounted to 140 million yen in 1980 and 1,250 million yen in 1981. These loans were at interest rates 0.3 percentage point below the prime rate. Subsidies inherent in these loans were 1.7 million yen or 0.002 percent of the value of production in 1980 and 16.3 million yen or 0.02 percent of the value of production in 1981. In addition, small- and medium-size businesses were given loans of 800 million yen in 1981 to finance purchases of robots. Subsidies inherent in these loans were equal to 16.7 million yen or 0.02 percent of the value of production in that year. 1/

Loans for ship purchases.--The JDB also helps the Japanese merchant marine finance ship purchases. JDB loans for this purpose run for a period of 10 years that starts after a grace period of 3 years. These are more favorable terms than those generally available on loans to the computer or machine tool industries. In 1981 the JDB loans covered 75 percent of the cost of containerships and liquefied natural gas (LNG) carriers and 65 percent of

1/ Loans to the robotics industry were discussed earlier in this report in the section on government aids to that industry. Data on robotics production are from Paul Aron, "Robotics Revisited," in Office of Technology Assessment, Social Impacts of Robotics, Washington, February 1982, p. 28. Production data for 1981 are estimated.

the cost of all other ships. In 1983 these loans covered 60 percent and 50 percent of the cost of these ships, respectively. 1/ JDB loans reduced the cost of containerships and LNG carriers by 7.6 percent in 1981 and by 6.9 percent in 1983 and reduced the cost of other ships by 6.6 percent in 1981 and by 5.8 percent in 1983. 2/

In 1979 the Japanese government began giving an additional subsidy to defray the cost of purchasing new ships. This subsidy is equal to 2.5 percent to 3.5 percent of the price of containerships and LNG carriers and to 2.1 percent to 3.0 percent of the price of other ships. 3/

JEXIM provides favorable financing to foreign purchasers of Japanese ships. Terms on these loans generally followed those allowed under the Organization for Economic Corporation and Development (OECD) "Understanding on Export Credits for Ships." These terms are more liberal than those on most exports, which are financed at terms allowed by the OECD "Arrangement on Guidelines for Officially Supported Export Credits." 4/ A typical loan to support a ship export calls for a 20-percent downpayment, an interest rate of 8 percent, and 17 equal semiannual payments. At a market interest rate of 8.8 percent, this loan reduces the cost of purchasing a ship by 5.3 percent. 5/

Tax policies

The Japanese Government gives three major types of tax benefits to targeted firms: tax credits, accelerated depreciation, and tax-free reserves. Accelerated depreciation and tax-free reserves primarily benefit firms by allowing them to defer tax payments. The subsidies inherent in these policies can be measured using present-value analysis.

1/ Information on these loans is from U.S. Maritime Administration, Maritime Subsidies, 1981, p. 94, and 1983, p. 82. Interest is paid during the grace period.

2/ These JDB loans carry the bank's minimum interest rate, 8.0 percent in 1981 and 7.3 percent in 1983. The market rate of interest is the long-term prime rate, 8.8 percent in 1981 and 8.4 percent in 1983. Market interest rates are adjusted to 9.8 percent in 1981 and 9.3 percent in 1983 to take account of the requirements for a 10-percent compensating balance. To determine the sensitivity of these calculations to the interest rates, savings were recalculated using 1979 interest rates: a JDB minimum interest rate of 6.05 percent, a long-term prime rate of 7.1 percent, and an adjusted market interest rate of 7.9 percent. At these interest rates, the 1981 loan terms reduced the cost of containerships and LNG carriers by 9.8 percent and reduced the cost of other ships by 8.5 percent; the 1983 loan terms brought cost reductions of 6.6 percent and 5.5 percent, respectively.

3/ U.S. Maritime Administration, op. cit., p. 94.

4/ The OECD Arrangement does not cover military equipment, agricultural commodities, nuclear power plants, aircraft, and ships.

5/ Loan terms are from U.S. Maritime Administration, op. cit., p. 94, and are for both 1981 and 1983. The market interest rate of 8.8 percent was the long-term prime rate on Mar. 31, 1981. The market interest rate was adjusted to 9.8 percent for the 10-percent compensating balance requirement common for long-term commercial loans.

Accelerated depreciation.--The Japanese tax code allows accelerated depreciation for a number of types of equipment. Accelerated depreciation allows a firm to deduct the cost of depreciating its equipment sooner than otherwise would be the case. 1/

The advantages of accelerated depreciation are equal to--

$$ADS = i \left(\sum_{t=o}^{N} (d_t^t X - d_t X)/(1 + r)^t \right)$$

Here i is the income tax rate, d_t^t is the percent of an asset's value a targeted firm can charge to depreciation in year t, d_t is the same percent for a nontargeted firm, and X is the value of the asset. This equation can be divided through by X to express the savings due to accelerated depreciation as a share of the value of the asset.

For example, the Japanese Government allows purchasers of systems that integrate data analysis equipment and industrial machinery, such as robots, to take additional depreciation of 13 percent in the first year. 2/ Because total depreciation may not exceed the asset's acquisition cost, this provision reduces depreciation in the later years. Suppose such a system were installed in an auto-manufacturing plant. The Japanese tax code allows auto-manufacturing plants to be depreciated over 10 years. At a 9.8-percent interest rate, the adjusted long-term prime rate on March 31, 1981, and a tax rate of 51.55 percent, the effective Japanese corporate tax rate in April 1981, savings due to accelerated depreciation will equal 6.2 percent of the value of the equipment. 3/

Another example of accelerated depreciation is an allowance given the merchant marine. The owners of steel vessels used in ocean transportation may take an additional 15 percent depreciation in the first year of the vessel's

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1/ The Japanese tax code does not require that Japanese equipment be purchased to use these accelerated depreciation provisions. If these provisions are used for imported equipment, that will obviously reduce their value to the Japanese industry that sells the equipment involved.

2/ This additional depreciation was recently reduced to 10 percent. Ministry of Finance, An Outline of Japanese Taxes 1982, Tokyo, p. 85. At an interest rate of 9.33 percent, the adjusted long-term prime rate on Mar. 31, 1982, savings due to this accelerated depreciation will be equal to 5.2 percent of the value of the equipment.

3/ Information on the Japanese tax system is from Jimmy W. Wheeler, et al., Japanese Industrial Development Policies in the 1980's: Implications for U.S. Trade and Investment, report prepared for the Department of State, by the Hudson Institute, October 1982, pp. 90-95, and Ministry of Finance, op. cit., pp. 84-87. This tax rate includes the enterprise and inhabitant's taxes and is for corporations with over 8 million yen in taxable income.

This calculation assumes double-declining-balance depreciation. The Japanese tax code also permits firms to use straight-line depreciation. Using the latter, savings from accelerated depreciation are 3.4 percent of the value of the equipment. At the assumed interest rate, however, firms would prefer the double-declining-balance method.

To test the sensitivity of this calculation to the assumed interest rate, the savings due to accelerated depreciation were reestimated assuming an interest rate of 7.1 percent, the long-term prime rate on Mar. 31, 1979. At this interest rate, adjusted to 7.9 percent due to the compensating balance requirement, the savings were 6.1 percent of the value of the equipment.

life. The Japanese tax code allows ocean-going vessels to be depreciated over 15 years. Given the same tax rate and interest rate assumed in the previous example, savings due to accelerated depreciation would be equal to 7.2 percent of the vessel's value. 1/

Tax-free reserves.--The Japanese tax code sometimes allows firms to put part of their income in a tax-free reserve. Taxes on this income are then deferred until it is withdrawn from the reserve.

One such tax-free reserve is for the repurchase of computers. Japanese computer manufacturers are allowed to put 20 percent of the value of their sales to computer-leasing organizations into a tax-free reserve. 2/ If these manufacturers have to repurchase computers from the leasing organizations because they have been returned by the users, then those losses are charged against the reserve. Any funds left in the reserve after 5 years must be added to income.

Savings due to the this reserve may be determined as a share of sales to leasing organizations using the following formula:

$$FRS = ai\left(1 - \left(\sum_{i=1}^{4} B_t \big/ (1+r)^t\right) - \left(1 - \sum_{i=1}^{4} B_t\right)\big/(1+r)^5\right)$$

where a is the share of income from sales to leasing companies that may be placed in the reserve, and B_t is the share of funds placed in the fund in a given year that must be withdrawn at time t. Because data are not available on B_t, FRS cannot be calculated. The maximum savings would occur if all B_t were zero, so there were no withdrawals from the fund until the fifth year. Assuming that the interest rate is 9.8 percent and the tax rate is 51.55 percent, the maximum savings due to this tax-free reserve would be 3.8 percent of sales to leasing companies. 3/ Sales to leasing companies constitute 42 to 59 percent of total sales. 4/ Thus, savings from this tax-free reserve are no more than 2.2 percent of total sales.

1/ Information on the depreciation schedule for vessels is from Wheeler, et al., op. cit. Again, double-declining-balance depreciation was assumed. At the given tax and interest rates, firms would prefer this procedure to the straight-line method. At a 7.1-percent interest rate, adjusted to 7.9 percent due to the compensating balance requirement, savings are equal to 7.1 percent of the vessel's value. Accelerated depreciation, the low-interest loans, and the interest-rate subsidy the Japanese Government gives its merchant marine resulted in combined savings of 17.3 to 18.3 percent of the cost of a new containership in 1981.

2/ In the 1960's, only 15 percent of the value of these sales could be placed in the tax-free reserve. Currently more than 20 percent can be placed in the reserve by companies with particularly large needs to buy back computers. The 20 percent figure will be used in these calculations. Wheeler, et al., op. cit., p. 142.

3/ The average computer leased from the JECC is returned in 3 years. If all funds are withdrawn from this reserve in 3 years, this reserve would yield savings equal to 2.5 percent of the value of sales to leasing companies. For these calculations the market interest rate was adjusted to 9.8 percent to take account of the compensating balance requirement.

4/ Based on 1977 data from the Semiconductor Industry Association.

These calculations provide only an upper limit on the subsidies inherent in the repurchase reserve. Data from the Japanese Ministry of Finance suggest that the acutal subsidies may be much smaller. These data show that revenue losses due to the repurchase reserve were equal to 2 billion yen in both 1980 and 1981, 0.1 percent of the value of the industry's production in that year. 1/

Another example of a tax-free reserve is that allowed computer software producers. These firms may put up to 25 percent of their income from sales of programs in a tax-free reserve for up to 4 years. 2/ The purpose of this reserve is to cover losses due to purchaser claims under computer program guarantees. The maximum subsidy due to such a reserve, assuming that all funds stay in the reserve for 4 years, will be equal to 4.0 percent of software sales. 3/

1/ Wheeler, et al., op. cit., pp. 100-101.

2/ This reserve is described in Wheeler, et al., op. cit., and in J. Gresser, "High Technology and Japanese Industrial Policy," Report to the Subcommittee on Trade of the House Committee on Ways and Means, Oct. 1, 1980, p. 25. Funds placed in this reserve may not exceed 50 percent of profits.

3/ The subsidy is calculated assuming an adjusted interest rate of 9.8 percent and a tax rate of 51.55 percent.

APPENDIX D

DEFINING THE DOMESTIC INDUSTRY

Defining the Domestic Industry

Each of the import relief statutes administered by the Commission requires that the agency define the term "domestic industry" on a case-by-case basis. The term generally means a group of competitors clustered on the basis of their "particular products and [production] processes." 1/ Each import relief statute either contains standards or the administration of the statute has resulted in standards that have been upheld by the reviewing court and acquiesed in by congressional oversight committees.

In antidumping and countervailing duty investigations, 2/ Title VII of the Tariff Act requires a domestic industry to be constructed from firms producing a product "like" the imports subject to investigation. In turn, the like product is defined in terms of characteristics and uses. 3/ The law requires that, to the degree necessary information is available, the materials, appearance, texture, quality, and use of the imports subject to investigation determine the selection of domestic producers of substitutable articles to define the appropriate industry against which injury will be assessed. In those cases where such data are not available to the Commission, the law provides that the industry shall consist of the domestic producers of the narrowest range of products that includes the like product. 4/

In import relief cases filed under section 201 of the Trade Act, the domestic industry is defined in terms of products like or directly competitive with the imports subject to investigation. 5/ In the case of section 201, the term "like" originated from its use in Article XIX of the GATT, where it is used in terms of product classification in tariff classification and customs administration. 6/ Directly competitive articles have been considered to be those that are substitutable commercially with the imports subject to investigation. 7/

Special duties to offset the less-than-fair-value sales or the net subsidy are the sole relief available (other than negotiated suspension agreements) under the antidumping and countervailing duty provisions of the law. A significant difference between import relief in section 201 and antidumping or countervailing duty cases is the ability to fashion relief responsive to the injury found to exist in the section 201 investigations. In this connection, section 601(5) of the Trade Act provides--

> An imported article is "directly competitive with" a domestic article at an earlier or later stage of processing, and a domestic article is "directly competitive with" an imported article at an earlier or later stage of processing, if the importation of the article has an economic effect on producers of the domestic article comparable to the economic effect of importation of articles in the same stage of processing as the domestic article . . . .

1/ R. Reich, "Beyond Free Trade," 61 Foreign Affairs, p. 793 (1983).
2/ Section 771(4)(A).
3/ Section 771(10A).
4/ Section 771(4)(D).
5/ Section 201(a)(2)-(3).
6/ J. Jackson, World Trade and the Law of GATT, pp. 260-261 (1969).
7/ S. Rept. No. 93-1298 (93d Cong., 2d Sess.), pp. 121-22 (1974).

This provision was first legislated in the Trade Expansion Act of 1962. 1/ It was construed narrowly under that act. The narrow construction was upheld in litigation 2/ and adopted by the Senate Finance Committee in the legislative history of the present provision. 3/

Nearly all of the investigations conducted under section 337 have involved alleged unfair trade practices concerning intellectual property rights. In patent-based section 337 investigations, the Commission has uniformly defined the term industry in terms of the domestic operations of the patent owner, its assignees, and licensees devoted to the production and sale of the articles covered by the patent at issue. 4/ This principle has been extended to trademark and copyright cases as well. 5/

Although the specific standards for determining the appropriate industry differ from statute to statute, a common problem with each of the statutes concerns the attributes necessary to make an industry domestic for the purposes of each of these import relief statutes. Examples of analyses the Commission has employed in making this determination are found in: Certain Radio Paging and Alerting Recovery Devices from Japan (antidumping, title VII of the Tariff Act); 6/ Heavyweight Motorcycles, and Engines and Power Train Subassemblies Therefore (section 201 of the Trade Act); 7/ and Certain Miniature Battery-Operated All Terrain, Wheeled Vehicles (section 337 of the Tariff Act). 8/

1/ Sect. 405(4), Public Law 87-794, 87th Cong., 76 Stat. 872 (Oct. 11, 1962).

2/ United Shoe Workers of America v. Bedell, 506 F.2d 174 (D.C. Cir. 1974).

3/ S. Rept. No. 93-1294, p. 122.

4/ Certain Ultra-Microtome Freezing Attachments, Investigation No. 337-TA-10, USITC Pub. No. 771 (April 1976).

5/ Certain Coin-Operated Audiovisual Games, Investigation No. 337-TA-105, USITC Pub. No. 1267 (July 1982).

6/ Investigation No. 731-TA-102 (Final), USITC Pub. No. 1410 (August 1983).

7/ Investigation No. TA-201-47, USITC Pub. No. 1342 (1983).

8/ Investigation No. 337-TA-122, USITC Pub. No. 1300 (1982); aff'd, Schaper Manufacturing Co. and A. Eddy Goldfarb d/b/a/ A Eddy Goldfarb & Associates v. U.S. International Trade Commission, Soma Traders, Ltd, et al. (U.S.C.A.F.C. Appeal No. 83-713, Sept. 22, 1983).

APPENDIX E

DIFFERENCES BETWEEN U.S. AND JAPANESE ANTITRUST LAWS

Differences Between U.S. and Japanese Antitrust Laws

This Appendix discusses differences between the United States and Japan with respect to societal antitrust values, antitrust enforcement, and the antitrust treatment of depression cartels and joint ventures for research and development.

Antitrust values

The 1955 Report of the Attorney General's National Committee To Study the Antitrust Laws states that "the general objective of the antitrust laws is the promotion of competition in open markets." 1/ This includes preserving opportunities for newcomers to enter fields of economic activity and encouraging a market-oriented environment in which consumers "will have the maximum possible choice as to what goods are produced and offered to them, and . . . will receive the lowest possible price for such goods." 2/

Historically, the administration of the antitrust laws has resulted in the projection of political values "into the economic sphere." 3/ One of the effects of antitrust enforcement is to subject powerful decisionmakers in otherwise unregulated markets "to the threat of encroachment by other authorities . . . ." 4/ Antitrust enforcement both prevents the concentration of economic power and promotes pluralism in national economic decisionmaking. Professor Louis Schwartz phrases the gist of antitrust policy as "How much power politically is too much?" 5/

Prior to the occupation of Japan by U.S. forces following World War II, there was no Japanese legislation equivalent to antitrust legislation. The Anti-Monopoly Law of 1947 was modeled on the U.S. Sherman, Clayton, and Federal Trade Commission Acts. 6/ The legislation was more stringent than U.S. law, and opposition to its provisions resulted in amendments in 1952 exempting depression cartels and rationalization cartels, eliminating a

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1/ Department of Justice, Report of the Attorney General's National Committee To Study the Antitrust Laws (Washington, D.C. (1955)) at 1.

2/ Steiner and Vagts, Transnational Legal Problems: Materials and Text (2d ed. 1976), at 989.

3/ Neale and Goyder, The Antitrust Laws of the U.S.A.: A Study of Competition Enforced by Law (3d ed. 1980), at 442.

4/ Id.

5/ Address, New York University Conference on Competition and World Markets: Law and Economics 110, 111 (May 14, 1982) (transcript available at N.Y.U.J. Int'l L. & Pol. Office), quoted in Fox, Competition and World Markets: Law and Economics, 15 N.Y.U.J. Int'l L. & Pol. 299, 304 (1983).

At present, the Department of Justice's policy toward antitrust enforcement is to promote the efficient allocation of resources exclusively. Attorney General William French Smith's Remarks to the District of Columbia Bar, reprinted in Antitrust & Trade Reg. Rep. (BNA) No. 1047, at H-1 (July 2, 1981); Interview with William F. Baxter, Assistant Attorney General, Antitrust Division, Report from Official Washington, 51 A.B.A. Antitrust L. J. 23 (1982).

6/ Kintner and Joelson, An International Antitrust Primer (1974), at 253.

provision holding cartels to be illegal per se, and eliminating another providing for the dissolution of large companies based on size alone. 1/

From the mid-1950's through the 1970's there was very little political constituency for antitrust enforcement. A competing policy, that of encouraging large-scale production capable of global competition, prevailed, 2/ and there was a general merger trend. 3/ The relationship between MITI and industry trade associations encouraged informal coordination of capacity increases and pricing through the Ministry's "administrative guidance." 4/ This phase changed in the late 1970's, when, in part as a result of the Fair Trade Commission's case against an oil cartel, the Anti-Monopoly Act was strengthened by additional amendments. Also in 1980, the Tokyo High Court ruled that administrative guidance suggesting oil pricing practices did not authorize a pricing cartel not otherwise authorized by law. 5/ At this time the Japanese business community is again calling for legislation to cut back the authority of the Fair Trade Commission. 6/

Unlike in the United States, there is virtually no private litigation for damages based on the Anti-Monopoly Law. This can be explained by an aversion to litigation in general and the award of damages in particular in Japanese society. Very few Japanese law graduates are allowed to pass the equivalent of a bar examination, the number of judges is limited, and the caseload of a Japanese district court judge is nearly six times that calculated for a U.S. district court judge in the mid-1970's. 7/ Extensive pretrial discovery is not provided for, and there is no provision for anything equivalent to class action suits. 8/ In Japanese antitrust litigation, the plaintiff must show that an illegal price was not passed along to others to demonstrate the damage suffered. 9/

1/ Matsushita, The Antimonopoly Law of Japan, XI Law In Japan 57 (1978).

2/ See generally McCraw, Antitrust and Regulation in Post-War Japan and the United States, Office of Special Projects, Bureau of Competition, Federal Trade Commission, National Competition Policy (Washington, D.C. (1981)), at 1-60.

3/ Fugate, Foreign Commerce and the Antitrust Laws (1982), at 398. This should not imply that Japanese markets are not competitive. Commentators find Japanese markets to be characterized by intense competition. Hadley, Antitrust Roundtable Discussion, Japan Economic Institute Report, June 5, 1981, at 5.

4/ Administrative guidance is often described as a consensus reached between business executives and Government officials which is "informal, flexible, often off-the-record . . . ." Ramseyer, Japan's Myth of Non-Litigiousness, The National Law Journal, July 4, 1983, 13, at 36.

The close relationship between business executives and Government officials is described in Yamamura, Success That Soured: Administrative Guidance and Cartels in Japan, in Yamamura (ed.), Policy and Trade Issues of the Japanese Economy (1982).

5/ The Fair Trade Commission subsequently released guidelines entitled "Interpretations Concerning the Relation Between the Antimonopoly Act and Administrative Guidances" (March 16, 1981; English).

6/ See, e.g., Keidanren Continues Push To Weaken Antimonopoly Law, The Japan Lawletter, June 1983, at 1-2.

7/ Ramseyer, Japan's Myth of Non-Litigiousness, The National Law Journal, July 4, 1983, 13, at 36.

8/ Id.

9/ Id.

Antitrust enforcement

The Sherman Act has both criminal and civil penalties. The Clayton and Federal Trade Commission Acts have only civil penalties. Consent decrees are used by both the Department of Justice and the Federal Trade Commission. Both the Sherman and Clayton Acts permit aggrieved private parties to sue in "private attorney general" actions for treble damages and attorneys fees.

In the period 1963-72, "over 7,000 private antitrust actions were filed in the Federal courts." 1/ In 1980, approximately 1,500 Federal antitrust cases were filed. All but 3 percent were private actions. 2/ As a former Justice Department antitrust official commented:

> With our process of virtually unlimited and undisciplined discovery, a plaintiff can seek to make his case *after* he has filed his complaint. Furthermore, the treble damage remedy is an incentive to bring cases on the flimsiest theories . . . . A further problem is that, unlike almost every other nation in the world, we don't assess the adversary's attorneys fees to the losing party in a litigation. So there is very little lost in prolonging these cases. 3/

A recent study of the antitrust experiences of 188 U.S. companies found that "For several companies, antitrust costs were nearly 10% of net income for the decade [1971-80]." 4/

> The average *Fortune* 500 corporation spent nearly $6 million between 1971 and 1980 on antitrust investigations, legal fees, fines, damages, court costs, and out-of-court settlements . . . . Including the costs of counseling in antitrust--management and legal staff time as well as that of outside counsel--brings the costs for the 1970's to approximately 20 million dollars for a representative company--for antitrust alone! 5/

In many individual cases, the financial stakes are incredibly large:

1/ Breit and Elzinga, Antitrust Enforcement and Economic Efficiency: The Uneasy Case for Treble Damages, in Calvani and Siegfried, Economic Analysis and Antitrust Law (1979), 326, at 327.

2/ Rosenthal, Antitrust Roundtable Discussion, op. cit., at 7.

3/ *Id.* (Emphasis in the original.)

4/ Beckenstein, Gabel, and Roberts, An Executive's Guide to Antitrust Compliance (mimeo, 1983).

5/ *Id.* These figures include costs associated with government enforcement of the antitrust laws as well as private actions.

> SCM sought one-and-a-half billion dollars from Xerox; Berkey three hundred million from Kodak; and Memorex nine hundred million dollars from IBM (all after trebling) 1/
>
> According to most estimates, Control Data settled its monopolization action against IBM for upwards of $100 million (including $15 million to reimburse legal fees and expenses); senior officials of Control Data boasted that the lawsuit had been the best investment the company had ever made. 2/

The treble damages provision, in effect, means that "A plaintiff with a 1-percent chance of winning $100 million in damages frequently will find litigation profitable." 3/ There is a motivation for defensive litigation as well. "Many [corporate] general counsel express the fear of stockholder derivative suits for failure to recover damages that could reasonably be obtained." 4/

There is another perverse effect of the treble damages provision. A customer paying a monopoly price will not necessarily change his behavior to mitigate harm if he suspects an antitrust violation. By absorbing additional damage, the customer is investing in a trebling of the amount of the damages. 5/ It is impossible to estimate the inhibiting effect that private antitrust litigation has on business behavior. Antitrust counsel is an important part of corporate decisionmaking. 6/ "Reported cases are not the issue. That is the least of it. Antitrust in America is done in law offices." 7/

In Japan, antitrust enforcement is carried out exclusively by the Fair Trade Commission, an independent, five-person regulatory commission. The Fair Trade Commission initiates investigations as a matter of discretion. Although thousands of citizen complaints are brought to the agency, 8/ the Commission cannot be compelled to conduct an investigation. 9/ The Commission distinguishes between cases with a "serious social impact" and others. As in

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1/ Report to the President and the Attorney General of the National Commission for the Review of Antitrust Laws and Procedures. Vol. II (1979), at 7.

2/ Handler, Blake, Pitofsky, and Goldschmid, Cases and Materials on Trade Regulation (1975), at 167.

3/ Easterbrook, Comments On "An Economic Definition of Predatory Product Innovation," in Salop (ed.), Strategy, Predation, and Antitrust Analysis (Bureau of Competition, Federal Trade Commission (1981)), 415, 427.

4/ Beckenstein, Gabel and Roberts, <u>supra</u>, page D-6, note 3.

5/ See Breit and Elzinga, op. cit., at 332-338.

6/ See Beckenstein and Gabel, Antitrust Compliance, Results of a Survey of Legal Opinion, 51 Antitrust Bulletin 459 (1983).

7/ Remarks of Josh Greenberg, Roundtable on Predatory Practices, in Salop (ed.), Strategy, Predation, and Antitrust Analysis, op. cit., at 660. An attempt to quantify the amount of economic activity devoted to antitrust is found in Reich, The Antitrust Industry, 68 Georgetown Law Journal 1053 (1980).

8/ The great bulk of complaints involve alleged unfair business practices by small business involved in wholesaling and retailing. Interview with officials of the External Affairs Office of the Fair Trade Commission, July 20, 1983.

9/ National Federation of Consumers' Organizations v. Fair Trade Commission, Tokyo High Court, April 26, 1961.

the United States, certain violations of the antitrust law are criminal offenses punishable by fine or imprisonment. However, few criminal actions have been brought by the Commission. 1/ Like the U.S. Department of Justice and the Federal Trade Commission, the Fair Trade Commission may conclude investigations without a trial or accept a settlement during the course of a trial before a formal decision is reached. 2/

During a 3-year period from the time a formal Fair Trade Commission decision becomes final (including consent orders), 3/ any aggrieved person injured by the antitrust violation may sue for damages on the basis of the Commission's decision without having to prove either willfulness or negligence on the part of the violator. 4/

During the 1970's, several suits for damages were filed on the basis of a favorable Fair Trade Commission decision. 5/ None of the plaintiffs prevailed, although some claims were settled. 6/ In cases where the Fair Trade Commission does not investigate or reach a formal decision, aggrieved persons can sue for damages as a result of a violation of civil obligations under the Civil Code. 7/ Unlike the proceeding based upon a Commission decision, the Civil Code requires a finding of willfulness or negligence on the part of the alleged violator. Although at least two dozen cases for damages have been filed with the courts under the Civil Code, there have been no awards of damages based on antitrust violations. However, it is likely that a number of the cases were settled. 8/

Cartel legislation

Unlike those in Japan, U.S. antitrust laws do not authorize temporary depression or rationalization cartels to allocate markets, fix prices, or limit production, nor does independent legislation authorize cutbacks in industry capacity by means of cartel arrangements in unregulated depressed industries. 9/ The United States Supreme Court explicitly applied a *per se* rule condemning price-fixing agreements in 1940. 10/ An earlier Supreme Court case had upheld the legality of a depression cartel; 11/ the 1940 ruling has

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1/ Kintner and Joelson, An International Antitrust Primer (1974), at 253.

2/ Matsushita, The Antimonopoly Law of Japan, XI Law In Japan 57, 73 (1973).

3/ The Anti-Monopoly Law, Article 26, para. 2.

4/ *Id.*, Article 25, para. 2.

5/ See Symposium: Oil Cartel Cases, 15 Law in Japan (1982).

6/ Interview, *op cit*, July 20, 1983.

7/ Civil Code, section 709--right to claim the indemnification of damages by unlawful activities--"A person who intentionally or negligently violates the rights of another is bound to make compensation for damage arising therefrom." Law No. 89 of 1896 and Law No. 9 of 1898, as amended.

8/ Interview, with officials of the External Affairs Office of the Fair Trade Commission, July 20, 1983.

9/ See pages 155-160 of this report.

10/ United States v. Socony Vacuum Oil Co., 310 U.S. 150 (1940).

11/ Appalachian Coals, Inc. v. United States, 288 U.S. 344 (1933). There was overcapacity in the bituminous coal industry during the 1920's and 1930's. The Hoover administration had assisted the producers in developing a plan for a coal reserve to be operated by a producer cartel "which would pull certain

(Continued)

remained the standard to date. The significance of the per se rule is evidentiary. 1/ If challenged conduct comes within the classification of the per se rule, the challenger has to prove only that as a matter of fact the alleged conduct took place. No justification for the conduct will be admissible in its defense. As Sullivan notes, other effects of the per se rule are that it "frees the judicial system of any need for continuous supervision of arrangements within its ban" 2/ and "it converts the private bar from an instrument tuned very largely to the goal of avoidance to one which presses for enforcement." 3/

Joint research and development ventures

The Law for Extraordinary Measures for Specific Machinery and Information Industries provides an exemption from the Japanese Anti-Monopoly Law for firms collaborating in the development of the key technologies. 4/ As a general proposition, however, the concept of joint research and development does not trigger antitrust concern in Japan. Cooperative research cannot be established as a sham for a price- or output-fixing cartel, 5/ but the Fair Trade Commission does not monitor joint research activities. 6/ In the event that participating companies patented the results but refused to use or license the patents, MITI is authorized to compel their licensing. 7/ There is no apparent legal avenue for a firm to challenge its exclusion from a MITI-sponsored research and development project.

(Continued)

11/ mines out of operation and hold them back until demand for coal revived." Hawley, Antitrust and the Association Movement, 1920-1940, in Office of Special Projects, Bureau of Competition, Federal Trade Commission, National Competition Policy (Washington, D.C. (1981)), at 122-123. The case before the Supreme Court focused on a joint selling agency for 137 coal firms in the Appalachian region. Posner suggests that the Court's decision in Appalachian Coals was influenced by the New Deal's National Industrial Recovery Act legislation (NRA), although its provisions did not apply directly to the challenged selling agreement. The NRA was premised on the depression's having been caused by excessive competition and cartelization as a means of stabilizing the economy. Posner, Antitrust Cases, Economic Notes and Other Materials (1974), at 75.

1/ Neale and Goyder, op. cit., at 30.

2/ Sullivan, Antitrust (1977), at 193.

3/ Id., at 194.

4/ Article II. The law is effective until June 30, 1985.

5/ Article II provides that "this exception shall not be available when an unfair means of transaction is used."

6/ Interview with officials of the External Affairs Office of the Fair Trade Commission, July 20, 1983.

7/ Article 93 of the Japanese Patent Code provides:

> In case the working of a patented invention is particularly necessary for the public interest, any person intending to carry out such patented invention may request an agreement in respect of the grant of a non-exclusive license to the patentee or exclusive licensee.

(Continued)

Joint research and development is relatively rare in the United States. Few reported cases are concerned with joint ventures in that area. Research and development has long been a "sacred cow" in the United States. 1/ However, joint ventures are looked upon with suspicion by antitrust enforcers. 2/ In a 1976 survey conducted by the National Association of Manufacturers, 70 percent of the firms surveyed stated that U.S. antitrust laws, particularly those restricting joint ventures, were a significant deterrent to their increasing exports or investments. 3/ In 1980, the Department of Justice issued a guide concerning joint ventures. 4/ The guide uses illustrative factual situations to exemplify the Department's approach to research joint ventures and contains summaries of the advisory letters of the Antitrust Division during the 1968-80 operation of the Business Review Procedure. 5/

(Continued)

7/ 2. In case no agreement is concluded, or it is impossible to make an agreement, any person desirous of undertaking the working of such patented invention may demand a decision of the Minister of International Trade and Industry.

Law No. 121, (April 13, 1959); English, ENS Law Bulletin Series 6850A.

1/ Sullivan, op. cit., at 299, characterizing the Supreme Court's opinion in United States v. Line Material Co., 333 U.S. 287 (1948).

2/ Joint ventures are often perceived as "quasi-mergers" which "may either necessarily or because of the temptations bred by close association, lead to a reduction of competition among the participating firms in other respects." Kaysen and Turner, Antitrust Policy: An Economic and Legal Analysis (1959), at 136-137. The Supreme Court has stated that joint ventures are not necessarily analyzed by the same criteria as mergers, however. United States v. Penn-Olin Chemical Co., 378 U.S. 158, 170 (1964).

3/ National Association of Manufacturers, The International Implications of U.S. Antitrust Laws (1976), at 4. See, also, Ginsburg, Antitrust, Uncertainty, and Technological Innovation, 24 Antitrust Bull. 635 (1979).

4/ United States Department of Justice, Antitrust Guide Concerning Research Joint Ventures (Washington, D.C. (1980)).

5/ The Business Review Procedure is provided for in 28 C.F.R. 50.6. A similar process exists at the Federal Trade Commission. FTC Advisory Opinions are provided for in 16 C.F.R. 1.2-1.4. The business review program is not reassuring to businessmen. See the testimony of the Chief Executive Officer of Motorola, Hearing on Options To Improve the Trade Remedy Laws, Subcommittee on Trade, U.S. House of Representatives (March 16, 1983) (Draft Transcript, at 101). Also see note 1, page D-14, infra.

On May 8, 1983, the Washington Post reported that retired Admiral and Central Intelligence Agency Deputy Director Bobby R. Inman, Chairman of Microelectronics and Computer Technology Corp., a research and development joint venture by twelve domestic firms with a business review letter from the Department of Justice, had been advised by his lawyer not to take the position with the venture because of its unclear status under the antitrust laws. Thomas W. Lipman, Competitive Boon or Monopoly? The Washington Post, at L-1.

Assuming that a joint venture for research and development is not a sham to divide markets or fix prices, *per se* violations of the antitrust laws, 1/ the arrangement will be judged by the "rule of reason," i.e., a factual inquiry into the purpose and the effect of the agreement. Collateral restrictions subject to the rule of reason are legal if they--

(1) are reasonably ancillary to a lawful main purpose of the agreement;
(2) have a scope and duration no greater than necessary to achieve that purpose, and
(3) are not part of an overall pattern of restrictive agreements that has unwarranted anticompetitive effects. 2/

Although one of the basic benefits of joint research and development is the elimination of duplicative research, both the elimination of ongoing research competition through the establishment of a joint venture 3/ and a collateral agreement by the participants in the joint venture to forgo independent research which competes with that being conducted by the joint venture 4/ could raise antitrust concerns. In addition, there is antitrust hostility toward joint research in environmental regulation areas on the theory that such agreements retard development of expensive antipollution compliance rather than promote research. 5/

Joint ventures for research and development are even more vulnerable on other grounds. Antitrust authorities are far more relaxed with joint research than with joint development. Once the joint researchers have developed a marketable product, any joint exploitation by participants with a more than de minimis share of the relevant market becomes subject to the doctrine of potential competition. 6/ Any firm with a substantial presence in a given product market area and the perceived ability to both conduct its own research and develop new products risks being challenged on antitrust grounds if it seeks a joint venture which could be expected to lead to commercial products.

Finally, assuming that a joint research and development venture successfully developed concepts which became important to competition in markets served by the joint venture participants, and the research effort was not "effectively duplicable" by firms excluded from participation in the

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1/ See Timken Roller Bearing Co. v. United States, 341 U.S. 593,598 (1951); United States v. General Dyestuff Corp., 57 F. Supp. 642,648 (S.D.N.Y. 1944).

2/ Department of Justice, Antitrust Guide, at 5.

3/ *Id*. at 8.

4/ *Id*. at 18.

5/ Remarks of Douglas E. Rosenthal, former Chief, Foreign Commerce Section, Antitrust Division, Antitrust Round Table Discussion, 21 Japan Economic Institute Report (June 5, 1981), at 11. Also, see United States v. Automobile Mfrs. Ass'n, 307 F. Supp. 617 (D.C. Cal. 1969) aff'd per curiam sub nom. City of New York v. United States, 397 U.S. 248 (1970).

6/ In merger cases, the Supreme Court has held that even firms which would not have entered a market independently but might have been perceived by firms in the market as potential entrants would eliminate potential competition by acquiring a firm within the market. United States v. Falstaff Brewing Corp., 410 U.S. 526 (1973).

venture, 1/ the antitrust laws may be read as mandating either access to the venture or to the results--on reasonable terms. 2/

Given these areas of antitrust vulnerability, it is easy to perceive why the Justice Department's Business Review Procedure is not more encouraging. Private litigants would not be intimidated by the Business Review Procedure. The procedure only provides "present enforcement intentions [and] does not preclude subsequent action against the venture . . . ."3/

The opportunity for collusion present in joint ventures makes the blanket exemption from the antitrust laws very unlikely. 4/ Doing away with treble damages 5/ and assessing legal costs to an unsuccessful claimant, 6/ and providing that the would-be joint venture participants confine their joint venture activities as defined in an amendment to the antitrust laws have been

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1/ Department of Justice, Antitrust Guide, at 21.

2/ Associated Press v. United States, 326 U.S.1 (1945). Also, see Problem 14 "Participation of Chemical Research Associates" in Handler, Blake, Pitofsky, and Goldschmid, Cases and Materials on Trade Regulation (1975), at 541.

3/ Department of Justice, Antitrust Guide, at 87. This is similar to the conundrum in the Webb-Pomerene Act. That act exempts U.S. export cartels from the antitrust laws when they are formed solely for engaging in export trade and have no effect on domestic commerce. If challenged on the basis of having an effect on domestic commerce, and found not to have the alleged effect, the cartel never needed the exemption, but if it is found to have an effect on domestic competition it is not exempt. This problem has been remedied by the passage of the Export Trading Act of 1982. That act contains a certificate procedure for export activities; as long as the firm with the certificate is within the scope of the specified activities, it is immune from civil and criminal antitrust suits, except private antitrust suits for single damages.

4/ In an ABA interview with Assistant Attorney General Baxter, op. cit., at 161, he said:

> One can imagine powerful circumstances where the case for aggregation in the joint venture activity is so powerful, because of extreme conditions of increasing returns to scale at the joint venture level, that one would simply have to get a firm grip on his stomach and say, "Sure there are damages flowing back . . . ." I just don't want all those vice presidents in charge of sales meeting as a board of directors in New York once a month.

5/ This has been proposed by Assistant Attorney General Baxter and former Assistant Attorney General Baker. See Justice, Commerce Agree On Package for Antitrust and Patent Legislation, Antitrust & Trade Reg. Rep. No. 1121, at 1248 (June 30, 1983) and Baker, Reagan Administration Proposal Opens Debate on Treble Damages, the National Law Journal, May 9, 1983, at 20.

6/ See Baker, op. cit.

proposed as legislation in the 98th Congress. 1/ The administration has proposed a draft bill which would create a disclosure process less formal than the certification process in the Export Trading Company Act (described in note 1, page C-14, above) in which proposed joint ventures for research and development are specified and reviewed in order to remove uncertainty over potential antitrust liability. 2/

1/ See, e.g., H. R. 3641 (98th Cong., 1st Sess.), introduced on July 25, 1983. The bill would define the terms "research and development" as--

> (A) Theoretical analysis, exploration or experimentation, or
> (B) the extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes, including the experimental production and testing of models, devices, equipment, materials and processes, and may include the establishment of facilities for the conduct of research, the collection and exchange of essential research information, and the conduct of such research and development on a protected and proprietary basis . . . .

2/ Draft Reagan Administration Legislation on Antitrust, Patents, and Joint Research and Development Ventures, Antitrust & Trade Reg. Rep. (BNA) No. 1121, at 1272 (June 30, 1983). Section III of the draft would "de-treble" damages in all antitrust cases which were not *per se* violations and remove research and development joint ventures from the category of *per se* violations. Subsequently, the administration abandoned the general "de-trebling" proposal. Under the amended proposal, research and development joint ventures would not be exempt from all private and Government suits, although only single damages would be allowed for antitrust violation arising from them. W. J. Moore, "Baxter Backpedals from Efforts to Ax Treble Damage Remedy," *Legal Times*, (Sept. 12, 1983); "Reagan Offers Proposal To Reduce Penalties for Joint R. & D. Ventures," *Antitrust & Trade Regulation Report* (BNA) No. 1131, 366 (Sept. 15, 1983).

APPENDIX F

TARGETING TECHNIQUES, BY INDUSTRY

Table F-1--Targeting practices in specific industries

Industry	Measure	Duration
Aircraft	TM/Special Depreciation Measures	1952-76
Aircraft	TM/Special Depreciation Measures	1950-83
Aircraft	FA/FILP/JDB	1953-80
Aircraft	FA/FILP/JDB	1983
Aluminum	Vision	1970's
Aluminum	AE/Cartel under Depressed Industries Law	1978-
Automobiles	HMP/Quotas	1950-65
Automobiles	HMP/Tariffs	1950-72
Automobiles	HMP/NTBs	1964-83
Automobiles	HMP/Technology Licensing	1950-68
Automobiles	TM/Special Depreciation Measures	1952-76
Automobiles	TM/Overseas Marketing Reserve 1/	1964-72
Bearings	HMP/Buy Japan	1950-65
Bearings	AE/Cartel under Industry Promotion Law	1955-
Bearings	TM/Special Depreciation Measures	1952-76
Biotechnology	R&D Grants and Subsidies	1983
Biotechnology	Regional Technopolis Development Program	1982-present
Clocks and watches	Vision	1970's
Coal	FA/FILP	1950-65
Coal	FA/FILP/JDB	1953-80
Color TV's	Vision	1970's
Color TV's	HMP/Quotas	1950-64
Color TV's	HMP/Tariffs	1953-71
Computers	HMP/Tariffs	1950-76
Computers	HMP/Closed Government Procurement	1950-81
Computers	TM/Special Depreciation Measures	1960-83
Computers	TM/Tax-Free Reserves	1961-83
Computers	FA/FILP/JDB	1983
Computers	FA/FILP/JDB	1951-76
Computers	TM/Special Depreciation/Industry Promo. Law	1960-83
Computers	R&D Grants and Subsidies	1983
Computers	R&D with NTT	1970-83
Computers	R&D Grants/Industry Promotion Law	1958-83
Computers	TM/Can write off 20% of the purchase price in the first year.	1971-72
Computers	TM/Can write off 25% of the purchase price in the first year.	1972-75
Computers	TM/Can write off 20% of the purchase price	1976-77
Consumer Electronics	HMP/Tariffs and quotas	1950-65
Consumer Electronics	FA/Export subsidies	1957-71
Cotton spinning	Vision	1970s
Cotton spinning	AE/Cartel under Depressed Industries Law	1978-
Elec. Machinery	HMP/NTBs	1970s
Elec. Machinery	HMP/Technology Licensing	1950-68
Elec. Machinery	TM/Special Depreciation Measures	1967-82
Elect. Machinery	FA/FILP	1950-65
Elect. Machinery	FA/FILP/JDB	1977-81
Elect. Machinery	FA/FILP/JDB	1953-80
Elect. Machinery	Regional Technopolis Development Program	1982-present
Elect. Machinery	R&D Grants/Industry Promotion Law	1957-83

Table F-1--Targeting practices in specific industries--Continued

Industry	Measure	Duratio
Elect. Machinery-----	MITI Development Plans	1956-83
Elect. Machinery-----	TM/Special Depreciation/50% additional depreciation for first 3 years	1951-61
Elect. Machinery-----	TM/Important Industrial Use Rationalization Machines/50% add'l depreciation in 1st year	1952-62
Elect. Machinery-----	AE/13 Cartels under Industry Promotion Law	1971
Elect. Machinery-----	AE/15 Cartels under Industry Promotion Law	1972
Elect. Machinery-----	AE/17 Cartels under Industry Promotion Law	1973
Elect. Machinery-----	AE/1 Cartel under Industry Promotion Law	1979
Elect. Machinery-----	AE/1 Cartel under Industry Promotion Law	1980
Electric Power-------	FA/FILP	1950-65
Electric Power-------	FA/FILP/JDB	1951-80
Electric Power-------	FA/FILP/JDB	1983
Electric Power-------	MITI Development Plans	1951-75
Electronics----------	AE/1 Cartel under Industry Promotion Law	1966-70
Electronics----------	AE/2 Cartels under Industry Promotion Law	1971
Fertilizers----------	TM/Special Depreciation Measures	1952-76
Fiber optics---------	R&D with NTT	1970-83
Film-----------------	HMP/Quotas	1950-71
Gears----------------	HMP/Buy Japan	1950-65
Industrial Machinery	HMP/Buy Japan	1950-65
Industrial Machinery	TM/Special Depreciation Measures	1952-76
Industrial Machinery	FA/FILP/JDB	1977-81
Industrial Machinery	TM/Special Depreciation/add'l 50% for 3 yrs.	1951-61
Industrial Machinery	TM/Important Industrial Use Rationalization Machines/50% add'l depreciation in 1st year	1952-62
Iron and Steel-------	FA/FILP/JDB	1953-80
Iron and Steel-------	AE/Administrative Guidance Cartel	1958-74
Iron and Steel-------	Vision	1970's
Iron and Steel-------	AE/Cartel under Depressed Industries Law 2/	1978-
Machine Tools--------	HMP/Buy Japan	1950-65
Machine Tools--------	HMP/Quotas	1950-71
Machine Tools--------	HMP/Technology Licensing	1950-68
Machine Tools--------	TM/Special Depreciation Measures	1950-83
Machine Tools--------	FA/Fiscal and Investment Loan Program (FILP)	1975-83
Machine Tools--------	TM/Special Depreciation/Industry Promo. Law	1957-83
Machine Tools--------	R&D Grants and Subsidies	1983
Machine Tools--------	R&D Grants/Industry Promotion Law	1957-83
Machine Tools--------	TM/Can write off 25% of the purchase price in the first year for NC machine tools.	1976-82
Machine tools--------	Administrative guidance/bank pressure	1977
Machine tools--------	FA/Grants/Motorbike wagering proceeds	1978-82
Machine tools--------	HMP/NTBs	1980

Table F-1--Targeting practices in specific industries--Continued

Industry	Measure	Duration
Machinery 3/	HMP/Buy Japan	1950-65
Machinery	FA/FILP/JDB	1953-80
Machinery	R&D Grants and Subsidies	1978-80
Machinery	Research Use-Machines/write-off in 3 years	
Machinery	TM/50% of the price of machinery that uses new technology write-off in 1st year.	1953-60
Machinery	TM/33% of the price of machinery that uses new technology write-off in 1st year.	1961-75
Machinery	TM/33% of the price of industrial mach.can be written off in the 1st year.	1961-63
Machinery	TM/25% of the purchase price can be written off in the 1st year.	1964-73
Machinery	TM/16% of the purchase price can be written off in the 1st year.	1974
Machinery	TM/8% of the purchase price can be written off in the first year.	1975
Machinery	TM/Can write off 25% of the purchase price of Machinery that uses computers in 1st year	1978-83
Machinery	AE/8 Cartels under Industry Promotion Law	1960-65
Machinery	AE/11 Cartels under Industry Promotion Law	1966-70
Machinery	AE/17 Cartels under Industry Promotion Law	1971
Machinery	TM/Special Depreciation for R&D equip.	1953-63
Machinery	TM/Cost of Machinery and Equipment for R&D can be written off in the 1st year	1964-66
Nuclear Power	TM/Special Depreciation Measures	1952-76
Nuclear Power	MITI Development Plans	1960-81
Petrochemicals	TM/Special Depreciation Measures	1952-76
Petrochemicals	FA/FILP/JDB	1983
Petrochemicals	AE/Cartel under Depressed Industries Law	1982-83
Pharmaceuticals	R&D Grants and Subsidies	1978-80
Polyethelene	Vision	1970's
Precision Machinery	FA/FILP/JDB	1953-80
Precision Machinery	R&D Grants and Subsidies	1978-80
Precision Inst.	R&D Grants/Industry Promotion Law	1960-83
Printing machines	HMP/Quotas	1950-71
Pulp and paper	TM/Special Depreciation Measures	1952-76
Pulp and paper	Vision	1970's
Robots	R&D Grants/Industry Promotion Law	1970-83
Robots	TM/Special Depreciation Measures	1970-83
Robots	FA/FILP/JDB and SBFC	1978-83
Robots	TM/Special Depreciation/Industry Promo. Law	1971-83
Semiconductors	HMP/Technology Licensing	1950-75
Semiconductors	R&D Grants and Subsidies	1983
Semiconductors	R&D with NTT	1970-83
Semiconductors	Regional Technopolis Development Program	1982-present

Table F-1--Targeting practices in specific industries--Continued

Industry	Measure	Duration
Shipbuilding	FA/FILP/EXIM	1951-76
Shipbuilding	FA/FILP/JDB	1953-83
Shipbuilding	FA/Grants to shipbuilders	1979-present
Shipbuilding	AE/Cartel under Depressed Industries Law	1978-83
Iron and Steel	HMP/Quotas	1950-61
Iron and Steel	TM/Special Depreciation Measures	1950-76
Iron and Steel	TM/Overseas Marketing Reserve 1/	1964-72
Iron and Steel	FA/FILP	1950-65
Iron and Steel	FA/FILP/JDB	1951-76
Iron and Steel	MITI Development Plans	1951-63
Synthetic fiber	Vision	1970's
Synthetic fiber	TM/Special Depreciation Measures	1952-76
Synthetic fiber	AE/Cartel under Depressed Industries Law	1978-83
Telecommunications	HMP/Closed Government Procurement	1950-81
Telecommunications	R&D with NTT	1970-83
Textiles	FA/FILP/JDB	1953-80
Transportation	R&D Grants and Subsidies	1978-80
Typewriters	HMP/Quotas	1950-71
Valves	HMP/Buy Japan	1950-65
Vinyl chloride resin	Vision	1970's

1/ While this measure was not specifically directed at the automobile and steel industries, they were the major users of this provision.

2/ Only open-hearth and electric furnace steelmakers are eligible for this cartel. In 1982, these producers accounted for 18.2 percent of Japanese steel capacity.

3/ Includes all products considered machinery, including electronic and electrical machinery, machine tools, robots, etc.

KEY: AE=Antitrust exemptions, EXIM=Export-Import Bank of Japan, FA=financial assistance, FILP=Fiscal Investment and Loan Program, HMP=home market protection, JDB=Japan Development Bank, NTT=Nippon Telephone and Telegraph, TM=special tax measures.

Table F-2.--Rates of duty in selected targeted industries in Japan, 1983

(Percent ad valorem)

CCCN No.	Description	Rate of duty
	Computers:	
84.52.111, 112, 119	Computers with 2,000 or fewer characters of main memory	8.7
84.52.121	Computers with 100,000,000 or more characters of main memory	0
84.52.129	All other computers	15.2
84.53.111, 112 119	Automatic digital data processing equipment including CPU's	4.9
84.53.121-129	Miscellaneous peripheral equipment	6.0
84.55.22	Card readers, card sorters, etc	3.5
	Semiconductors:	
85.19	Semiconductors	4.5
85.19	Switches, resistors, and printed circuits	4.5
85.21.293	Light emitting diodes, encased	7.6
85.21.219	Light emitting diodes	5.6
85.212.-299	Integrated circuits	4.2
85.21.300-399	Microassemblies, photocells, mounted photo-electric crystals	4.9
	Machine tools and robots:	
84.45.114	Numerically-controlled machine tools for metal-working	0
84.45	All other metal and metal carbide working tools	0
84.46	Ceramic, glass, stone, and concrete working tools	12.0
84.48	Parts for above (84.45-84.46)	6.0
85.11.100	Welding machines	12.0
85.11.211	Numerically controlled welding machines	9.5
85.11.221	Other numerically controlled machines	9.5
85.11.310	Part for 85.11	12.0
85.11.310	Other machines (if numerically controlled)	9.5
85.11	Other machines (not numerically controlled)	12.0
	Aircraft:	
84.06.210	Parts for aircraft engines	6.7
84.08.111, 112 119	Turbojects, turboprops and other aircraft engines	6.7
84.08.129	Other aircraft engines	6.7
85.15.310	Aircraft and aircraft control radar	6.0
88.02.112	Aircraft with four or more engines	5.4
88.02.113-199	Propeller aircraft	7.6
88.03	Parts for above (88.01-88.02)	8.1
85.08.220	Spark plugs for aircraft	4.9
85.08.392	Distributors and ignition coils for aircraft	4.9

Source: Tariff Schedules of Japan.

Table F-3.--Corporate funding in Japan, by sources of funding, 1975-81

Year	Total	Borrowing	Direct Finance 1/	Borrowing	Direct Finance
	--------Actual, in million yen----			--Percent of Total--	
1975	1,640,596	1,129,107	511,489	68.8	31.2
1976	1,777,351	1,218,588	588,763	68.6	31.4
1977	1,864,339	1,267,059	597,280	68.0	32.0
1978	2,038,503	1,394,322	664,181	67.7	32.3
1979	2,304,241	1,536,831	767,410	66.7	33.3
1980	2,535,745	1,662,570	873,175	65.6	34.4
1981	2,820,668	1,850,330	970,338	65.6	34.4

1/ Direct finance is defined as equity and bond financing. The portion of direct financing accounted for by bonds is about 20 percent with equity accounting for about 80 percent. The data on direct finance includes foreign bonds and equity as well.

Source: Ministry of Finance of Japan estimates.

Table F-4.--Direct investment in Japan, total and by the United States, 1981, 1982, and 1951-82.

Item	1981	1982	1951-82
Number of cases:			
United States	896	859	9,995
Total	2,563	2,552	29,063
United States share of total----------percent--	35	34	34
Value of investment:			
United States--million dollars--	2,354	2,738	13,970
Total---------------do----	8,931	7,703	53,131
United States share of total----------percent--	26	36	26

Table F-5.-- Timetable of liberalization of foreign direct investment in Japan

Date	Action
July 1967	Automatic approval system for establishment of subsidiaries introduced. Establishment of wholly owned subsidiaries of foreign companies was authorized in 17 industries.
March 1969	Establishment of wholly owned subsidiaries of foreign companies was authorized in 44 industries (an addition of 27 industries).
September 1970	Establishment of wholly owned subsidiaries of foreign companies was authorized in 77 industries (an addition of 33 industries).
April 1971	Establishment of subsidiaries with up to 50 percent foreign ownership was allowed in the automobile industry.
August 1971	Establishment of foreign subsidiaries was allowed in all industries (with levels of ownership ranging from 50 to 100 percent, depending on the industry) for all industries except 7. The 7 industries were: manufacturing, sales or leasing of electronic computers or data processing; retail operations with more than 11 stores; real estate; agriculture, forestry and fisheries; oil; and, leather and leather products.
May 1973	Establishment of wholly owned foreign subsidiaries was allowed in all industries except 5: retail operations with more than 11 stores; agriculture, forestry and fisheries; mining; oil; and, leather and leather products. A grace period for liberalization was allowed for 17 industries, including: integrated circuits, pharmaceuticals, record manufacturing, computers, data processing, fruit juice and fruit beverage manufacturing.
	With respect to stock acquisition of existing companies, foreigners were allowed to purchase up to 100 percent of the stock with the consent of the company concerned, and up to 25 percent of the stock without the consent of the company concerned. In certain industries, such as water supply, electric power, and broadcasting, foreign ownership could not exceed 25 percent; in the 5 industries listed above, foreign ownership could not exceed 25 percent, regardless of the consent of the company.

Table F-5.-- Timetable of liberalization of foreign direct investment in Japan--continued

Date	Action
December 1974	Investment in the integrated circuit industry liberalized.
May 1975	Investment in 12 industries, including pharmaceuticals and record manufacturing liberalized.
June 1975	Investment in retail business liberalized.
December 1975	Investment in manufacturing, sales or leasing of computers liberalized.
April 1976	Investment in data processing liberalized.
May 1976	Investment in 2 industries, including fruit juice or fruit beverage manufacturing liberalized.
December 1980	Investment completely liberalized in all industries except 4 (agriculture, forestry and fisheries; mining; oil; and, leather and leather products.) Foreign investment in 11 designated companies, which are in the atomic power, oil, aircraft, narcotic production, and agriculture industries. No one foreign company may own more than 10 percent of the stock issued by the designated companies; and total foreign ownership is limited to a certain percentage, indicated in brackets next to the company name. The companies are Sankyo [25], Katakura Industries [25], Arabian Oil Company [25], Fuji Electric Company [26], Hitachi [30], Tokyo Keiki [32], General Sekiyu [49], Showa Oil Company [50], Mitsubishi Oil [50], Toa Nenryo Kogyo [50], Koa Oil [50].

Table F-6.--Financial indicators for selected Japanese industries, 1978-82

(In percent)

Industry	1978	1979	1980	1981	1982
	Total asset turnover 1/				
Chemicals	1.12	1.11	1.25	1.29	1.23
Iron and steel	.81	.86	.94	1.03	1.01
Nonferrous metals	.98	1.02	1.34	1.37	1.30
General machinery	1.07	1.14	1.18	1.25	1.20
Electrical machinery	1.34	1.38	1.48	1.53	1.48
Transportation machinery	1.66	1.73	1.81	1.89	1.88
	Inventory turnover 2/				
Chemicals	8.29	8.42	9.37	8.54	7.81
Iron and steel	4.38	5.00	5.74	5.82	5.56
Nonferrous metals	4.91	5.41	7.26	6.98	6.02
General machinery	5.96	6.69	7.01	6.88	6.76
Electrical machinery	6.72	7.24	7.73	7.63	7.87
Transportation machinery	15.10	16.11	17.94	18.01	17.85
	Profit margins 3/				
Chemicals	1.3	1.9	2.4	2.0	1.0
Iron and steel	.2	1.7	3.0	2.1	1.3
Nonferrous metals	.6	.4	1.9	1.3	.1
General machinery	1.6	1.9	2.5	2.8	2.4
Electrical machinery	2.2	2.2	2.7	2.6	2.8
Transportation machinery	2.3	2.2	2.3	2.2	1.9
	Return on investment 4/				
Chemicals	1.5	2.1	2.8	2.5	1.2
Iron and steel	.2	1.5	2.8	2.1	1.2
Nonferrous metals	.6	.4	2.4	1.8	0.1
General machinery	1.7	2.1	2.8	3.3	2.8
Electrical machinery	2.9	2.9	3.8	3.7	3.9
Transportation machinery	3.7	3.7	4.0	3.9	3.4

Table F-6.--Financial indicators for selected Japanese industries, 1978-82--Continued

(In percent)

Industry	1978	1979	1980	1981	1982
	Leverage ratio 5/				
Chemicals	79.4	77.8	78.5	76.1	78.4
Iron and steel	89.9	89.1	87.0	85.7	85.1
Nonferrous metals	89.8	89.2	88.7	86.8	87.4
General machinery	79.3	77.9	75.1	75.6	75.0
Electrical machinery	74.2	73.1	72.5	71.5	68.1
Transportation machinery	72.3	71.1	69.1	68.2	67.8

1/ Total asset turnover is defined as the ratio of sales to total assets.
2/ Inventory turnover is defined as the ratio of sales to average inventory.
3/ Profit margins are defined as the ratio of after-tax profits to sales.
4/ Return on investment is defined as the ratio of after-tax profits to total assets.
5/ Leverage ratio is defined as the ratio of debt to total assets.

Source: Ministry of Finance of Japan.

Table F-7.--Partial list of Products covered by elevation plans under the 1978 temporary law for the promotion of the electronic machinery industries 1/

I. Electronic Machinery

1. Electronic measuring instruments

a. Standard measuring instruments or apparatus for basic electrical quantities
b. Numerically controlled pressure measuring instruments (or guages)
c. Electric wave measuring instruments
d. Wave-type measuring and recording instruments
e. High capacity in circuit device measuring instruments

2. High capacity spectrum analyzers

3. Electronic instruments for medical applications

a. Biological analysis instruments (e.g. blood testing machines)
b. Health investigation instruments (e.g. EKG machines)
c. Therapeutic instruments
d. Physical organ aiding instruments

4. Measuring instruments or apparatus for basic physical and chemcial quantities (e.g. shape, pressure)

a. Temperature measuring instruments
b. Pressure measuring instruments
c. Gas analysis instruments

5. Scientific apparatus

6. Communication instruments

a. Multiplex and modem testing apparatus and instruments
b. Fiber light guide testing apparatus and instruments
c. Praetersonic (surface accoustic wave) testing and measuring apparatus

7. Aircraft machinery

a. Automatic communication switching apparatus
b. Terminal control apparatus (entry and landing)

1/ Based on provisional translation of information from MITI.

Table F-7.--Partial list of Products covered by elevation plans under the 1978 temporary law for the promotion of the electronic machinery industries--Continued

8. Digital electronic computers and peripherals

9. Electronic tubes

a. High power microwave tubes
b. Travelling wave tubes
c. Storage tubes
d. Picture tubes

10. Semiconductor devices

a. Silicon semiconductor devices
b. Combination semiconductor devices

11. Integrated circuits

a. Large scale integrated circuits
b. Low power integrated circuits
c. High speed integrated circuits
d. High power, high voltage integrated circuits

12. Discrete parts and mechanical components for integrated circuits

a. Resistors
b. Capacitators
c. Connectors

13. Electronic machinery materials

a. Compound semiconductor materials
b. Photoelectric conversion materials
c. Phospher
d. Magnetic materials
e. Integrated circuit materials
f. Praetersonic
g. Organic packaging materials, organic resistor materials, piezo electric materials and organic thin membrane (e.g. mylar) materials
h. Photosensitive materials
i. Ceramic photosensitive materials, ceramic magnets restrictive materials and ceramic sensor materials
j. Fiber light guide materials
k. High capacity primary and storage batteries

APPENDIX G

JAPANESE GOVERNMENT-SPONSORED RESEARCH AND DEVELOPMENT

Table G-1.--Major R&D projects sponsored by the Japanese Government in 1981

(million dollars)

Project	Funding
Science and Technology Agency:	
Deep Sea Submersible Research Boat	18.5
Underwater Research Technology	1.6
Utilization of Japan Current	.6
Continental Shelf Technology	.1
New Ocean Survey System Technology	.4
Ocean Energy Use Technology	.2
Underwater Laboratory Vessel	.2
Ocean Bottom Earthquake Technology	.3
Agriculture, Forestry and Fisheries Ministry:	
High Intensity Farming Technology	3.0
Efficient Use of Natural Energy in Farming	4.3
Salmon and Trout Hatcheries Technology	.6
Systemic Management of Water Systems	.6
Mountaineous Areas Farm Animal Feed System	1.0
Biological Insecticide Technology	1.5
Animal Husbandry Management	.4
International Trade and Industry Ministry:	
Pattern Recognition System	.7
High Temperature Gas Steel Technology	1.3
Olefin Manufacturing Using Crude Oil	14.3
Jet Engine for Aircraft	8.6
Resource Recycling Technology	6.8
High Performance Laser Compound Production System	12.5
Optically Based Measurement Control System	10.9
C_1 Chemistry Technology	4.1
Nodule Mining of Manganese	.2
High Speed Calculation System for Scientific Research	.8
Energy from Sunlight	10.6
Thermal Energy	8.0
Energy from Coal	4.0
Energy from Hydrogen	2.0
High Efficiency Gas Turbine	4.6
Electromagnetic Flow (MHD) Generators	2.8
Waste Heat Usage System	.6
Special Battery Generation System	.7
New Style Electricity Storage System	1.1
Energy Related Software Systems	.1
Other Ministry Energy Programs	4.0

Table G-1.--Major R&D projects sponsored by the Japanese Government in 1981

(million dollars)

Project	Funding
Science and Technology Agency:	
Deep Sea Submersible Research Boat	18.5
Underwater Research Technology	1.6
Utilization of Japan Current	.6
Continental Shelf Technology	.1
New Ocean Survey System Technology	.4
Ocean Energy Use Technology	.2
Underwater Laboratory Vessel	.2
Ocean Bottom Earthquake Technology	.3
Agriculture, Forestry and Fisheries Ministry:	
High Intensity Farming Technology	3.0
Efficient Use of Natural Energy in Farming	4.3
Salmon and Trout Hatcheries Technology	.6
Systemic Management of Water Systems	.6
Mountaineous Areas Farm Animal Feed System	1.0
Biological Insecticide Technology	1.5
Animal Husbandry Management	.4
International Trade and Industry Ministry:	
Pattern Recognition System	.7
High Temperature Gas Steel Technology	1.3
Olefin Manufacturing Using Crude Oil	14.3
Jet Engine for Aircraft	8.6
Resource Recycling Technology	6.8
High Performance Laser Compound Production System	12.5
Optically Based Measurement Control System	10.9
C_1 Chemistry Technology	4.1
Nodule Mining of Manganese	.2
High Speed Calculation System for Scientific Research	.8
Energy from Sunlight	10.6
Thermal Energy	8.0
Energy from Coal	4.0
Energy from Hydrogen	2.0
High Efficiency Gas Turbine	4.6
Electromagnetic Flow (MHD) Generators	2.8
Waste Heat Usage System	.6
Special Battery Generation System	.7
New Style Electricity Storage System	1.1
Energy Related Software Systems	.1
Other Ministry Energy Programs	4.0

Table G-1.--Major R&D projects sponsored by the Japanese Government in 1981--Continued

(In millions of dollars)

Project	Funding
Construction Ministry:	
Method of Urban Disasters Countermeasures	.5
House Energy System	.5
Environmental Improvement in the Construction Industry	.4
Residential Environment Maintenance in Coastal Areas	.4
Construction Materials Durability Technology	.3
Construction Industry Waste Materials Recycling Technology	.1
Earthquake Resistant Structure Technology	.1
Home Ministry:	
Disaster Prevention in Petroleum "Kombinats"	.4

Source: Submission of Bradley M. Richardson, op cit., p. A-19. Science and Technology Agency, Indicators of Science and Technology, 1981.

Table G-2.--R&D projects sponsored by the Japanese Government, by industry research products, 1966-80

Project area	Time schedule	Purpose	Funding	Type of funding	Companies involved
			Million yen (million dollars)		
Computers----------	1972-76	Development of basic technology for 3d and 5th generation computers.	8,700 $29.4	Conditional loan.	Fujitsu, Hitachi, Mitsubishi Electric, NEC, Oki, Toshiba.
Very large scale Project (VLSI).	1976-79	Development of: basic technology for extra large scale integrators of 4th generation computers.	30,000 $132.3	------do-------	Fujitsu, Hitachi, Mitsubishi Electric, NEC, Toshiba.
Development of basic software and related periphery.	1979-83	Development of software for the 4th generation computers, particularly operating system software.	47,000 $102.3	------do-------	Fujitsu, Hitachi, Matsushita Electric, Mitsubishi Electric, NEC, Oki, Sharp, Toshiba.
Pattern information processing system (PIPS).	1971-80	Development of technology for an information processing system capable of understanding patterns of words, colors, voice, and sounds.	22,073 $82.7	Consigned payment.	Hitachi, Fujitsu, Matsushita, Mitsubishi, NEC, Oki, Sanyo, Electric, Toshiba, Koya Glass.
High speed scientific computer.	1981-89	Development of technology for an information processing system.	22,073	------do-------	Fujitsu, Toshiba, NEC, Mitsubisha Electric, Sanyo, Matsushita, Konishiroku, Hoya Glass
Flexible manufacturing system using lasers.	1977-present	Development of a complex production system which can produce various kinds of machinery components and parts in small batches.	13,000	------do-------	N/A
Software automation.	1976-81	Develop capability for computers to write own software automatically.	6,600 ($30)		Over 100 software firms.
Development of 5th generation computers.	1979-91	Deliberate investigation and development of 1990's computers based upon the newest theory and technology.	11,375 $45.5	------do-------	Fujitsu, Hitachi, Mitsubishi, NEC, Oki, Toshiba.

Table G-2.--R&D projects sponsored by the Japanese Government, by industry research products, 1966-80--Continued

Project area	Time schedule	Purpose	Funding	Type of funding	Companies involved
			Million yen (million dollars)		
Aircraft--Cont.					
FJR-170 experimental engine.	1971-81	Develop civil aircraft engine.	20,400	Consigned payment.	IHI, Kawasaki, Mitsubishi
STOL aircraft----	1978-90	To develop a commercial short take-off and landing aircraft.	25,000	Consigned payment.	Kawasaki, others
Basic technologies:	1981-1990	Develop technologies basic to industries of the 1990's.	104,000	--------do------- payment.	
A. New materials: High-efficiency separation film	------do------		N/A	-------do------	Toray, Teijin, Asahi Chemicals, Kuraray, Toyobo.
Conductivity macromolecule-------	------do------		------do-------	-------do------	Sumimoto Denko Daiseru Chemicals, Asahi Glass, Mitsubishi Chemicals.
High crystalline macromolecule-----	------do------		------do-------	------do-------	Toray, Teijin, Asahi Chemicals Sumitomo Denko, Sumitomo Chemicals.
Fine ceramics	------do------	Develop high strength, corrosion-resistant and high-precision abrasion-resistant fine ceramic materials.	14,160 (59)	------do-------	Toshiba, Kyoto Ceramics, Ishikawajima-Harima Heavy Ind., Kobe Steel, Showa Denko, Sumitomo Denko, Asahi Glass, Electro-Chemistry, Nippon Glass, Special Ceramics, Kurosaki Ceramics, Toyota Machine Tools, Chinagawa White Brick, Inoue Japax Research Institute Toyota Motors

Table G-2.--R&D projects sponsored by the Japanese Government, by industry research products, 1966-80--Continued

Project area	Time schedule	Purpose	Funding	Type of funding	Companies involved
			Million yen (million dollars)		
A. New materials, continued:					
High-efficiency crystal control alloy.	1981-1990	Develop technologies basic to industries of the 1990's	N/A	Consigned payment.	Hitachi Works, Kobe Steel, Daido Special Steel, Mitsubishi Metals, Hitachi Metals, Sumitomo Denko, Ishikawajima Harima Heavy Ind., Mitsubishi Electric Machines, Kawasaki Heavy Ind.
Processing technology for above.	do	do	do	do	Mitsubishi Heavy Ind., Fuji Heavy Ind., Toyota Motors, Toshiba Machines, Ishikawa-Harima Heavy Industries, Misubishi Electric Machinery, Kawasaki Heavy Industries
High molecular composite materials.	do	do	do	do	Toray, Teijin, Mitsubishi Chem., Nippon Carbon
B. Biotechnology	do	do	28,320 (118)	do	
Technology for large scale cultivation and utilization.					Asahi Chemical, Ajinonmoto, Kyowa Fermentation, Takeda Pharmaceutics, Toyo
Bio reactor.	do	do	do	do	Kao Soap, Daiseru Chemicals, Electro-Chemistry, Mitsui Petro chemicals, Mitsubishi Gas Chemistry, Mitsubishi Chemicals

Table G-2.--R&D projects sponsored by the Japanese Government, by industry research products, 1966-80--Continued

Project area	Time schedule	Purpose	Funding	Type of funding	Companies involved
			Million yen (million dollars)		
Gene recombination and utilization.	1981-90	Develop technologies basic to industries of the 1990's.	N/A	Consigned payment.	Sumitomo Chemicals, Mitsui Toatsu Mitsubishi Chemicals, Biological Research Inst.
New Function Elements-integrated circuits			27,120 ($113)		
Supergrid components (ICs).	1981-90	------do-------	8,000 ($36.4)	------do-------	Fujitsu, Hitachi, Sumitomo Denko.
Three dimensional components (ICs).	1981-90	------do-------	9,000 ($40.9)	------do-------	Nippon Electric Corp. (NEC), Oki, Toshiba, Mitsubishi Electric Sanyo Electric Matsushita Electric, Sharp.
Elements with increased resistence to the environment (ICs).	1981-88	------do-------	8,000 ($36.4)	------do-------	Toshiba, Hitachi, Mitsibishi Electric.

APPENDIX H

JAPANESE COMPANY PROFILES

H-1.--Japan's 30 leading exporters, 1981

Company 1/	Value of exports	Exports as a percent of sales
	Billion yen	
Toyota Motor	1,945.0	52
Nissan Motor	1,642.2	53
Nippon Steel	1,156.3	37
Honda Motor	1,070.1	74
Matsushita Electric	741.8	32
Toyo Kogyo	725.4	62
Sumitomo Metal	584.1	44
Mitsubishi Heavy Industries	577.2	37
Hitachi	575.0	29
Sony	553.9	71
Nippon Kokan	521.2	36
Kawasaki Steel	482.1	39
Sanyo Electric	416.6	55
Toshiba	394.5	24
Kawasaki Heavy Industries	389.3	54
Sharp	321.1	59
Yamaha Motor	319.4	64
Isuzu Motors	307.9	43
Ishikawajima-Harima (IHI)	307.3	43
Komatsu	307.1	54
Victor	295.3	69
Nippon Electric Company (NEC)	293.0	31
Kobe Steel	289.4	25
Mitsubishi Electric	250.7	20
Hitachi Shipping	241.5	59
Fuji Heavy Industries	235.7	48
Suzuki Motor	235.7	47
Cannon	209.2	74
JGC (Nikki)	207.7	79
Mitsui Engineering	195.7	59

1/ Ranked by value.

Source: Keizai Koho Center, Japan 1982, p. 35.

Table H-2.--Japan's production and exports, by major manufactured items, 1981

Item	Production	Exports	Ratio of Exports to Production
	1,000 units		Percent
35mm cameras	13,158	10,092	76.7
Watches	107,754	84,641	78.6
Motorcycles	7,413	4,263	57.5
Bicycles	6,601	1,058	16.0
Telephone sets	3,870	1,584	40.9
VTR's	9,498	7,355	77.4
Color televisions	11,630	6,248	53.7
Radios	7,907	5,850	74.0
Microwave ovens	2,416	1,574	65.1
Washing machines	4,758	1,135	23.9
Electric refrigerators	4,206	829	19.7
Electronic calculators (table type)	52,435	41,494	79.1
Manganese dry cells	1,720,839	478,395	27.8

Source: Keizai Koho Center, Japan 1982, p. 35 based on data from the Ministry of Finance and MITI.

H-3.--Profiles of companies that have benefited from targeting through JDB or SBFC loans, research and development grants, or participation in Government supported cooperative R&D projects 1/

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Company Profiles by Industry

Industry	Company
Automobiles	Toyota Motor
Chemicals	
	Kao Corporation
	Kyowa Hakko Kogyo
	Mitsubishi Chemical
	Mitsubishi Gas Chemical
	Mitsui Petrochemical Industries
	Mitsui Toatsu Chemical
	Showa Denko
	Sumitomo Chemical
	Takeda Chemical Industries
	Toyojozo
Electronics	
	Fujitsu
	Hitachi
	Matsushita Electric
	Nippon Electric Company (NEC)
	Oki Electric
	Sanyo Electric
	Sharp
	Sumitomo Electric
	Toshiba
Film	
	Konishiroko Photo Industry
Glass	
	Asahi Glass
	Hoya
	Kurasaki Refractories
	Kyowa Carbon
	Nippon Sheet Glass
	Nippon Carbon

1/ Company profiles are based on information contained in The Oriental Economist, The Japan Company Handbook, 1st Half, 1983. Information for the "Notes" section is based on information in the body of this report.

H-3.--Profiles of companies that have benefited from targeting through JDB or SBFC loans, research and development grants,or participation in Government supported cooperative R&D projects 1/

INDEX

Company Profiles by Industry

1/ Company profiles are based on information contained in The Oriental Economist, The Japan Company Handbook, 1st Half, 1983. Information for the "Notes" section is based on information in the body of this report.

TOYOTA MOTOR
Major industry: Automaker

Sales breakdown:

Product	(Percent of sales) 1982	1981	1980
Passenger cars	60	58	59
Trucks & buses	21	22	22
Other	19	20	19
Export ratio	43	43	41

Major creditors: Mitsui, Tokai, Sanwa, Long-Term Credit Bank

Major stockholders: Sanwa Bank, 5.0%; Mitsui Bank, 5.0%; Tokai Bank, 4.8%; Toyoda Automatic, 4.5%; Nippon Life Insurance, 3.9%; Long-Term Credit Bank, 3.5%; Taisho M-F Insurance, 2.6%; Daiwa Bank, 2.6%; Dai-Ichi M. Life Insurance, 2.4%

Financial Indicators:

	1982 (million yen)	1981
Total assets	2,741,151	1,817,733
Stockholders' equity	1,581,109	1,098,395
Equity ratio	57.7%	60.4%
Debts	83,410	-
Sales	3,849,544	3,506,412
Net profit	141,589	132,727

Notes: Toyota Motor participated in the following Government-sponsored research and development projects:

Fine ceramics, processing technology for high effiencency crystal control alloy

Toyota Motor spent $6.50 million on R&D in fiscal year 1980, or 4.0 percent of sales.

KAO CORPORATION
Major industry: Chemicals

<u>Sales breakdown</u>:

Product	1982	1981	1980
	(Percent of sales)		
Household products	87	84	83
Industrial chemicals	13	16	17
Export ratio:	2	2	2

<u>Major creditors</u>: Fuji, Sumitomo, Dai-ichi Kangyo, Kyowa, Hokkaido, Takushoku

<u>Major stockholders</u>: Chiyoda M. Life Inusrance, 4.7%; Tokio M. & F. Insurance, 4.4%; Sumitomo Bank, 4.3%; Fuji Bank, 4.3%; Daiwa Bank, 4.2%, Barclays Bank, 4.1%; Nippon Life Insurance, 2.9%, Kyowa Bank, 2.5%, Zenkyoren, 2.2%; Foreign ownership, 9.4%

<u>Financial Indicators</u>:

	1982	1981
	(million yen)	
Total assets	194,573	178,313
Stockholders equity	72,874	56,430
Equity ratio	37.5%	31.6%
Debts	8,903	18,315
Sales	280,628	252,438
Net profit	4,777	3,885

Notes: Kao Corporation is participating in the Government-sponsored research project to develop a bioreactor.

KYOWA HAKKO KOGYO

Major industry: Chemicals (particularly biotechnology)

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Drugs	37	34	29
Chemicals and fertilizer	28	30	38
Foods	21	21	19
Alcohol, liquors, and others	14	15	14
Export ratio:	7	9	8

Major creditors: Industrial Bank, Norinchukin, Dai-Ichi Kangyo, Kyowa, Mitsubishi

Major stockholders: Dai-Ichi M. Life Insurance, 7.3%; Industrial Bank, 4.2%; Dai-Ichi Kangyo Bank, 3.8%, Kyowa Bank, 3.8%; Norinchukin Bank, 2.7%; Mitsubishi Trust, 2.2%, Hong Kong Transportation, 2.0%; Foreign ownership, 9.2%

Financial Indicators: (million yen)

	1982	1981
Total assets	189,134	173,709
Stockholders equity	52,971	44,525
Equity ratio	28.0%	25.6%
Debts	39,980	42,115
Sales	217,000	206,471
Net profit	5,100	4,191

Notes: Kyowa Hakko Kogyo is participating in the Government-sponsored research project to develop biotechnology for large scale cultivation and utilization.

MITSUBISHI CHEMICAL IND.
Major industry: Petrochemicals

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Petrochemicals	42	43	48
Carbon products	32	31	27
Chemicals	14	13	-
Agricultural materials	10	11	12
Other	3	3	14
Export ratio	11	12	13

Major creditors: Mitsubishi, Mitsubishi Trust, Industrial Bank, Long-Term Credit Bank, Norinchukin, Dai-Ichi Kangyo

Major stockholders: Meiji M. Life Insurance, 8.1%; Nippon Life Insurance, 7.2%; Mitsubishi Bank, 4.8%; Dai-Ichi M. Life Insurance, 4.3%; Taryo M. Life Insurance, 3.1%; Mitsubishi Trust, 3.0%; Tekio M.-F. Insurance, 3.0%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	784,292	749,820
Stockholders' equity	109,634	111,665
Equity ratio	14.0%	14.9%
Debts	349,335	333,147
Sales	750,000	756,095
Net profit	(6,000)	3,008

Notes: Mitsubishi has participated in the following Government-sponsored research and development projects: development of processing technology for crystal control alloys and gene recombination and utilization.

MITSUBISHI GAS CHEMICAL
Major industry: Chemicals

Sales breakdown: Product	1982	1981	1980
	(Percent of sales)		
Xylene	29	35	37
Industrial chemicals	16	19	17
Methanol	16	18	20
Ammonia	6	13	13
Synthetic resins and others	33	15	13
Export ratio:	11	13	14

Major creditors: Mitsubishi, Mitsubishi Trust, Industrial Bank, Norinchukin

Major stockholders: Nippon Life Inusrance, 7.1%; Mitsubishi Bank, 4.8%; Mitsubishi Trust, 4.6%; Meiji M. Life Insurance, 3.8%; Asahi Glass, 2.9%, Tokio F. & M. Insurance, 2.1%; Bank of Yokohama, 2.0%; Foreign ownership, 3.5%.

Financial Indicators:	1982	1981
	(million yen)	
Total assets	208,499	208,425
Stockholders equity	53,715	52,671
Equity ratio	25.8%	25.3%
Debts	73,025	74,875
Sales	207,178	191,006
Net profit	4,633	6,524

Notes: Mitsubishi Gas Chemical is participating in the Government-sponsored research project to develop a bioreactor.

MITSUI PETROCHEMICAL INDUSTRIES

Major industry: Chemicals

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Ethylene products	38	41	41
Propylene products	34	32	31
Aromatic products	15	13	13
Others	13	13	13
Export ratio:	15	13	13

Major creditors: Mitsui, Mitsui Trust, Long-term Credit Bank, Industrial Bank, Norinchukin, Daiwa

Major stockholders: Toray Industries, 14.8%; Mitsui Bank, 9.7%; Mitsui Trust, 6.2%, Mitsui and Company, 5.4%, Koa Oil (like Wesson Oil) 5.2%, Mitsui M. Life Insurance, 4.7%; Mitsui Engineering and Shipbuilding, 4.2%; Mitsui Toatsu Chemicals, 3.4%; Foreign ownership, 0.8%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	333,015	323,346
Stockholders equity	34,734	36,808
Equity ratio	10.4%	11.4%
Debts	211,974	187,306
Sales	280,341	284,830
Net profit	(1,905)	2,294

Note: Mitsui Petrochemical Industries is participating in the Government-sponsored research project to develop a bioreactor.

MITSUI TOATSU CHEMICAL
Major industry: Chemicals

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Industrial chemicals	52	42	40
Synthetic resins	27	27	26
Fine chemicals	12	13	13
Fertilizers	-	10	11
Others	9	8	10
Export ratio:	12	11	9

Major creditors: Mitsui, Mitsui Trust, Norinchukin, Industrial Bank, Long-term Credit Bank

Major stockholders: Japan Sec. Clearing, 6.7%; Mitsui Trust, 3.2%; Mitsui Bank, 2.9%; Mitsui M. Life Insurance, 2.6%; Taiyo M. Life Insurance, 2.2%; Industrial Bank, 2.0%; Foreign ownership, 0.7%

Financial Indicators: (million yen)

	1982	1981
Total assets	422,277	412,816
Stockholders equity	26,120	25,854
Equity ratio	6.2%	6.3%
Debts	252,206	249,087
Sales	433,331	418,153
Net profit	(4,967)	(6,977)

Notes: Mitsui Toatsu Chemicals is participating in the Government-sponsored research project on gene recomination and utilization.

SHOWA DENKO
Major industry: Chemicals

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Petrochemicals	55	56	60
Chemical & carbon	28	28	23
Inorganic materials & others	17	16	18
Export ratio	10	11	10

Major creditors: Fuji, Yasuda Trust, Industrial Bank, Norincukin, Kyowa, Long-Term Credit Bank

Major stockholders: Fukoko M. Life Insurance, 8.0%; Fuji Bank, 6.2%; Nippon Life Insurance, 4.9%; Dai-Ichi M. Life Insurance, 4.5%; Taiyo M. Life Insurance, 4.2%; Yasida F & M Insurance, 4.0%; Yasuda M. Life Insurance,, 3.9%; Yasuda Trust, 3.3%; Ajinomoto 3.1%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	472,796	467,125
Stockholders' equity	55,326	58,771
Equity ratio	11.7%	12.6%
Debts	281,918	269,794
Sales	370,000	384,490
Net profit	1,000	572

Note: Showa Denko has participated in the Government-sponsored R&D project for fine ceramics.

SUMITOMO CHEMICAL
Major industry: Chemicals

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Industrial chemical & fertilizers	51	54	56
Plastics & rubber	21	20	21
Fire chemicals	13	12	11
Agricultural chemicals	7	4	8
Pharmaceuticals	8	6	8
Export ratio	10	10	9

Major creditors: Sumitomo, Sumitomo Trust, Norinchukin, Industrial Bank

Major stockholders: Sumitomo M. Life Insurance, 8.4%; Nippon Life Insurance, 7.3%; Sumitomo Bank, 4.3%; Sumitomo Trust, 2.9%; Industrial Bank, 2.3%; Long-Term Credit Bank, 2.3%; Dai-Ichi M. Life Insurance, 2.2%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	591,882	599,749
Stockholders' equity	102,487	102,096
Equity ratio	17.3%	17.0%
Debts	247,255	221,967
Sales	630,000	640,760
Net profit	5,000	2,342

Note: Sumitomo Chemical has participated in the Government-sponsored R&D project to develop high crystalline macromolecule, and the gene recombination and utilization project.

TAKEDA CHEMICAL INDUSTRIES

Major industry: Chemicals particularly pharmaceuticals

Sales breakdown:	(Percent of sales)		
Product	1982	1981	1980
Pharmaceuticals	63	60	58
Foodstuffs	12	14	15
Industrial chemicals products	13	13	14
Others	12	13	14
Export ratio:	6	7	7

Major creditors: Sumitomo, Fuji, Mitsubishi, Sumitomo Trust, Industrial Bank

Major stockholders: Nippon Life Insurance, 8.4%; Dai-Ichi M. Life Insurance, 8.2%; Sumitomo Bank, 4.7%; Sumitomo Trust, 2.5%; Takeda Science Foundation, 2.1%; Foreign ownership, 12.6%

Financial Indicators:	1982	1981
	(million yen)	
Total assets	470,985	410,649
Stockholders equity	298,103	165,167
Equity ratio	44.2%	40.2%
Debts	6,310	7,272
Sales	460,416	430,883
Net profit	18,505	17,447

Note: Takeda Chemical Industry is particating in the in the Government-sponsored research project to develop biotechnology for large scale cultivation and utilization.

TOYOJOZO

Major industry: Chemicals (particularly pharmaceuticals)

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Pharmaceuticals	55	56	58
Sake	30	32	31
Others	15	12	12
Export ratio:	2	2	1

Major creditors: Suruga, Norinchukin, Shizuoka, Tokai, Dai-Ichi Kangyo, Long-term Credit Bank

Major stockholders: Asahi Chemical Industries, 35.5%; Suruga Bank, 3.9%; Long-term Credit Bank, 3.9%, Japan Sec. Finance, 3.6%; Tokai Bank, 3.5%, Yamaichi International Europe, 2.7%; Nippon Life Insurance, 2.7%, Dai-Ichi Kangyo Bank, 2.6%; Yasuda F. & M. Insurance, 2.4%; Foreign ownership, 3.7%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	51,171	48,911
Stockholders equity	16,472	15,468
Equity ratio	32.2%	31.6%
Debts	16,367	16,094
Sales	61,000	56,401
Net profit	1,800	1,431

Note: Toyojozo is participating in the Government-sponsored research project to develop biotechnology for large scale cultivation and utilization.

FUJITSU

Major industries: computers and communications

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Computer, and data communications equipment	67	68	65
Communications instruments	18	18	21
Other	15	14	14
Export ratio	23	15	15

Major creditors: Dai-Ichi Kangyo, Industrial Bank of Japan, Kyowa, Taiyo Kobe, Mitsubishi

Major stockholders: Fuji Electric, 17.6%; Asahi M. Life Insurance, 7.7%; Dai-Ichi Kangyo Bank, 6.4%; Industrial Bank of Japan, 2.8%; Foreign onwership, 16.9%.

Financial Indicators:	1982	1981
	(million yen)	
Total assets	760,692	605,126
Stockholders' equity	268,668	185,097
Equity ratio	35%	31%
Debts	152,572	136,629
Income taxes	n/a	17,040
Sales	671,080	581,678
Net profit	22,894	18,453

Note: Fujitsu has participated in the following Government sponsored R&D projects: Development of basic technology for, third, fourth, and fifth generation computers; pattern information processing system (PIPS); development of super high speed and performance computers; optical measurement and control system; supergrid semiconductor components; next generation industry project and VLSI project.

Purchases from Fujitsu accounted for a 13% share of total NTT procurement. NTT procurement accounted for 12% of company sales. In 1982, telecommunications sales accounted for $684 million worth of Fujitsu's sales, or 20% of total sales. It exported 24% of its telecommunnications equipment. Fujitsu is a leading maker of PBX-electronic exchange equipment and cable TV's. Fujitsu spent $266 million on R & D in fiscal year 1980 or 9.3% of sales.

HITACHI
Major industry: electronics

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Information and communications devices and electronic devices	29	28	27
Consumer products	23	26	24
Power systems and equipment	23	32	25
Industrial machinery and plants	14	12	12
Transportation equipment and others	11	12	13
Export ratio	32	30	27

Major creditors: Industrial Bank of Japan, Dai-Ichi Kangyo, Sanwa, Fuji

Major stockholders: Nippon Life Insurance, 3.9%; Dai-Ichi M. Life Insurance, 2.8%; Industrial Bank of Japan, 2.6%; Credit Suisse, 2.5%; Sanwa Bank, 2.5%; Meiji M. Life Insurance, 2.4%; Foreign Ownership (G.E.), 17.5%.

Financial Indicators: (million yen)

	1982	1981
Total assets	2,041,952	1,863,316
Stockholders' equity	569,243	483,028
Equity ratio	28%	26%
Debts	218,509	331,971
Income taxes	152,883	138,589
Sales	2,140,905	1,947,029
Net profit	66,777	61,846

Notes: Hitachi has participated in the following Government-sponsored research and development projects: VLSI project; development of basic technology for the 3d, 4th, and 5th generation computers; pattern information processing system (PIPS) project; development of supercomputers; development of system for remote control and monitoring of industrial processes; using optical elements for sensing and transmission; Next Generation Industries Project, development of high-efficiency, supergrid components and semiconductor elements with increased resistance to the environment.

Hitachi does not receive any loans from the JDB. Its share of total NTT procurement was 6%, those sales represented 2% of company sales. It exported 30% of its telecommunications equipment. Hitachi is a leading maker of PBX-electronic exchange equipment and cable TV. Hitachi spent $569 million on R & D in fiscal year 1980, or 5.9% of sales.

MATSUSHITA ELECTRIC (also Panasonic, Technics, National)
Major industry: consumer electronics

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Video equipment	31	28	22
Home electric appliances	20	21	25
Audio equipment	12	14	14
Communications equipment	15	14	16
Other	22	24	24
Export ratio	32	30	21

Major creditors: Sumitomo, Kyowa

Major stockholders: Sumitomo Bank, 4.7%; Sumitomo M. Life Ins., 4.5%; Nippon Life Insurance, 4.1%; Matsushita Kosan, 4.1%, Knosuke Matsushita, 2.9%; Kyowa Bank, 2.1%.

Financial Indicators: (million yen)

	1982	1981	
Total assets	1,535,088	1,433,758	
Stockholders' equity	832,357	751,754	
Equity ratio	54%	52%	
Debts	0	0	
Income taxes	n/a	265,318	current
		33,526	deferred
Sales	2,480,000	2,346,296	
Net profit	87,000	83,612	

Notes: Matsushita Electric participated in the following Government-sponsored research and development projects: development of software for 4th generation computers; Pattern Information Processing System (PIPS) project; and Next Generation Industries project to develop 3 dimensional semiconductor components.

In 1982, telecommunications sales accounted for $924 million worth of Matsushita's sales, or 6% of total sales. It exported 46% of its telecommunications production. Matsushita Electric spent $500 million on R&D on fiscal year 1980 or 5.0% of sales.

NIPPON ELECTRIC COMPANY (NEC)

Major industries: telecommunications, computers, semiconductors

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Communication instruments	39	41	39
Electronic devices (including semiconductors)	29	26	27
Computers and industrial electronic systems	24	23	25
Others	8	10	9
Export ratio	35	33	33

Major creditors: Sumitomo, Sumitomo Trust, Yokohama, Industrial Bank of Japan, Long-Term Credit Bank of Japan

Major stockholders: Sumitomo M. Life Insurance, 7.6%; Sumitomo Bank, 5.5%; Sumitomo M. & F. Insurance, 3.1%; Nippon Life Insurance, 3.0%; Dai-Ichi M. Life Insurance, 3.0%; Sumitomo Electric, 2.7%; Sumitomo Trust, 2.6%; Foreign ownership, 13.0%.

Financial Indicators:

	1982	1981
	(million yen)	
Total assets,	1,062,149	897,632
Stockholders' equity	250,960	176,465
Equity ratio	24%	20%
Debts	278,809	277,725
Income taxes	n/a	102,462
Sales	1,054,049	892,810
Net profit	21,328	18,045

Note: NEC participated in the following government sponsored projects: development of basic technology for third, fourth and fifth generation computers; pattern information processing system (PIP); development of super high speed and performance computers; optical measurement and control system; three dimensional semiconductor components; VLSI project and next generation industries project.

NEC had a 20% share of total NTT procurement, and sales to NTT accounted for 12% of company sales. In 1982, telecommunications sales accounted for $1,980 million worth of NEC's sales, or 38% of total sales. It exported 33% of its telecommunications equipment.

OKI ELECTRIC

Major industries: computers and communications

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Data processing units	52	49	43
Electronic communications equipment	29	35	31
Electronic components	17	14	13
Other	2	2	13
Export ratio	26	15	10

Major creditors: Fuji, Long-term Credit Bank, Yasuda Trust, Taiyo Kobe, Tokai

Major stockholders: Yasuda M. Life Insurance, 8.3%; Fuji Bank, 7.8%; Dai-Ichi Kangyo Bank, 7.3%, Meiji M. Life Insurance, 7.2%; Barclays Bank International, 3.1%; Foreign ownership, 10.4%.

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	245,197	220,402
Stockholders' equity	39,618	36,751
Equity ratio	16	17
Debts	92,870	78,608
Income taxes	n/a	3,107
Sales	214,171	186,075
Net profit	3,391	3,909

Note: Oki has participated in the following Government-sponsored research and development projects: development of basic technology for third, fourth, and fifth generation computers; optical measurement and control system; development of super high speed performance computers; next generation industries project.

In 1982, Oki had a 7% share of total NTT procurement, and sales to NTT accounted for 21% of company sales. In 1982, telecommunications sales accounted for $317 million worth of its sales, on 20% of total sales. It exported 27% of its telecommunication equipment. Oki Electric is a leading maker of PBX-electronic exchange equipment.

SANYO ELECTRIC
Major industry: consumer electronics

Sales breakdown:	(Percent of sales)		
Product	1982	1981	1980
Consumer electronics	54	55	51
Electric household appliance	29	30	34
Commerical electric equipment	9	9	11
Other	8	6	4
Export ratio	54	55	47

Major creditors: Sumitomo, Kyowa

Major stockholders: Sumitomo, M. Life Insurance, 5.4%; Sumitomo Bank, 4.7%; Nippon Life Insurance, 3.7%; Credit Suisse, 3.7%; Asahi M. Life Insurance, 3.3%; Kyowa Bank, 3.2%; Meiji M. Life Insurance, 2.4%; Foreign ownership, 8.3%

Financial Indicators:	1982	1981
	(million yen)	
Total assets	570,045	508,328
Equity ratio	42.4%	42.1%
Stockholders' equity	241,522	213,823
Debts	1,447	1,001
Sales	760,000	752,403
Net profit	24,200	23,947

Note: Sanyo is participating in the Government-sponsored research and development project to develop three dimensional IC's high speed scienfific compurters, pattern information processing system (PIPS), and the Next Generation Industries project. Sanyo also received a subsidy for research on applications for ICs from MITI's AIST in 1982.

SHARP

Major industry: Electric appliances, business machines, calculators, computers, etc.

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Industrial Instrument and electronic components	34	34	34
TV and video systems	31	28	25
Appliance systems and solar systems	21	20	24
Audio system	14	18	17
Export ratio	55	59	54

Major creditors: Fuji, Sanwa, Daiwa, Dai-Ich Kangyo, Tokyo, Mitsubishi

Major stockholders: Nippon Life Insurance, 5.4%; Fuji Bank, 5.3%; Sanwa Bank, 4.4%; Daiwa Bank, 4.4%; Yasuda M. Life Insurance, 4.0%; Sumitomo M. Life Insurance, 3.5%; Foreign ownership 16.4%.

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	483,499	443,376
Stockholders' equity	217,923	195,937
Equity ratio	45.1%	44.2%
Debts	2,302	2,032
Sales	580,088	501,402
Net profit	20,383	16,289

Note: Sharp has participated in the Government-sponsored R&D projects to develop software for fourth generation computers and the Next Generation Industries project.

SUMITOMO ELECTRIC

Major industries: fiber optics, semiconductors

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Cables	58	56	61
Powdered alloys	10	9	10
Specialty steel wire	8	7	8
Other	24	28	21
Export ratio	15	21	16

Major creditors: Sumitomo, Sumitomo Trust, Industrial Bank, Mitsubishi, Mitsubishi Trust

Major stockholders: Sumitomo M. Life Insurance, 7.7%; Nippon Life Insurance, 6.5%; Dai-Ichi M. Life Insurance, 4.0%; Sumitomo, 3.7%, Sumitomo Bank, 3.5%; Nippon Electric, 2.9%; Employee Stockholders, 1.9%; Mitsubishi Trust, 1.9%.

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	344,017	345,593
Stockholders' equity	108,735	100,367
Equity ratio	32%	29%
Debts	93,845	99,578
Income taxes	n/a	28,572
Sales	455,561	428,875
Net profit	9,084	7,517

Note: Sumitomo Electric has participated in the government-sponsored R&D project to develop optical measurement and control systems.

Sumitomo Electric had a 3% share of total NTT procurement and sales to NTT accounted for 4% of company sales.
Sumitomo Electric is a leading maker of optical fiber.

TOSHIBA

Major industries: Consumer electronics

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Heavy electrical apparatus	39	41	35
Consumer products	32	33	39
Electronic components and industrial electronics	29	26	26
Export ratio	23	24	22

Major creditors: Mitsui, Tokai, Long-Term Credit Bank, Kyowa, Dai-Ichi Kangyo

Major stockholders: General Electric, 8.4%; Dai-ichi M. Life Insurance, 4.6%; Nippon Life Insurance, 4.0; Mitsui Bank, 3.1%; Foreign ownership, 17.3%.

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	1,829,464	1,695,335
Stockholders' equity	427,266	390,030
Debts	274,628	282,738
Income taxes	n/a	73,312
Equity/ratio	23	23
Sales	1,747,224	1,547,611
Net profit	47,292	44,238

Note: Toshiba participated in the following government-sponsored research projects: development of basic technology for 3rd, 4th, and 5th generation computers, pattern information processing system, development of super high-speed and performance computers, fine ceramics, processing technology for high efficiency crystal control alloy, semiconductors elements with increased resistance to the environment, VLSI project.

KONISHIROKO PHOTO INDUSTRY

Major industry: Photo sensitive materials, copying machines

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Photo films	39	35	36
Dry process copiers	25	29	23
Printing papers	18	17	17
Cameras	10	9	15
Other	8	10	9
Export ratio	48	55	51

Major creditors: Sanwa, Mitsubishi, Toyo Trust, Mitsubishi Trust, Taiyo Kobe

Major stockholders: Japanese Sec. Finance, 4.3%; Mitsubishi Corp., 3.3%; Asahi M. Life Insurance, 3.2%; Chiyoda M. Life Insurance, 3.1%, Mitsubishi Bank, 2.9%; Saniwa Bank, 2.9%; Sumitomo Trust Tokyo, 2.8%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	223,901	186,728
Stockholders' equity	95,333	75,310
Equity ratio	42.6%	40.3%
Sales	215,015	198,583
Net profit	10,813	6,314

Note: Konishiroko Photo Industry is participating in the Government-sponsored R&D project to develop a pattern information processing system (PIPS).

ASAHI GLASS

Major industry: Chemicals, ceramics, glass

Sales breakdown:	(Percent of sales)		
Product	1982	1981	1980
Glass	54	58	57
Chemical products	39	37	37
Ceramics	3	4	4
Other	4	2	2
Export ratio	8	7	9

Major creditors: Mitsubishi, Dai-Ichi Kangyo, Mitsubishi Trust, Fuji, Long-term Credit Bank

Major stockholders: Mitsubishi Bank 5.4%; Meiji M. Life Insurance 5.4%; Dai-Ichi M. Life Insurance 5.2%; Tokio M. & F. Insurance 5.1%; Mitsubishi Trust, 4.2%; Dai-Ichi Kangyo Bank, 3.8%; Fuji Bank 3.3%

Financial Indicators:	1982	1981
	(million yen)	
Total assets	510,426	473,447
Stockholders' equity	225,404	193,929
Equity ratio	44.2%	41.0%
Debts	83,656	89,122
Sales	510,000	473,976
Net profit	21,000	23,580

Note: Asahi Glass is involved in the Government-sponsored project to develop conductivity macromolecules and fine ceramics.

The company is involved in a joint venture with Nippon Carbon to produce silicon fiber. The joint venture is the only producer of silicon fiber in Japan.

HOYA

Major industry: Optical and crystal glass

Sales breakdown:	(Percent of sales)		
Product	1982	1981	1980
Optical glass	27	32	29
Crystal glass	28	26	26
Eye glass	45	42	45
Export ratio	13	13	12

Major creditors: Sanwa, Kyowa, Mitsubishi, Fuji, Toyo Trust, Daiwa

Major stockholders: Tetsuo Suzuki (President), 4.4%; Sanwa Bank, 4.2%; Robert Fleming & Co., 3.7%; Dai-Ichi M. Life Insurance, 3.5%; Kyowa Bank, 3.1%; Kohei Yamanaka, 2.8%; Mishubishi Bank, 2.5%; employee stockholding, 2.5%; Foreign ownership, 22.3%

Financial Indicators:	1982	1981
	(million yen)	
Total assets	58,426	49,774
Stockholders' equity	38,561	28,829
Equity ratio	66%	58%
Sales	137,643	128,981
Net profit	6,447	6,559

Notes: Hoya is involved in the Government-sponsored R&D projects to develop a pattern information processing system (PIPS) and fine ceramics.

KUROSAKI REFRACTORIES
Major industry: Glass and ceramics

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Refractories	82	79	81
Engineering work and others	18	21	19
Export ratio:	14	28	21

Major creditors: Fuji, Industrial Bank, Sumitomo Trust, Fukuoka

Major stockholders: Nippon Steel, 50.0%; Nippon Life Insurance, 2.2%; Nittetsu Yahata M. Aid, 2.1%, Bank of Fukuoka, 2.0%; Industrial Bank, 1.4%, Mitsubishi Trust, 1.1%, Sumitomo Trust, 1.0%, Kawasaki Steel, 1.0%; Foreign ownership, 1.2%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	51,670	49,302
Stockholders equity	6,700	6,657
Equity ratio	13.0%	13.5%
Debts	16,802	15,351
Sales	59,785	53,378
Net profit	1,545	1,413

Note: Kurosaki Refractories is participating in the Government-sponsored research project to develop fine ceramic new materials.

KYOWA CARBON

Major industry: Glass and ceramics

Sales breakdown: Product	1982	1981	1980
	(Percent in sales)		
Carbon products for aluminum refining	33	33	22
Carbon products specialties	14	9	11
Carbon products non-saturations	1	3	61
Graphite electrodes	48	52	3
Others	3	3	3
Export ratio:	47	56	39

Major creditors: Sanwa, Nippon Credit; Toyo Trust, Sumitomo Trust, Tokyo, Iyo

Major stockholders: Sumitomo Chemical, 33.3%; Osaka Sec. Finance, 7.3%; Sumitomo Corp., 5.0%; Sanwa Bank, 3.9%; Fuji F. & M. Insurance, 2.1%; Daido M. Life Insurance, 2.0%; Foreign ownership, 0.1%

Financial Indicators:	1982	1981
	(million yen)	
Total assets	15,322	13,631
Stockholders equity	3,831	3,568
Equity ratio	25.0%	26.2%
Debts	8,229	4,145
Sales	9,351	9,224
Net profit	428	400

Notes: Kyowa Carbon is participating in the Government-sponsored research project to develop fine ceramic new materials.

NIPPON SHEET GLASS

Major industry: flat glass fibers, optical fibers (tie-up w/AT&T)

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Float glass & others	56	57	57
Sashes	26	27	26
Sheet & figured glass	18	16	17
Export ratio	5	7	4

Major creditors: Sumitomo, Sumitomo Trust, Industrial Bank, Long-Term Credit Bank, Yokohama, Nokkaido Takushoko

Major stockholders: Sumitomo Bank, 6.0%; Sumitomo M. Life Insurance, 5.7%; Sumitomo Trust, 5.2%; Nippon Life Insurance, 4.0%; Toyota Motor, 2.9%; Sumitomo M-F Insurance, 2.9%; Nissan Motor, 2.5%; Sumitomo Corp., 2.1%; Industrial Bank, 1.7%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	170,947	155,019
Stockholders' equity	45,333	37,711
Equity ratio	26.5%	24.3%
Debts	38,638	40,006
Sales	168,382	157,815
Net profit	3,801	4,603

Notes: Nippon Sheet Glass is participating in the Government-sponsored research project to develop fine ceramics new materials.

NIPPON CARBON

Major industry: Glass and ceramics

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Artificial graphite electrodes	70	69	72
Resbon	4	4	5
Special carbon products	11	10	2
Other	15	17	23
Export ratio	31	34	34

Major creditors: Fuji, Yasuda Trust, Yokohama, Mitsui, Sanwa

Major stockholders: Japan Sec. Finance, 15.1%; Fuji Bank, 7.2%; Sumitomo Corp., 5.0%; Yasuda Trust, 4.9%; Nippon Life Insurance, 4.0%; Bank of Yokohama, 2.5%, Yasuda F & M Insurance, 1.9%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	37,789	34,305
Stockholders' equity	13,031	7,412
Equity ratio	34.5%	21.6%
Debts	10,172	12,889
Sales	28,500	29,373
Net profit	1,000	1,228

Notes: Nippon Carbon is participating in the Government-sponsored research and development project on high-molecular composite materials.

The company is involved in a joint venture with Asahi Chemical to produce silicon fiber. The joint venture is the only producer of silicon fiber in Japan.

FUJI HEAVY INDUSTRIES
Major industries: automobiles and aircraft

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Automobiles	82	82	80
Bus bodies	6	6	5
Aircraft and others	8	6	8
Export ratio	50	48	45

Major creditors: Industrrial Bank, Fuji, Taiyo Kob, Saimata, Gunma, Ashikaga

Major stockholders: Industrial Bank of Japan, 6.9%; Nissan Motor, 6.6%; Nippon Life Insurance, 5.0%; foreign ownership, 10.6%.

Financial Indicators:	1982	1981
	(million yen)	
Total assets	333,197	298,533
Stockholders' equity	78,786	67,423
Debts	56,321	57,733
Sales	533,761	570,000
Net profit	12,203	14,000

Note: Fuji Heavy Industries is participating in the Government-sponsored research project for international joint development of an engine for a 150 seat jet with Rolls Royce LTD, and international joint development of 200 seat aircraft resulting in the Boeing 767.

HITACHI (subsidiaries)
Hitachi Koki
Major industry: Machinery

Sales breakdown:	(Percent of sales)		
Product	1982	1981	1980
Metalworking machine tools	69	75	81
Line printers (mainly laser)	26	20	14
Other	5	5	5
Export ratio	27	27	14

Major creditors: Joyo, Sanwa, Industrial Bank of Japan, Dai-Ichi Kangyo, Tokyo, Mitsui Trust

Major stockholders: Hitachi, 26.3 %; Chuo Shoji, 11.3 %.

Financial Indicators:	1982	1981
	(million yen)	
Total assets	54,403	51,566
Stockholders' equity	32,751	30,920

HITACHI (subsidiaries)
Hitachi Seiki
Major industry: Machine tools

Sales breakdown:	(Percent of sales)		
Product	1982	1981	1980
NC machine tools	64	65	76
Specialty machine tools	21	22	8
Giant machine tools	3	2	1
Export ratio	30	37	38

Major creditors: Mitsui, Dai-Ichi Kangyo, Daiwa, Fuji, Sanwa, Mitsubishi

Major stockholders: Nissan F&M Insurance, 6.3%; Mitsui Life Insurance, 5.7%; Mitsui Bank, 4.6%.

Financial Indicators:	1982	1981
	(million yen)	
Total assets	41,447	35,845
Stockholders' equity	20,431	13,779
Debts	5,813	5,098
Sales	26,894	29,771
Net profit	-626	203

IKEGAI
Major industry: machinery

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Machine tools (inc. NC's)	69	71	64
Industrial machinery	17	16	17
Engines	10	9	10
Other	4	4	5
Export ratio	23	28	31

Major creditors: Industrial Bank, Kyowa, Taiyo Kobe, Sanwa

Major stockholders: Industrial Bank, 10.0%; Japan Sec. Clearing, 8.1%; Nippon Life Insurance, 2.6%; Nissin F & M Insurance, 2.4%; Nichido F & M Insurance, 2.3%; Kyowa Bank, 2.0%; Taiyo Kobe Bank, 2.0; Fuji Bank, 1.4%; Foreign ownership 1.4%

Financial Indicators: (million yen)

	1982	1981
Total assets	34,883	32,043
Stockholders' equity	2,959	3,585
Equity ratio	8.5%	11.2%
Debts	19,105	14,626

Notes: From 1968 to 1970 this firm received AIST loans for research on integrated manufacturing systems.

ISHIKAWAJIMA-HARIMA HEAVY IND. (IHI)
Major industry: Heavy Machinery

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Industrial machinery - plants	79	70	77
Shipbuilding & ship repairs and other	21	30	23
Export ratio	42	37	37

Major creditors: Dai-Ichi Kangyo, Taiyo Kobe, Takai, Industrial Bank, Long-Term Credit Bank

Major stockholders: Toshiba, 4.3%; Nippon Life Insurance, 3.5%; Dai-Ichi Kangyo Bank, 3.4%; Dai-Ichi M. Life Insurance, 3.2%; Asahi M. Life Insurance, 2.8%; Foreign onwership, 2.8%

Financial Indicators:	1982	1981
	(million yen)	
Total assets	1,553,427	1,495,518
Stockholders' equity	115,164	108,982
Equity ratio	7.4%	7.3%
Debts	500,150	547,109
Sales	77,672	681,126
Net profit	9,684	6,032

Note: IHI has been involved in the Government-sponsored project to develop civil aircraft engines including the RJ-500, the FJR-experimental engine, the STOL aircraft, fine ceramics, and high efficiency crystal control alloys.

KAWASAKI HEAVY INDUSTRIES
Major industry: Heavy MAchinery

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Plant engineering	20	25	31
Shipbuilding	11	26	14
Engine and motorcycle	17	19	23
Machinery	20	14	21
Rolling stock	9	6	6
Aircraft and others	23	10	5
Export ratio:	12	11	50

Major creditors: Dai-Ichi Kangyo, Taiyo Kobe, Industrial Bank, Kyowa, Daiwa

Major stockholders: Dai-Ichi Kangyo Bank, 4.6%, Nippon Life Insurance, 4.6%; Tokio M. & F. Insurance, 3.9%; Kawasaki Steel, 2.4%; Nippon F.& M. Insurance, 2.1%, Yashuda F. & M. Insurance, 2.1%; Foreign ownership, 4.4%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	1,055,528	982,588
Stockholders equity	109,091	109,057
Equity ratio	10.3%	11.1%
Debts	400,523	332,179
Sales	764,381	647,529
Net profit	4,254	2,829

Notes: Kawasaki Heavy Industries has been involved in the following Government-sponsored projects: high efficiency control alloys, fine ceramics, the FJR-170 experimental engine, the STOL aircraft, international joint development of 200 seat aircraft resulting in the Boeing 767, development of civil aircraft engines RJ-500.

MAKINO MILLING MACHINE
Major industry: Machinery

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Maching center	31	39	27
NC milling machine	33	28	40
Milling machines	15	18	23
Other	21	15	10
Export ratio	22	29	26

Major creditors: Mitsubishi, Mitsubishi Trust, Nippon Trust

Major stockholders: Machine Tool Engineering Foundation, 5.4%; (Chairman) Tsunezo Makino, 5.4%; Mitsubishi Bank 4.7%; (President) Masatoshi Shimizo, 3.1%; Nippon Life Insurance, 3.7%; Hanoon Nomimes, 2.9%, Mitsubishi Trust, 2.7%; Foreign ownership, 32.1%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	49,397	40,581
Stockholders' equity	29,821	23,736
Sales	35,596	27,075
Net profit	3,204	2,604

Notes: From 1975 to 1977, this firm received four AIST loans to do research on automatically adjustable machinery systems. It also received AIST loans in 1970 and 1973.

MITSUBISHI HEAVY INDUSTRIES
Major industry: shipbuilding, industrial machinery

<u>Sales breakdown</u>: (Percent of sales)

Product	1982	1981	1980
Prime movers	27	32	22
Shipbuilding	22	22	21
Construction, precision, refrigerating and air-conditioning machinery	18	17	25
Machinery	10	14	19
Chemical plants and others	23	15	13
Export ratio	40	42	32

<u>Major creditors</u>: Mitsubishi Corp., Mitsubishi Trust, Industrial Bank of Japan, Taiyo Kobe, Tokai, Sumitomo, Long-Term Credit Bank

<u>Major stockholders</u>: Mitsubishi Bank, 4.9%, Meiji M. Life Insurance, 4.0; Tokio M. & F. Insurance, 2.8%; Nippon Life Insurance, 2.5; Mitsubishi Trust, 2.3; Mitsubishi Corp., 2.2%; Foreign ownership, 6.0%.

Financial Indicators:	1982	1981
	(million yen)	
Total assets	3,056,186	2,818,370
Stockholders' equity	272,551	265,183
Equity/ratio	9%	9%
Debts	972,415	841,568
Sales	1,683,636	1,325,621
Net profit	12,596	12,107

Note: Mitsubishi has participated in the following Government-sponsored research and development projects: optical measurement and control system, international joint development of 200-seat aircraft resulting in the Boeing 767: development of the RJ-500 civil aircraft engine; Next Generation Industries project; bioreactor; gene recombination and utlization projects.

MITSUBISHI ELECTRIC

Major industry: electronic machinery

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Electronic industrial machinery	35	31	31
Heavy electric machinery	25	27	26
Home electric appliances	25	26	26
Standardized Electric Equipment	16	17	17
Export ratio	24	19	20

Major creditors: Mitsubishi Corp., Dai-Ichi Kangyo, Mitsubishi Trust

Major stockholders: Meiji M. Life Insurance, 4.5%; Nippon Life Insurance, 4.1%; Lloyd's Bank International, 3.6%; Mitsubishi Bank, 3.2%, Westinghouse World Investments, 2.7%; Foreign ownership, 15.1%.

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	1,359,576	1,228,500
Stockholders equity	234,492	210,328
Equity/ratio	17%	17%
Debts	277,599	243,081
Income taxes	n/a	36,703
Sales	1,315,538	1,221,397
Net profit	22,197	23,191

Note: Mitsubishi has participated in the following Government-sponsored research and development projects: development of basic technology for the 3rd, 4th and 5th generation computers; the VLSI project; Pattern Information Processing System (PIPS) project; development of supercomputers; optical measurement and control system; Next Generation Industries Project, development of processing technology for crystal control alloy, gene recombination and utilization, three dimensional components (ICs) and elements with increased resistance to the environment (ICs). In 1982, Mitsubishi Electric Corporation received grants from the MITI's AIST for research on trial manufacture of gas insulated DC switch gear and for research on ultra high frequency devices. In 1977, 1978 and 1979 it received grants from MITI's AIST for research on trial manufacture of high-performance file memory.

NACHI FUJIKOSHI CORP.
Major industry: Machinery

Sales breakdown:	(Percent of sales)		
Product	1982	1981	1980
Bearings	43	41	40
Tools	22	22	25
Hydraulic equipment	12	13	14
Other	22	24	21
Export ratio	18	17	20

Major creditors: Tokai, Kokuriku, Industrial Bank, Mitsui Trust, Mitsubishi Trust

Major stockholders: Tokai Bank, 7.7%; Toyota Motor, 6.4%; Mitsui Trust, 4.9%; Nissan Motor, 4.6% Japan Sec. Finance, 3.5%; Chayoda F & M Insurance, 2.5%; Sumitomo M. Life Insurance, 2.0%; Foreign ownership, 4.4%

Financial Indicators:	1982	1981
	(million yen)	
Total assets	97,131	90,010
Stockholders' equity	30,476	24,359
Equity ratio	31.4%	27.1%
Debts	19,319	21,463
Sales	93,000	98,253
Net profit	1,000	2,541

Notes: In 1966, this firm received an AIST loan for trial production of a continuous broaching machine.

OKUMA MACHINERY WORKS
Major industry: Machinery

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Machine tools	89	89	93
Industrial machinery	5	3	-
Other	6	8	6
Export ratio	25	27	43

Major creditors: Tokai, Chuo Trust, Taiyo Kobe, Fuji, Industrial Bank, Yokohama, Mitsubishi

Major stockholders: Nippon Life Insurance, 8.7%; Tokai Bank, 6.3%, Chuo Trust, 5.6%; Aisahi M. Life Insurance, 3.7%, Tokyo M. Life Insurance, 3.4%, Dai-Ichi M. Life Insurance, 3.4%, Credit Suisse, 3.2%; Nippon Group Life Insurance, 3.1%; Chryoda M. Life Insurance, 2.8%; Foreign ownership, 7.1%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	52,094	49,248
Stockholders' equity	34,431	27,342
Equity ratio	66.1%	55.5%
Debts	180	220
Sales	57,187	53,343
Net profit	4,815	4,053

Notes: From 1968 to 1970, this firm received AIST loans for research on integrated manufacturing systems.

TOSHIBA MACHINES
Major industry: Machinery

<u>Sales breakdown</u>:

Product	1982	1981	1980
	(Percent of sales)		
Machine tools	42	34	38
Industrial machinery	18	28	-
Textile & synthetic resin machinery	23	22	23
Other	17	12	-
Export ratio	20	31	28

<u>Major creditors</u>: Shizuoka, Mitsui, Mitsui Trust, Long-term Credit Bank, Yokohama, Kyowa

<u>Major stockholders</u>: Toshiba, 50.1%; Mitsui M. Life Insurance, 5.1%, Toyo Trust, 2.7%; Lloyds Bank Intl', 2.3%; Mitsubishi Trust, 1.8%; Toyota Motor, 1.6%; Mitsui Trust, 1.5%; Foreign ownership, 12.0%

Financial Indicators:	1982	1981
	(million yen)	
Total assets	95,744	92,576
Stockholders' equity	35,060	23,231
Equity ratio	36.6%	25.1%
Debts	24,238	27,677
Sales	94,448	83,904
Net profit	3,510	3,013

Notes: Toshiba is participating in the Government-sponsored project to develop Processing technology for high efficiency crystal control alloy. Toshiba received AIST loans for trial production of new machines in 1965 and 1968 and for research on integrated manufacturing systems from 1968 to 1970.

TOYODA MACHINE WORKS
Major industry: Machinery

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Machine tools	52	53	47
Automobile parts	42	43	48
Other (measuring machines)	6	5	5
Export ratio	8	5	11

Major creditors: Mitsui, Takai, Sanwa, Kyowa, Mitsui Trust

Major stockholders: Toyota Motor, 24.9%; Nippon Life Insurance, 4.2%; Mistsui Bank, 4.0%; Takai Bank, 4.0%; Mitsui Trust, 3.1%; Bishi Company, 2.8%; Daiwa Bank, 2.8%; Sanwa Bank, 2.4%; Toyoda Automatic, 2.1%. Foreign ownership 10.6%.

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	67,300	59,226
Stockholders' equity	43,066	33,533
Equity ratio	64.0%	56.6%
Sales	91,489	73,359
Net profit	4,691	4,486

Notes: In 1976 this firm received an AIST loan to support trial production of a high precision numerically controlled camgrinding machines.

TSUDAKOMA

Major industry: Machinery

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Textile machines	80	86	84
Machine- tool attachments	18	12	13
Cast iron goods	2	2	3
Export ratio:	31	43	38

Major creditors: Houriku, Industrial Bank, Nippon Credit, Japan Development Bank, Hokkuku, Fukui

Major stockholders: Meiji M. Life Insurance, 10.0%; Osaka Sec. Finance, 7.0%; Horuriku Bank, 5.0%; Tokio M. & F. Insurance, 3.9%; Sumitomo M. & F. Insurance, 3.9%; Komajiro Tsuda, 3.2%; Koa F. & M. Insurance, 3.0%; Robert Fleming, 2.9%; Tokuji Koshiba, 2.7%, Foreign ownership, 16.0%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	20,779	21,882
Stockholders equity	8,807	7,534
Equity ratio	42.4%	34.4%
Debts	1,872	1,224
Sales	25,000	28,752
Net profits	870	1,995

Note: Tsudakoma received a loan from MITI's AIST in 1966 for trial production of a multispindle lathe.

FURUKAWA ELECTRIC
Major industry: Nonferrous metals

Sales breakdown:	(Percent of sales)		
Product	1982	1981	1980
Cables and wires	57	55	52
Light metal products	22	23	25
Rolled copper products	11	13	14
Others	10	10	9
Export ratio:	16	10	8

Major creditors: Dai-Ichi Kangyo; Long-term Credit Bank, Kyowa, Yokohama, Fuji, Yasuda Trust

Major stockholders: Asahi M. Life Insurance, 7.6%; Furukama, 4.6%; Dai-Ichi Kangyo Bank, 3.7%; Nippon Life Insurance, 3.3% Yasuda Trust, 3.1%; Long-term Credit Bank, 3.0%, Mitsui Trust, 2.6%; Fuji Electric, 2.2%, Foreign ownership, 2.8%

Financial Indicators:	1982	1981
	(million yen)	
Total assets	354,574	361,353
Stockholders equity	72,742	66,442
Equity ratio	20.5%	18.4%
Debts	124,888	125,108
Sales	447,464	406,051
Net profit	6,369	3,339

Note: Furukawa Electric is participating in the Government-sponsored research project to develop an optical measurement and control system. The company is a leading maker of optical fibers and is one of NTT's top ten suppliers.

MITSUBISHI METALS
Major industry: Nonferrous metals

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Copper	32	37	38
Processed-metal products	26	30	26
Gold and silver	24	17	23
Zinc	7	9	6
Lead	2	3	3
Acid and electronics materials	6	5	4
Export ratio:	11	12	15

Major creditors: Mitsubishi, Mitsubishi Trust, Industrial Bank

Major stockholders: Meiji M. Life Insurance, 6.5%; Mitsubishi Bank, 4.6%; Mitsubishi Trust, 3.8%; Nomura Securities, 2.3%; Nikko Securities, 2.1%; Japan Sec. Finance, 2.1%; Foreign ownership, .9%

Financial Indicators:	1982	1981
	(million yen)	
Total assets	346,966	313,736
Stockholders equity	32,122	31,869
Equity ratio	9.3%	10.2%
Debts	194,903	168,393
Sales	301,743	327,587
Net profit	2,034	1,687

Note: Mitsubishi Metals is participating in the Government-sponsored R&D project to develop high efficiency crystal control alloys.

DAIDO STEEL
Major industry: Specialty steel

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Specialty steel	69	68	72
Cast & forged steel products	19	19	14
Industrial furnace	6	6	4
Steel brands & others	6	6	4
Export ratio	12	11	12

Major creditors: Industrial Bank, Tokai, Mitsubishi Trust, Dai-Ichi Kangyo

Major stockholders: Nippon Steel, 12.5%; Nissen Motor, 7.4%; Industrial Bank, 4.3%; Meiji M. Life Insurance, 3.5%; Tokai Bank, 3.1%

Financial Indicators:

	June 1982	June 1981
	(million yen)	
Total assets	249,433	244,764
Stockholders' equity	44,489	40,208
Sales	279,335	289,612
Net profit	6,003	7,388

Notes: Daido Steel participated in the High efficiency crystal control alloy project.

HITACHI METALS

Major industry: Specialty steels

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Specialty steels	30	29	32
Piping components	19	19	20
Malleable Iron castings	12	15	14
Magnetic materials	11	11	9
Mill rolls	21	19	18
Light alloy casting	7	7	7
Export ratio	21	23	25

Major creditors: Sanwa, Fuji, Industrial Bank, Toyo Trust, Dai-Ichi Kangyo

Major stockholders: Hitachi, 53.4%, Sanwa Bank, 2.9%; Toyo Trust, 2.0; Industrial Bank, 2.0%; Fuji Bank, 1.9%; Mitsubishi Trust, 1.8%

Financial Indicators: (million yen)

	1982	1981
Total assets	188,394	185,757
Stockholders' equity	78,082	72,005
Equity ratio	41.4%	38.8%
Debts	39,971	44,771
Debt/equity	.5	.6
Sales	249,005	252,997
Net profit	7,262	8,066

Notes: Hitachi Metals is participating in the Government-sponsored R&D project to develop high efficiency crystal control alloys.

KOBE STEEL

Major industry: Steelmaker, industrial machinery

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Iron & steel	56	56	60
Ind. machinery	30	28	23
Aluminum & copper	14	16	17
Export ratio	30	28	22

Major creditors: Sanwa, Dai-Ichi Kangyo, Taiyo Kobe, Industrial Bank, Yasuda Trust

Major stockholders: Sanwa Bank, 4.5%; Dai-Ichi Kangyo Bank, 4.5%; Taiyo Kobe Bank, 4.2%; Industrial Bank, 3.2%; Asahi M. Life Insurance, 3.1%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	1,626,301	1,476,650
Stockholders' equity	166,247	163,518
Equity ratio	10.2%	11.1%
Debts	652,629	604,412
Debt/equity	3.9%	3.7%
Sales	1,182,752	1,140,083
Net profit	13,608	26,253
Profit share	6.7	13.0

Notes: Kobe Steel is participating in the research project on fine ceramics.

ASAHI CHEMICAL INDUSTRY

Major industry: Synthetic fibers, acrylicfiber, petrochemical

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Fibers & textiles	35	38	38
Chemicals	30	31	31
Construction materials	17	16	14
Plastics	14	13	13
Other	4	4	4
Export ratio	13	13	13

Major creditors: Dai-Ichi Kangyo, Fuji, Industrial Bank

Major stockholders: Sumitomo Bank, 4.9%; Dai-Ichi M. Life Insurance, 4.0%; Sumitomo M. Life Insurance, 3.9%; Dai-Ichi Kangyo Bank, 3.8%; Mitsui M. Life Insurance, 3.5%; Nippon Life Insurance, 3.5%; Asahi M. Life Insurance, 3.4%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	662,402	643,245
Stockholders' equity	148,475	139,250
Equity ratio	22.4%	21.6%
Sales	592,407	595,693
Net profit	10,774	13,707

Note: Asahi Chemicals has participated in the Government-sponsored project in Biotechnology Technology for large-scale-cultivation and utilization.

KURARAY
Major industry: polyester fiber

Sales breakdown: Product	(Percent of sales) 1982	1981	1980
Polyester fiber	48	49	47
Non-fiber	27	26	24
Vinylon	13	13	16
Rayon	12	12	12
Export ratio	27	29	27

Major creditors: Industrial Bank, Fuji, Sumitomo, Sumitomo Trust, Yasuda Trust

Major stockholders: Nippon Life Insurance, 4.2%; Industrial Bank, 3.4%; Employees Stockholding, 3.3%; Kiyo M. Life Insurance, 3.3%; Fuji Bank, Dai-Ichi M. Life Insurance, 2.1%; Meiji M. Life Insurance, 1.9%

Financial Indicators:	1982	1981
	(million yen)	
Total assets	214,400	206,318
Stockholders' equity	25,333	23,998
Equity ratio	11.8%	11.6%
Debts	110,491	104,085
Debt/equity	4.4	4.3
Sales	195,411	203,466
Net profit	1,812	1,606

Notes: Kururay is participating in the Government-sponsored project for to develop high-efficiency separation film.

TEIJIN

Major industry: Synthetic fibers

Sales breakdown:

Product	1982	1981	1980
	(Percent in sales)		
Polyester fiber	61	56	54
Chemical products	22	28	29
Nylon	12	12	13
Techonology and plant exports and others	5	2	4
Export ratio:	24	23	21

Major creditors: Sanwa, Fuji, Daiwa, Nikko, Yamaichi

Major stockholders: Nippon Life Insurance, 6.5%; Sanwa Bank, 4.1%; Sumitomo M. Life Insurance, 3.2%; Fuji Bank, 2.4% Daiwa Bank, 2.3%, Foreign ownership, 8.3%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	460,578	464,409
Stockholders equity	100,251	96,609
Equity ratio	21.8%	20.8%
Debts	178,912	180,035
Sales	460,868	449,132
Net profit	5,363	6,020

Notes: Teijin is participating in the Government-sponsored research project to develop high molecular composite materials, high efficiency separation film, and high crystalline macromolecules.

TORAY INDUSTRIES

Major industry: Synthetic fibers, carbon fibers, plastics, biotechnology

Sales breakdown: (Percent of sales)

Product	1982	1981	1980
Polyester fiber	36	38	37
Nylon	20	22	24
Plastics	22	19	17
Acrylic fiber	-	6	8
Chemical products, other	22	15	15
Export ratio	26	28	27

Major creditors: Dai-Ichi Kangyo, Long-term Credit Bank, Mitsui Trust, Tonay Kobe

Major stockholders: Dai-Ichi M. Life Insurance, 4.2%; Wippon Life Insurance, 4.1%; Mitsui M. Life Insurance, 3.5%; MItsui Trust, 2.8%; Mitsui Bank 2.3%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	562,407	543,563
Stockholders' equity	190,161	172,279
Equity ratio	33.8%	31.7%
Debts	128,782	127,083
Debt/equity	.7	.7
Sales	556,814	530,708
Net profit	10,735	12,321

Note: Toray industries is participating in the Government-sponsored projects to develop high-efficiency separation film, high crystalline macromolecule, and high molecular composite materials.

TOYOBO

Major industry: Synthetic fibers

Sales breakdown:

Product	1982	1981	1980
	(Percent of sales)		
Synthetic fibers	49	63	65
Cotton	16	18	20
Wool	5	7	6
Other	29	13	9
Export ratio:	18	11	10

Major creditors: Dai-Ichi Kangyo, Mitsubishi, Sumitomo, Fuji, Sanwa, Long-term Credit Bank, Industrial Bank

Major stockholders: Dai-Ichi Kangyo Bank, 3.9%, Mitsubishi Bank, 3.9%; Sumitomo Bank, 3.9%; Nippon Life Insurance, 2.8%; Daiwa Bank, 2.7% Foreign ownership, 0.7%

Financial Indicators:

	1982	1981
	(million yen)	
Total assets	337,285	302,138
Stockholders equity	52,001	48,014
Equity ratio	15.4%	15.9%
Debts	159,141	149,552
Sales	316,828	263,940
Net profit	4,454	2,129

Notes: Toyobo is participating in the Government-sponsored project develop high efficiency separation film.

APPENDIX I

STATISTICAL TABLES

Table I-1.--Japan's total exports of of selected manufactured products, specified years, 1954 to 82

Industry	1954	1958	1963	1967	1972	1977	1982
Quantity:							
Aircraft and							
aerospace---units----:	45	401	833	7,703	8,866	2,579	13,179
Automobiles-------do---:	1/	1,773	14,211	89,998	688,612	2,148,503	4,468,112
Trucks------------do---:	1/	2,398	20,509	38,321	145,010	458,287	1,026,429
Synthetic fibers							
fibers--metric tons--:	1/	8,089	16,110	38,627	87,256	132,211	141,555
Pharmaceuticals--------:	2/	2/	2/	2/	25,887	48,405	75,621
Telecommunications-----:	2/	2	101,187	229,872	672,641	1,588,818	1,993,135
Machine tools--units---:	1/	1,013	8,113	17,647	27,408	115,493	247,576
Semiconductors							
------1,000 units----:	1/	1/	1/	1/	12,728	72,674	282,796
Steel mill products							
--1,000 metric tons--:	49,163	64,762	187,238	333,594	858,175	2,095,630	2,110,617
Aluminum---metric tons---:	2,941	2,596	5,959	6,234	12,209	70,907	98,050
Value:							
Aircraft and aerospace							
---million yen-------:	5	23	5	28	101	38	70
Automobiles----do------:	1/	3,933	38,051	245,421	1,520,876	3,030,325	4,287,565
Trucks---------do------:	1/	2,062	39,803	86,958	318,074	636,264	1,075,343
Synthetic fibers---do--:	1/	13,177	78,363	146,422	372,512	405,507	353,603
Pharmaceuticals----do--:	2/	2/	2/	2/	2/	2/	2/
Telecommunications-do--:	2/	2/	2/	2/	2/	2/	2/
Machine tools------do--:	1/	1/	1/	36,564	53,802	129,372	218,823
Semiconductors-----do--:	1/	1/	1/	1/	497,169	1,939,090	3,703,680
Steel mill	971	1,235	4,247	7,013	17,964	27,800	27,337
products---------do--:	971	1,235	4,247	7,013	17,964	27,800	27,337
Aluminum-----------do--:	14,343	11,318	32,329	21,491	45,174	191,723	162,208

1/ Not available.
2/ Not meaningful.
3/ Quantity in thousand units.
4/ Quantity in thousand metric tons.

Note: Aircraft and aerospace are defined as SITC No. 705.1101 and CCCN 8802; automobiles are defined as SITC No. 705.0301 and CCCN 8702-1; trucks are defined as CCCN 8702-901/929; synthetic fibers are defined as SITC No. 211.05 and CCCN 5601/5604; pharmaceuticals are defined as SITC 507 and CCCN 2938/2942, 2944, and 30; telecommunications are defined as SITC No. 703.09 and CCCN 8513/8515; machine tools are defined as SITC No. 701.0701 and CCCN 8445-1; semiconductors are defined as SITC 703.1703 and CCCN 8521-39-419; steel mill products are defined as SITC No. 611.01 through 611.11 and CCCN Nos. 7301/7302, and 7304/7313, 7315-1/-7, 7318-14, 7340-1/-3; aluminum is defined as SITC Nos. 613.03 and CCCN Nos. 7601-2, 7602/7607.

Source: Ministry of Finance of Japan.

Table I-2.--U.S. producers' shipments, exports of domestic merchandise, imports for consumption, total and from Japan, apparent consumption, and employment in alleged targeted industries, specified years 1954 to 1982

Industry and year	Producers' shipments 1/	Exports	Imports: Total	Imports: From Japan	Consumption 1/	Ratio of-- Imports from Japan to total imports	Ratio of-- Imports from Japan to consumption 1/	Total employment 1/
	1,000 dollars					Percent		1,000 workers
Aluminum:								
1954	1,478,484	8,377	91,615	162	1,561,722	0.2	-	47
1958	2,371,203	37,543	137,480	-	2,477,140	-	-	50
1963	3,286,416	115,223	188,964	7,512	3,360,157	4.0	0.2	57
1967	4,567,600	189,415	235,238	4,275	4,613,423	1.8	.1	68
1972	6,066,700	188,168	356,987	6,033	6,235,519	1.7	.1	70
1977	13,669,500	439,968	742,337	14,443	13,971,869	1.9	.1	73
1978	16,038,500	543,066	1,114,118	95,022	16,609,552	8.5	.6	77
1979	17,875,300	881,892	1,030,287	86,431	18,023,695	8.4	.5	79
1980	19,459,300	1,992,448	970,453	20,789	18,437,305	2.1	.1	76
1981	19,702,700	1,271,710	1,340,330	46,383	19,771,320	3.5	.2	72
1982	16,893,850	1,008,481	1,321,902	176,921	17,207,271	13.4	1.0	64
Aircraft and aerospace:								
1954	5,484,000	120,785	28,797	2/	5,392,012	.5	2/	2/
1958	6,894,000	225,676	72,569	4	6,740,893	1.1	3/	2/
1963	6,086,000	1,084,216	91,099	9	5,092,883	1.8	3/	723
1967	9,975,000	1,518,480	249,173	6,616	8,705,693	2.9	.1	991
1972	11,648,000	2,919,408	409,720	16,577	9,138,312	4.5	.2	588
1977	16,447,000	5,865,777	600,613	20,017	11,181,836	5.1	.2	565
1978	19,654,000	8,150,000	660,000	30,593	12,194,000	4.6	.3	620
1979	26,705,000	9,662,000	1,077,000	57,742	18,120,000	5.4	.3	713
1980	31,929,000	12,761,000	1,908,000	106,454	21,076,000	5.6	.5	766
1981	35,963,000	14,612,000	2,586,000	130,856	23,937,000	5.1	.5	777
1982	33,858,000	11,638,000	2,481,000	162,426	24,701,000	6.5	.7	739
Automatic data processing machines (computers):								
1978	12,364,500	1,230,467	387,542	107,284	11,521,575	27.7	.9	230
1979	15,883,500	1,468,439	508,482	110,536	14,923,543	21.7	.7	255
1980	19,806,600	1,938,032	552,596	91,394	18,421,164	16.5	.5	306
1981	23,789,800	2,016,135	692,400	180,110	22,466,065	26.0	.8	318
1982	27,834,100	2,041,817	977,228	388,020	26,769,511	39.7	1.4	339
Automobiles and trucks:								
1954	9,878,113	615,702	46,133	3	9,308,544	3/	3/	275
1958	9,740,393	538,564	520,793	1,774	9,722,622	.3	3/	250
1963	17,517,422	525,234	612,806	7,039	17,604,994	1.2	3/	330
1967	19,245,485	969,096	3,172,958	204,892	21,449,347	6.5	.9	321
1972	30,787,231	1,735,942	6,653,267	1,354,700	35,704,556	20.4	3.8	339
1977	45,200,000	4,849,680	13,794,746	4,571,794	58,505,066	33.1	7.8	344
1978	49,492,000	3,641,652	14,097,951	5,770,790	59,948,299	40.9	9.6	300
1979	47,989,000	4,689,282	14,879,520	6,471,054	58,179,238	43.5	11.1	325
1980	40,959,000	3,995,617	17,096,351	8,228,789	54,059,734	48.1	15.2	300
1981	43,771,000	3,996,144	17,993,510	9,491,228	57,768,366	52.7	16.4	250
1982	37,036,000	2,922,854	20,179,508	9,608,019	54,292,654	47.6	17.7	225

See footnotes at end of table.

Table I-2.—U.S. producers' shipments, exports of domestic merchandise, imports for consumption, total and from Japan, apparent consumption, and employment in alleged targeted industries, specified years 1954 to 1982—Continued

Industry and year	Producers' shipments 1/	Exports	Imports: Total	Imports: From Japan	Consumption 1/	Ratio of—: Imports from Japan to total imports	Ratio of—: Imports from Japan to consumption 1/	Total employment 1/
	1,000 dollars					Percent		1,000 workers
Drugs and related products (pharmaceuticals):								
1972	8,019,000	530,000	245,000	13,000	7,734,000	5.3	0.2	132
1977	14,248,000	1,461,000	657,000	72,000	13,444,000	11.0	3/	157
1978	15,898,000	1,480,000	885,000	85,000	15,303,000	9.6	.6	154
1979	17,758,000	1,656,000	903,000	95,000	17,005,000	10.5	.6	148
1980	21,883,000	2,004,000	970,000	104,000	20,849,000	10.7	.5	164
1981	22,667,000	2,228,000	1,068,000	120,000	21,507,000	11.2	.6	170
1982	26,102,000	2,319,000	1,096,000	110,000	24,879,000	10.0	.4	180
Fertilizers and fertilizer materials:								
1978	6,320,000	1,600,000	953,000	4/	5,673,000	-	-	52
1979	6,790,000	2,155,000	1,053,000	4/	5,688,000	-	-	53
1980	7,750,000	3,187,000	1,279,000	4/	5,842,000	-	-	56
1981	8,900,000	2,737,000	1,394,000	4/	7,557,000	-	-	54
1982	7,120,000	2,280,000	1,300,000	4/	6,140,000	-	-	46
Industrial paperboard:								
1978	7,700,000	662,000	18,000	7	7,056,000	3/	3/	68
1979	9,300,000	816,000	22,000	45	8,506,000	.2	3/	69
1980	10,430,000	1,299,000	25,000	32	9,156,000	.1	3/	69
1981	10,650,000	1,225,000	28,000	46	9,453,000	.2	3/	68
1982	10,220,000	1,061,000	23,000	165	9,182,000	.7	3/	67
Industrial papers, packaging and miscellaneous papers:								
1978	27,600,000	477,000	224,000	22,000	27,347,000	9.8	3/	303
1979	30,300,000	591,000	288,000	31,000	29,997,000	10.8	.1	307
1980	33,300,000	796,000	295,000	28,000	32,799,000	9.5	3/	337
1981	45,000,000	875,000	382,000	39,000	44,507,000	10.2	3/	334
1982	42,600,000	863,000	406,000	35,000	42,143,000	8.6	3/	328
Iron and steel mill products:								
1954	8,687,000	433,128	72,500	1,900	8,326,372	2.6	3/	582
1958	10,357,000	527,500	149,900	18,300	9,679,600	12.2	.2	523
1963	12,837,000	465,280	633,188	215,200	13,004,908	34.0	1.7	520
1967	15,342,000	414,936	1,292,195	530,000	16,219,259	41.0	3.3	555
1972	19,754,000	603,839	2,793,648	1,094,000	21,943,809	39.2	5.0	478
1977	35,853,000	1,037,077	5,531,317	2,376,000	40,347,240	43.0	5.9	452
1978	42,545,000	1,328,734	6,916,865	2,428,000	48,133,131	35.1	5.0	449
1979	48,071,000	1,878,436	6,966,737	2,738,000	53,159,301	39.3	5.1	453
1980	43,668,000	2,556,617	6,885,355	2,928,000	47,996,738	42.5	6.1	399
1981	51,367,000	2,275,267	10,247,660	3,764,000	59,339,730	36.7	6.3	391
1982	34,577,000	1,601,430	8,958,396	3,497,000	41,933,966	39.0	8.3	289

See footnotes at end of table.

Table I-2.--U.S. producers' shipments, exports of domestic merchandise, imports for consumption, apparent consumption, total and from Japan, and employment in alleged targeted industries, specified years 1954 to 1982--Continued

Industry and year	Producers' shipments 1/	Exports	Imports		Consumption 1/	Ratio of--		Total employment 1/
			Total	From Japan		Imports from Japan to total imports	Imports from Japan to consumption 1/	
	1,000 dollars					Percent		1,000 workers
Machine tools:								
1954								
1958	1,007,800	127,608	28,105	43	908,297	0.2	3/	80
1963	1,450,600	185,483	44,291	1,379	1,309,408	3.1	0.1	84
1967	2,803,800	222,432	203,411	26,640	2,784,779	13.1	1.0	104
1972	1,903,900	238,107	139,327	16,697	1,805,120	12.0	0.9	78
1977	3,679,900	426,729	485,981	116,305	3,739,152	23.9	3.1	84
1978	4,732,800	738,648	835,677	239,023	4,829,829	28.6	4.9	95
1979	6,120,500	878,630	1,241,513	381,473	6,483,383	30.7	5.9	108
1980	7,216,700	1,093,598	1,518,832	537,671	7,641,934	35.4	7.3	109
1981	7,630,000	1,453,067	1,726,144	735,094	7,903,077	42.6	9.3	111
1982	5,548,900	1,010,855	1,497,497	576,758	6,035,542	38.5	9.6	67
Semiconductors:								
1972	2,704,800	473,550	330,278	12,369	2,561,528	3.8	0.5	98
1977	4,532,300	1,507,259	1,356,025	86,621	1,669,016	6.4	5.2	114
1978	5,402,593	1,952,839	1,790,338	139,395	5,240,092	7.8	2.7	134
1979	7,056,797	2,634,823	2,447,662	249,240	6,869,636	10.2	3.6	161
1980	8,993,780	3,477,234	3,348,107	408,835	8,864,653	12.2	4.6	185
1981	9,671,694	3,606,979	3,617,584	402,551	9,682,299	11.1	4.2	195
1982	10,370,000	3,821,715	4,205,115	607,607	10,753,400	14.4	5.7	197
Synthetic fibers:								
1958	668,400	32,000	6,100	4	642,500	0.1	3/	19
1963	1,403,200	72,500	13,800	100	1,344,500	0.7	3/	41
1967	2,033,200	84,000	45,500	8,900	1,994,700	19.6	0.4	57
1972	2,949,000	141,300	138,400	30,000	2,946,100	21.7	1.0	78
1977	5,571,500	292,400	100,400	42,700	5,279,500	42.5	0.8	74
1978	5,912,200	346,583	113,216	39,894	5,678,833	35.2	0.7	72
1979	6,719,200	541,381	73,290	30,178	6,251,109	41.2	0.5	71
1980	7,146,700	692,109	77,249	28,954	6,531,840	37.5	0.4	65
1981	7,869,300	764,875	111,625	26,152	7,216,050	23.4	0.4	58
1982	7,160,000	733,600	110,754	29,541	6,537,154	26.7	0.5	55
Telecommunications:								
1963	9,327,000	528,928	75,791	50,281	8,874,063	66.3	0.6	558
1967	12,866,100	472,188	497,186	313,928	12,891,098	63.1	2.4	642
1972	15,479,100	698,541	1,774,058	1,087,617	16,554,951	61.3	6.6	540
1977	24,727,400	2,123,512	3,658,010	2,269,745	28,385,410	62.0	8.0	534
1978	28,387,526	2,455,643	4,855,383	2,395,363	30,787,266	49.3	7.8	580
1979	32,334,768	2,682,557	4,817,865	1,943,054	34,470,076	40.3	5.6	600
1980	38,363,246	3,120,399	5,369,751	2,008,884	40,612,598	37.4	4.9	631
1981	43,110,500	3,500,430	6,643,570	2,885,973	46,253,640	43.4	6.2	635
1982	49,608,809	3,554,714	6,690,111	2,831,629	52,744,206	42.3	5.4	590

1/ Estimated by the staff of the U.S. International Trade Commission.
2/ Not available.
3/ Less than 0.05 percent.
4/ Japan was not among the top 10 sources of imports.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table I-3.--Aircraft and aerospace: U.S.-exports, by principal markets, specified years 1954 to 1981

Market	1954	1958	1963	1967	1972	1977	1981
	1,000 dollars						
Not disclosed 1/	-	13,120	840,115	305,077	406,885	1,186,023	1,711,841
Japan	4,264	20,439	29,913	70,575	402,354	220,791	1,301,357
West Germany	2,667	12,842	9,808	135,438	222,721	280,239	1,038,626
Canada	17,891	12,155	40,672	169,753	193,890	200,990	959,446
United Kingdom	4,277	4,782	15,013	49,705	214,285	368,915	744,827
Saudi Arabia	695	26	10,472	9,789	37,627	272,315	678,933
France	1,034	13,786	20,694	58,010	151,353	214,230	674,561
Switzerland	250	2,826	10,499	30,707	44,604	88,816	278,663
All other	89,707	145,700	117,401	689,426	1,245,689	3,033,458	7,223,746
Total	120,785	225,676	1,084,216	1,518,480	2,919,408	5,865,777	14,612,000

1/ Due to the confidentiality of military aerospace sales, names of specific markets for such exports are not available.

Source: Compiled from official statistics of the U.S. Department of Commerce, 1954 and 1958; United Nations data, 1963-81.

Table I-4.--Aircraft and aerospace: Japanese exports, by principal markets, specified years 1963 to 1981

Market	1963	1967	1972	1977	1981
	1,000 dollars				
United States	1,207	2,284	15,571	18,497	108,040
West Germany	7	-	379	32	3,170
Australia	194	403	108	165	2,512
United Kingdom	24	7	21	90	906
Sweden	-	-	1,223	906	626
Singapore	16	2	6	52	565
Philippines	1	7,979	4,088	558	558
India	7	-	1	69	546
All other	4,203	12,633	12,635	1, 157	2,304
Total	5,659	23,308	34,032	21,526	119,227

Source: Compiled from official statistics of the United Nations.

Table I-5.--Aluminum: U.S. exports, by principal markets, specified years 1954 to 1981

Market	1954	1958	1963	1967	1972	1977	1981
	1,000 dollars						
Japan	10	73	2,476	20,308	11,781	12,234	397,924
Canada	4,110	12,379	22,014	58,874	78,336	153,775	300,395
Mexico	884	1,869	3,224	3,207	9,381	36,557	172,376
United Kingdom	230	11,977	26,035	14,044	14,358	45,596	40,172
Venezuela	791	1,175	1,345	2,473	2,175	22,600	39,521
Italy	37	115	6,785	6,046	6,192	14,067	24,747
France	7	67	3,336	7,425	2,576	14,620	23,537
West Germany	45	927	10,289	8,785	12,397	19,427	23,187
All other	2,263	8,961	43,224	76,025	59,006	146,482	273,032
Total	8,377	37,543	118,728	197,187	196,202	465,358	1,271,704

Source: Compiled from official statistics of the U.S. Department of Commerce, 1954 and 1958; United Nations data, 1963-81.

Table I-6.—Aluminum: Japanese exports, by principal markets, specified years 1954 to 1981

Market	1954	1958	1963	1967	1972	1977	1981
	1,000 dollars						
United States	111	165	8,211	4,409	6,396	26,689	101,798
China	-	12	-	177	3,144	31,161	38,605
Indonesia	191	349	590	1,013	4,359	21,147	33,762
Republic of Korea	263	14	515	1,079	3,422	54,920	32,001
Australia	2	-	135	68	318	822	17,935
Hong Kong	331	409	1,245	1,674	3,376	10,855	14,592
Singapore	253	212	692	714	3,271	7,644	13,249
Malaysia	252	14	299	265	1,009	8,089	10,403
All other	6,767	6,035	4,874	7,917	14,345	104,726	89,690
Total	8,170	7,210	16,561	17,316	39,640	266,053	352,035

Source: Compiled from official statistics of the Japan Tariff Association, 1954 and 1958; United Nations data, 1963-81.

Table I-7.--Automobiles and trucks: U.S. exports, by principal markets, specified years 1963 to 1981 1/

Market	1963	1967	1972	1977	1981
	1,000 dollars				
Canada	42,534	678,138	1,457,586	3,549,940	3,638,143
Saudi Arabia	12,557	12,321	14,147	257,064	467,161
Venezuela	43,571	31,460	50,948	244,880	170,182
Kuwait	14,435	16,368	20,056	150,801	143,778
Iraq	3,693	1,739	51	3,501	118,197
Mexico	82,328	76,962	86,485	131,317	114,103
Peru	24,162	15,782	10,271	11,414	66,344
Japan	8,967	8,670	24,766	90,432	63,396
All other	318,284	361,517	277,388	971,420	994,179
Total	550,531	1,202,957	1,941,698	5,410,769	5,775,483

1/ Not available for years 1954 and 1958.

Source: Compiled from official statistics of the United Nations.

Table I-8.--Automobliles and trucks: Japanese exports, by principal markets, specified years 1963 to 81 1/

Market	1963	1967	1972	1977	1981
	1,000 dollars				
United States	7,257	95,665	1,410,517	5,030,193	11,490,565
Saudi Arabia	844	2,907	34,559	632,378	1,080,073
Canada	171	6,396	256,889	339,293	1,013,782
Australia	11,415	44,486	96,269	436,154	964,391
West Germany	6	481	21,341	164,858	870,317
United Kingdom	2	2,015	113,135	377,186	685,637
Indonesia	5,153	7,974	34,181	257,732	666,558
South Africa	10,822	23,195	89,383	154,440	470,432
All other	78,960	207,993	834,083	3,636,938	8,019,679
Total	114,630	391,112	2,890,357	11,029,172	25,261,434

1/ Not available for years 1954 and 1958.

Source: Compiled from official statistics of the United Nations.

Table I-9.--Drugs and related products: U.S. exports, by principal markets, specified years 1963 to 1981

Market	1963	1967	1972	1977	1981
	1,000 dollars				
Japan	11,188	15,551	57,855	175,592	436,828
France	6,504	10,589	25,787	68,151	197,625
Canada	23,589	25,480	49,114	98,942	159,336
West Germany	7,244	10,367	18,678	60,869	132,545
Belgium	13,913	18,150	37,272	73,614	127,136
United Kingdom	7,373	6,639	18,786	42,503	118,236
Italy	7,027	8,256	21,152	50,003	106,228
Switzerland	5,901	5,419	9,832	36,466	73,321
All other	186,516	187,525	235,026	474,419	904,105
Total	269,255	287,976	473,502	1,080,559	2,255,360

Source: Compiled from official statistic of the United Nations.

Note: United Nations trade data are based upon the Standard International Trade Classification system and are not directly comparable with official U.S. Government trade statistics because of significant differences in the classification systems for drugs and related products.

Table I-10.--Drugs and related products: Japanese exports, by principal markets, specified years 1963 to 1981

Market	1963	1967	1972	1977	1981
	1,000 dollars				
United States	4,410	3,244	13,025	45,932	92,220
West Germany	1,268	2,551	10,653	12,828	25,194
Hong Kong	644	987	2,739	8,108	17,952
France	426	992	2,770	6,007	17,561
Republic of Korea	865	1,375	2,464	7,049	12,056
Belgium	242	564	687	4,594	9,648
Denmark	41	513	761	1,389	9,128
Switzerland	231	796	5,243	6,452	8,326
All other	17,269	26,228	46,060	87,902	137,727
Total	25,396	37,250	84,402	180,261	329,812

Source: Compiled from official statistics of the United Nations.

Note: United Nations trade data are based upon the Standard International Trade Classification system and are not directly comparable with official U.S. Government trade statistics because of significant differences in the classification systems for drugs and related products.

Table I-11.--Iron and steel mill products: U.S. exports, by principal markets, specified years 1954 to 1981

Market	1954 1/	1958 1/	1963	1967	1972	1977	1981
	1,000 dollars						
Canada	136,002	204,142	99,609	143,034	196,669	317,934	672,358
Mexico	19,924	33,232	15,363	24,651	36,534	104,128	648,192
Saudi Arabia	1,299	2,110	1,389	1,432	5,128	39,233	150,390
United Kingdom	17,325	18,990	7,123	18,492	22,635	39,484	85,330
Venezuela	15,593	38,507	21,267	10,547	25,634	78,771	78,813
Peru	4,331	7,385	4,459	7,450	6,077	12,698	46,743
Egypt	866	2,110	1,993	984	2,231	16,925	38,666
Japan	5,631	1,582	8,081	4,794	7,205	15,844	38,521
All other	232,127	219,442	317,858	265,592	376,356	625,837	852,745
Total	433,128	527,500	477,142	476,976	678,469	1,250,854	2,611,758

1/ Estimated by the staff of the U.S. International Trade Commission from official statistics of the U.S. Department of Commerce.

Source: United Nations data, 1963-81, except as noted.

Table I-12.--Iron and steel mill products: Japanese exports, by principal markets, specified years 1954 to 1981

Market	1954 1/	1958 1/	1963	1967	1972	1977	1981
	1,000 dollars						
United States	2,477	31,899	209,499	533,457	1,018,177	2,284,748	3,939,101
U.S.S.R	-	4,238	40,796	18,070	86,642	550,458	1,314,220
People's Republic of China	-	4,053	11,971	102,672	231,219	984,691	965,415
Republic of Korea	1,084	-	20,761	41,606	134,624	552,008	789,659
Saudi Arabia	92	-	3,412	4,925	53,824	278,937	766,385
Indonesia	9,599	5,800	10,472	11,087	83,954	226,368	663,203
Singapore	-	-	14,901	20,290	92,540	246,629	654,043
Mexico	929	-	1,248	3,210	10,854	104,746	413,113
All other	140,649	177,080	378,354	528,554	1,832,487	5,149,195	6,918,118
Total	154,830	223,070	691,414	1,263,871	3,544,321	10,377,780	16,423,257

1/ Estimated by the staff of the U.S. International Trade Commission from United Nations data.

Source: United Nations data, 1963-81.

Table I-13.--Machine tools: U.S. exports, by principal markets, specified years 1963 to 1981 1/

Market	1963	1967	1972	1977	1981
	1,000 dollars				
Mexico	7,685	13,231	17,802	42,018	261,331
Canada	22,960	48,311	43,198	61,081	255,230
United Kingdom	19,267	37,248	16,561	26,627	68,903
Japan	25,384	21,655	31,322	22,076	54,675
Federal Republic of Germany	14,175	8,188	10,368	23,708	35,387
France	11,359	14,300	12,213	10,799	30,293
Brazil	5,155	5,229	25,757	40,522	23,284
Australia	3,601	8,097	4,837	6,622	21,651
All other	85,191	79,968	97,944	218,617	292,961
Total	194,777	236,227	260,002	452,070	1,043,715

1/ Not available for years 1954 and 1958.

Source: Compiled from official statistics of the United Nations.

Table I-14.--Machine tools: Japanese exports, by principal markets, specified years 1963 to 1982 1/

Market	1963	1967	1972	1977	1981
	1,000 dollars				
United States	1,024	23,965	15,773	111,433	752,029
Federal Republic of Germany	130	135	5,613	23,069	93,974
Other Asia n.e.s	426	3,875	5,897	23,767	76,141
Australia	347	2,197	3,850	10,968	60,229
U.S.S.R	2,542	5,804	32,140	80,381	57,616
United Kingdom	577	992	1,854	12,335	54,834
South Africa	172	1,598	1,868	4,885	51,653
Republic of Korea	620	4,273	9,960	133,179	46,303
All other	11,083	14,913	63,739	210,684	493,916
Total	16,921	57,752	140,694	610,701	1,686,695

1/ Not available for years 1954 and 1958.

Source: Compiled from official statistics of the United Nations.

Table I-15.--Semiconductors: U.S. exports, by principal markets, specified years 1972 to 1981

Market	1972	1977	1981
	1,000 dollars		
Malaysia	1,185	244,548	725,734
Singapore	64,117	224,654	437,934
Philippines	116	63,249	387,222
Canada	25,639	38,303	240,436
Korea	172	142,187	228,332
Mexico	46,129	86,602	220,597
Thailand	105	15,439	184,971
West Germany	45,794	113,127	182,315
All other	290,293	578,950	999,438
Total	473,550	1,507,059	3,606,979

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table I-16.--Semiconductors: Japanese exports, by principal markets, specified years 1972 to 1981

Market	1972	1977	1981
	1,000 dollars		
United States	50,077	78,055	411,087
Taiwan	3,953	64,603	157,120
Korea	7,039	54,426	120,062
Hong Kong	2,437	40,854	162,394
Singapore	7,820	25,346	93,891
West Germany	1,077	18,858	80,780
Brazil	0	8,549	37,911
France	7,868	2,625	20,780
All other	1,050	64,312	255,835
Total	81,321	357,628	1,339,860

Source: Compiled from official statistics of the Japan Tariff Association.

Table I-17.--Synthetic fibers: U.S. exports, by principal markets, specified years 1963-81

Market and total	1963	1967	1972	1977	1981
	1,000 dollars				
China	-	-	-	19,432	320,775
Canada	5,682	10,600	34,644	51,507	83,923
Belgium	6,092	5,279	13,274	46,181	43,957
Taiwan	190	277	2,300	8,390	28,481
South Africa	2,253	1,381	1,142	7,689	28,113
Australia	2,372	1,440	3,681	11,291	26,681
Mexico	3,127	4,828	2,257	5,129	17,062
Brazil	270	581	3,889	6,163	12,090
All other	52,514	59,614	80,113	136,618	203,793
Total	72,500	84,000	141,300	292,400	764,875

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table I-18.--Synthetic fibers: Japanese exports, by principal markets, specified years 1963-81

Market and total	1963	1967	1972	1977	1981
	1,000 dollars				
China	878	7,024	20,930	88,936	233,133
Republic of Korea	4,399	34,160	39,116	60,367	77,045
Pakistan	40	309	816	31,981	58,882
Indonesia	3	118	5,334	23,416	47,970
India	1,791	3,366	5,248	27,824	32,749
Hong Kong	132	7,287	44,489	22,919	32,407
Australia	1,202	5,754	11,787	15,755	27,534
United States	49	9,737	31,581	51,304	24,976
All other	5,594	55,235	200,999	227,530	285,172
Total	14,088	122,990	360,300	550,032	819,868

Source: Compiled from official statistics of the United Nations.

Table I-19.--Telecommunications apparatus: U.S. exports, by principal markets, specified years 1963 to 1981

Market	1963	1967	1972	1977	1981
	1,000 dollars				
Canada	47,465	92,428	183,631	293,627	423,118
Mexico	5,375	13,272	79,065	166,915	362,237
Germany	14,476	33,736	66,405	101,811	253,512
United Kingdom	12,394	30,737	49,445	102,637	227,761
Japan	5,524	21,431	45,157	71,358	159,553
Korea	938	6,127	7,545	67,925	136,158
Saudi Arabia	1,423	5,681	2,892	138,703	129,377
Venezuela	8,663	12,457	12,255	39,902	125,791
All other	376,309	258,957	389,629	1,140,636	1,668,023
Total	472,576	474,826	836,024	2,123,514	3,485,530

Source: Compiled from official statistics of the United Nations.

Table I-20.--Telecommunications: Japanese exports, by principal markets, specified years 1963 to 1981

Market	1963	1967	1972	1977	1981
	1,000 dollars				
United States	133,855	348,787	1,111,072	2,325,986	3,051,649
West Germany	8,119	13,028	103,387	395,714	657,059
United Kingdom	2,947	7,178	97,225	241,705	466,927
Saudi Arabia	856	1,782	9,496	179,033	377,659
Singapore	6,181	9,157	22,803	111,739	335,965
Hong Kong	11,331	16,284	43,872	99,570	310,173
Australia	3,147	5,508	22,754	255,319	292,428
Canada	5,934	22,625	128,291	215,277	252,700
All other	110,392	214,226	1,644,995	2,070,266	4,056,410
Total	282,762	638,584	2,183,895	5,894,609	9,800,970

Source: Compiled from official statistics of the United Nations.

Table I-21.--Aircraft and aerospace: U.S. and Japanese exports to world markets, specified years 1954 to 1981

(In thousands of dollars)

Year	U.S. exports	Japanese exports
1954	120,785	1/
1958	225,676	1/
1963	1,084,216	5,659
1967	1,518,480	23,308
1972	2,919,408	34,032
1977	5,865,777	21,526
1981	14,612,000	119,227

1/ Not available.

Source: Compiled from official statistics of the U.S. Department of Commerce, 1954 and 1958; United Nations data, 1963-81.

Note: Quantity data are not available.

Table I-22.--Aluminum: U.S. and Japanese exports to world markets, specified years 1954 to 1981

Year	U.S. exports		Japanese exports	
	Quantity	Value	Quantity	Value
	1,000 pounds	1,000 dollars	1,000 pounds	1,000 dollars
1954	21,516	8,377	31,621	8,170
1958	127,128	37,543	24,952	7,210
1963	441,258	118,728	71,273	16,561
1967	623,392	197,187	47,379	17,316
1972	526,110	196,202	99,592	39,640
1977	618,586	465,358	422,676	266,053
1981	1,252,026	1,271,704	278,854	352,035

Source: Compiled from official statistics of the United Nations, 1954-81; Bureau of Mines, 1954-81; Japan Tariff Association, 1954-77, and World Bureau of Metal Statistics 1981.

Table I-23.--Automobiles and trucks: U.S. and Japanese exports to world markets, specified years 1954 to 1981

Year	U.S. exports		Japanese exports	
	Quantity	Value	Quantity	Value
	Units	1,000 dollars	Units	1,000 dollars
1954	360,974	615,702	679	1/ 543
1958	274,453	538,564	9,897	1/ 8,907
1963	269,921	525,234	97,324	114,630
1967	368,309	969,096	359,178	391,112
1972	535,590	1,735,942	1,954,933	2,890,357
1977	906,614	4,849,680	4,328,796	11,029,172
1981	679,172	3,996,144	5,964,063	25,261,434

1/ Estimated by the staff of the U.S. International Trade Commission.

Source: Compiled from official statistics of the U.S. Department of Commerce, 1954-81; Japan Automobile Manufacturers' Association data, 1954-81; and United Nations data, 1963-81, except as noted.

Table I-24.--Drugs and related products (pharmaceuticals): 1/ U.S. and Japanese exports to world markets, specified years 1972 to 1981

(In thousands of dollars)

Year	U.S. exports	Japanese exports
1972	473,502	84,402
1977	1,080,559	180,261
1981	2,255,360	329,812

1/ United Nations Trade data are not directly comparable with official U.S. Government trade statistics because of significant differences in the classifications systems for drugs and related products.

Source: Compiled from official statistics of the United Nations.

Note: Quantity data are not available.

Table I-25.--Iron and steel mill products: U.S. and Japanese exports to world markets, specified years 1954 to 1981

Year	U.S. exports		Japanese exports	
	Quantity	Value 1/	Quantity	Value
	1,000 metric tons	1,000 dollars	1,000 metric tons	1,000 dollars
1954	2,540.5	433,128	1,109.2	154,830
1958	2,675.7	527,500	1,547.8	223,070
1963	1,951.8	477,142	5,282.5	691,414
1967	1,548.4	476,976	8,707.0	1,263,871
1972	2,631.2	678,469	20,922.0	3,544,321
1977	1,857.1	1,250,854	33,627.9	10,377,780
1981	2,736.2	2,611,758	28,455.4	16,423,257

1/ Does not include wheels, tires, and axles. Data for 1954 and 1958 are estimates from Department of Commerce statistics.

Source: Compiled from official statistics of the U.S. Department of Commerce, 1954 and 1958; United Nations data 1963-81.

Table I-26.--Machine tools: U.S. and Japanese exports to world markets, specified years 1954 to 1981

(In thousands of dollars)

Year	U.S. exports	Japanese exports
1958		
1963	194,777	16,921
1967	236,227	57,752
1972	260,002	140,694
1977	452,070	610,701
1981	1,043,715	1,686,695

Source: Compiled from official statistics of the United Nations.

Note: Quantity data are not available.

Table I-27.--Semiconductors: U.S. and Japanese exports to world markets, specified years, 1972, 1977, and 1981

(In thousands of dollars)

Year	U.S. exports	Japanese exports
1972	473,550	81,321
1977	1,507,059	357,628
1981	3,606,979	1,339,860

Source: Compiled from official statistics of the United Nations.

Note.--Quantity data are not available.

Table I-28.--Synthetic Fibers: U.S. and Japanese exports to world markets, specified years 1958 to 1981

Year	U.S. exports		Japanese exports	
	Quantity	Value	Quantity	Value
	1,000 pounds	1,000 dollars	1,000 pounds	1,000 dollars
1958	19,500	32,000	1/	1/
1963	55,700	72,500	1/	14,088
1967	90,200	84,000	1/	122,970
1972	217,600	141,300	1/	360,300
1977	361,200	292,400	1/	550,032
1981	1/	764,875	1/	819,868

1/ Not available.

Source: Compiled from official statistics of the U.S. Department of Commerce, 1958-81; United Nations data, 1958-81.

Table I-29.--Telecommunications: U.S. and Japanese exports to world markets, specified years 1963 to 1981

(In thousands of dollars)

Year	U.S. exports	Japanese exports
1963	472,576	282,762
1967	474,826	638,584
1972	831,024	2,183,895
1977	2,123,514	5,894,609
1981	3,827,800	9,800,970

Source: Compiled from official statistics of the United Nations.

Note: Quantity data are not available.

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