United States
International Trade Commission

Industry Trade and Technology Review

OFFICE OF INDUSTRIES

USITC Publication 3390

January 2001

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Karl S. Tsuji
assisted by

Zema Tucker
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Contributing Authors

Yvette Alt
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U.S. Metal Mining: Recent Trends and Uncertainty Discourage Domestic Exploration and Investment

Yvette Alt[1]
David Lundy[1]
lundy@usitc.gov
(202) 205-3439

The United States is a major producer of mined copper, gold, iron, lead, and zinc, as well as a significant producer of other metals.[2] However, recent trends suggest that future U.S. metal-mining production may decline significantly, at least in comparison with metal-mining production in other countries. Both external and internal factors are responsible. Outside the United States, there has been a consistent trend during the past 20 to 25 years towards liberalized mining laws and regulations in foreign countries with rich mineral endowments, creating attractive and cost-effective foreign mining opportunities. Inside the United States, regulatory issues regarding mining on public lands and the environment have contributed to increased uncertainty regarding present and proposed mining ventures. This article examines both foreign and domestic factors affecting the U.S. metal mining industry, including trends in exploration expenditures, foreign mining opportunities, implications of U.S. regulatory and environmental issues, and the outlook for the U.S. metal-mining industry.

Metal mining is a basic industry that provides essential raw materials for an industrial society. The availability of metals as input for many, if not most, manufactured goods has been a major factor in industrial progress. Although the metal mining industry is a small portion of the world's economic activity, it is an important part providing a vehicle for economic development, especially in third-world countries, and relatively high-paying jobs.

Mining is also a controversial industry, primarily because of its potential effects on the environment. Mining operations can involve the movement of large amounts of earth, the generation of waste dumps, and the release of potentially dangerous chemical compounds. The concern about the environmental effects of mining has grown substantially in recent years, both in the United States and the rest of the world. As a result, there are sharply divided views on mining.

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[1] The views expressed in this article are those of the authors. They are not the views of the U.S. International Trade Commission as a whole or of any individual Commissioner.

[2] To be more precise, minerals containing these metals are mined. The mining industry also includes the initial mineral processing operations (also called milling), such as crushing, grinding, flotation, and leaching, which concentrate or separate metal-containing minerals from waste minerals. After mining and milling, the mineral concentrate must be treated using metallurgical processing techniques (e.g., smelting and refining) to produce metals.

Exploration Expenditure Trends

As current mines are exhausted, new mineral deposits must be discovered and developed to replace lost production. Mineral exploration--the search for new mineral deposits that can be economically mined--is time consuming and expensive. The entire process of finding and developing a new mineral deposit can take from 5 to 7 years in North America.[3] Thus, mining companies typically allocate between 15 and 20 percent of total capital spending for exploration activities.[4] Exploration is an investment in future production and determines the location of future mines.

Two trends characterize exploration spending throughout the 1990s worldwide: an overall rise in spending and a shift in areas where this money is spent. Worldwide exploration spending grew steadily from 1993 to 1997 (figure 1), rising by more than 150 percent. Spending has fallen dramatically since 1997, likely a result of declining metal prices, although exploration spending is still higher than 10 years ago.[5] The exploration activities of Phelps Dodge, the largest copper-mining company in the United States, during this period followed worldwide exploration trends and were representative of the U.S. metal-mining industry.[6] In 1992, Phelps Dodge conducted mineral exploration in 5 countries; by 1999/2000, Phelps Dodge explored in 26 countries.[7] Although the bulk of Phelps Dodge's copper mining is still in the United States, since the mid-1990s, most of its mineral exploration has been overseas. During the years 1992-94, the company spent over 50 percent of its exploration expenditures in the United States; by 1998-99, this figure had dropped to 25 percent.[8]

This trend is evident overall in the U.S. mining industry as well. Despite the surge in worldwide mineral exploration spending during the 1990s, a decreasing portion of these funds has flowed to the United States. Mining companies have transferred spending away from traditional mining centers, such as the United States, to new mining areas in Asia, Africa, the Pacific, and especially in Latin America (figure 2). The United States has experienced the

[3] *Facts About Minerals*. Washington, DC: The National Mining Association, 1998.

[4] This figure is a recent Canadian estimate. However, given the fixed nature of exploration spending (particularly technology and labor costs), this estimate is likely accurate for the U.S. industry as well. *Overview of Trends in Canadian Mineral Exploration*, Canadian Intergovernmental Working Group on the Mineral Industry, Minister of Public Works and Government Services Canada, Ottawa: 2000, p. 95.

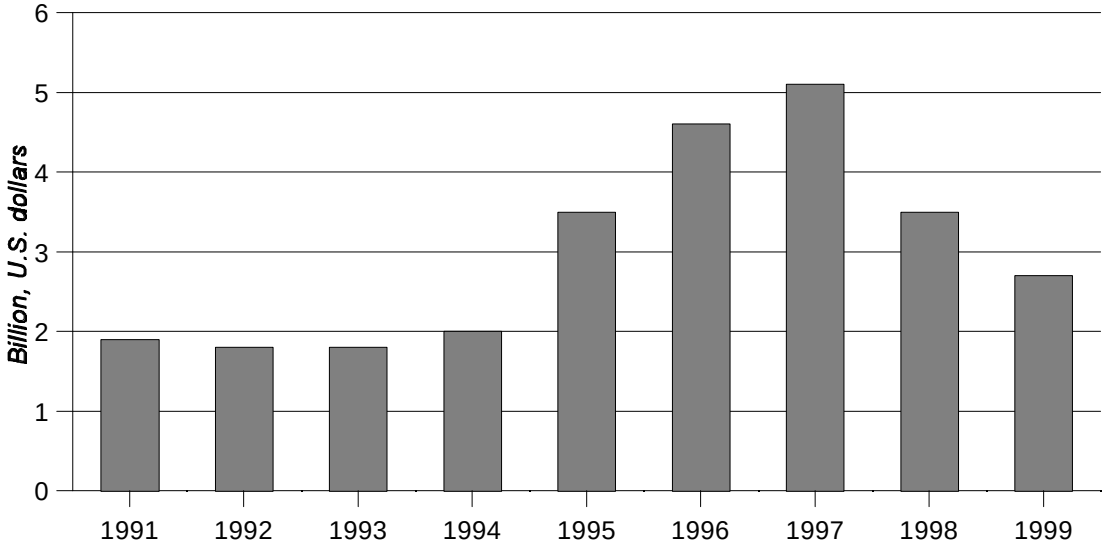
[5] The link between lower commodity prices and trends in exploration spending is unclear. Although some observers explain the dip in exploration spending levels in 1997 as a result of lower prices, and therefore of lower profits, others maintain there is little connection. John L. Dobra and Thomas R. Harris, "Economic Impacts of Proposed Changes in U.S. Mining Laws and Public Lands Regulation on Nevada," Natural Resources Industry Institute, University of Nevada, Reno, for the Nevada Division of Minerals, Department of Business and Industry, June 1999.

[6] The large size and innovative character of Phelps Dodge render it an industry bellwether; Platt's *Metals Week* was typical in noting "(a)s goes Phelps Dodge, so goes the U.S. copper mining industry," Oct. 31, 2000, p. 6.

[7] Phelps Dodge Corp., found at *http://www.phelpsdodge.com/index-pdmc.html* on Aug. 21, 2000.

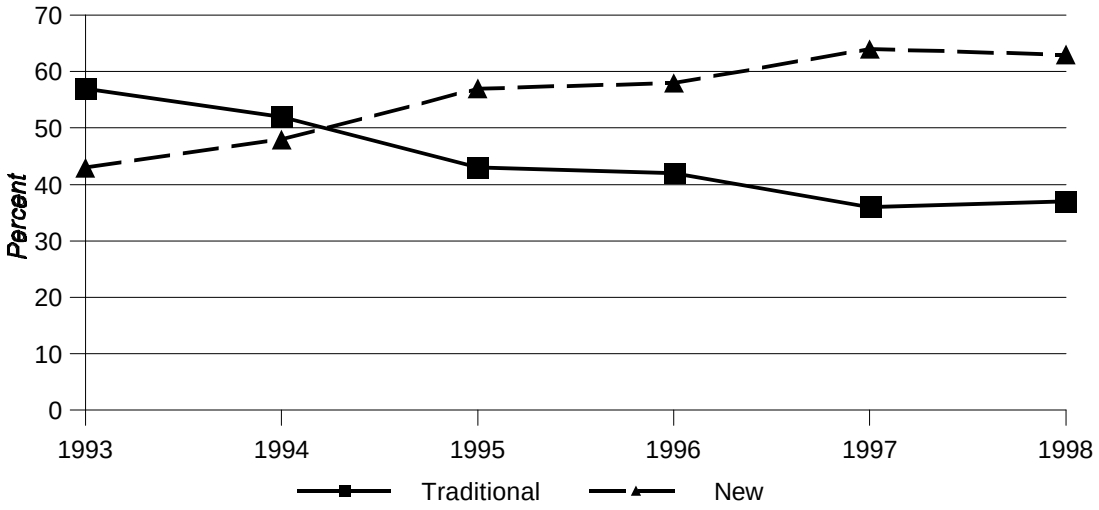
[8] Based on annual reports (form 10-K) filed with the Securities and Exchange Commission found at *http://www.sec.gov*.

Figure 1
Exploration budgets for metals worldwide, 1991-1999



Source: Data compiled from Metals Economics Group estimates, reported in *Mining Journal*, Vol. 327, No. 8401, Oct. 26, 1999 and "Exploration Spending Declines 31%", *Mining Engineering*, Dec.1999.

Figure 2
Trend in exploration spending favoring new mining areas, 1993-1998



Note.-- Traditional mining areas include the United States, Canada, Australia, and Europe. New mining areas include Latin America, the Pacific, Asia, and Africa.

Source: Based on Metals Economics Group estimates, reported in *Mining Engineering*, May 2000.

sharpest decline in mineral exploration spending, and lags behind Canada and Australia. Among the new mining centers, Latin America has experienced the most dramatic gains.

Foreign Mining Opportunities

The prospect of larger and higher-grade mineral deposits in many foreign countries is a principal reason encouraging companies to explore and invest overseas. In the early 1990s, as companies began to mine overseas in greater numbers, a perception emerged of new mining areas having particularly rich mineral deposits. This mineral wealth contrasted with the less impressive deposits in the United States and other traditional mining countries, where 100 years or more of commercial mining had depleted many known mining areas, and where many of the richest deposits had been at least partially mined already.[9]

Several major discoveries caused mining companies to turn their attention to emerging mining centers. For example, Newmont Mining led the trend in gold in the early 1990s with two major discoveries in Peru: Minas Conga (which contained approximately $3.7 billion of copper, gold, and silver reserves) and Yanacocha (which contained approximately $2.5 billion of gold reserves).[10] The Peruvian Central Bank has noted that the discovery and development of Yanacocha brought Peru to the attention of the international mining community, ending 20 years of stagnant investment in the Peruvian mining sector.[11]

The following year, a number of copper discoveries further dramatized the potential of new mining areas, including Kucing Liar (Irian Jaya, Indonesia) developed by Rio Tinto and Freeport ($9.6 billion of copper reserves), and Spence (Chile) developed by Rio Algom ($6.3 billion of copper reserves).[12] Today, the world's largest gold and copper mines are in the new mining areas. Grasberg, in Indonesia, is the world's largest gold and copper mine (developed in 1967).[13] Escondido, in Chile, is the world's largest copper mine (discovered in 1981).[14]

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[9] Alaska is a likely exception. This state has mineral deposits that are currently being mined that are as rich as anywhere else in the world, and the potential for finding additional rich mineral deposits is high. However, mining is problematic in large parts of the state because of climatic conditions as well as concerns about the environmental effects of mining.

[10] Newmont owns 40 percent of Minas Conga and 65 percent of Yanacocha. Data from Michael Chender, Metals Economic Group, Halifax, "Changing Patterns of Exploration Spending and Implication for Growth," published in the proceedings of the Eighth Annual MEMS Professional Meeting, Apr. 15-17, 1999, pp. 180-203, and Newmont Mining Corporation's Submission to the Securities and Exchange Commission, Form 10-K, for the year ending Dec. 31, 1998, found at *http://www.sec.gov/Archives/edgar/data/71824/0000950134-99-002280.txt* on Aug. 18, 2000.

[11] Javier de la Rocha Marie, *Peru: the Macroeconomic Environment for the Private Investment*, Central Reserve Bank of Peru, Dec. 1997.

[12] "Grasberg Keeps Growing," *Mining Journal*, Vol. 329, No. 8447, Sept. 26, 1997, found at *http://www.mining-journal.com/MJ/26sep97.htm* on Aug. 18, 2000, and Michael Chender, Metals Economic Group, Halifax, "Changing Patterns of Exploration Spending and Implication for Growth," published in the proceedings of the Eighth Annual MEMS Professional Meeting, Apr. 15-17, 1999, pp. 180-203.

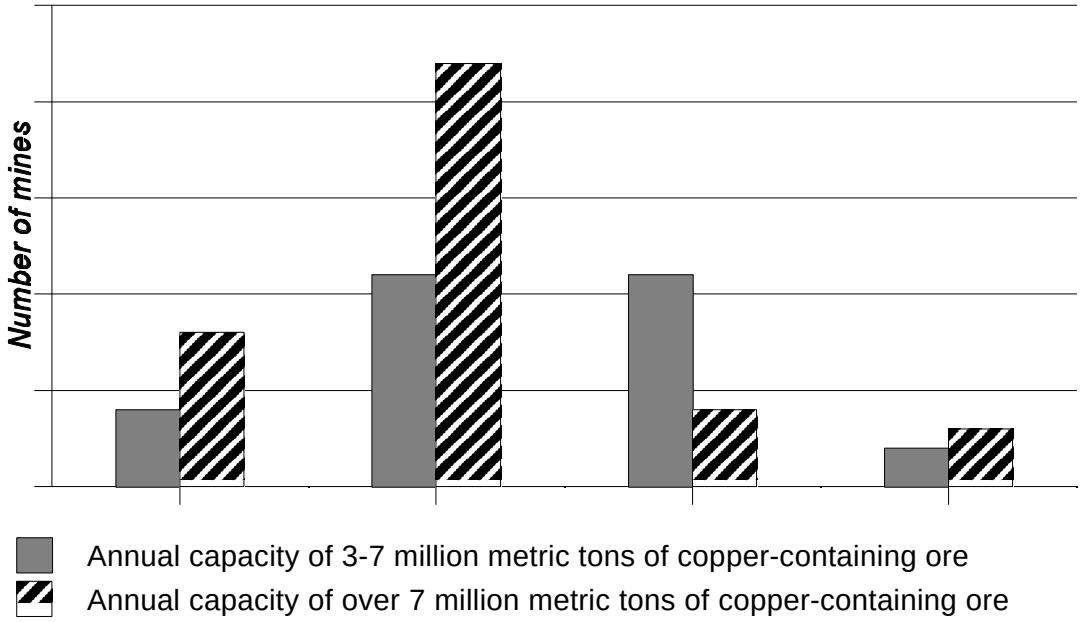
[13] *Mining Journal*, Vol. 332, No. 8531, May 14, 1999. Grasberg is owned by P.T. Freeport Indonesia, which is a majority-owned subsidiary of Freeport-McMoran Copper and Gold, Inc.

[14] Rio Tinto Online Publications, found at *http://members.tripodnet.nl/kaalslag/*

(continued...)

A comparison of copper mine locations by output per year shows that many existing copper mines with the highest output are in newer mining regions, particularly Latin America (figure 3).

Figure 3
New copper-mining regions in Latin America have more high-capacity operations in 1999



Source: Compiled from data from *Mining Magazine*, Jan. 2000.

The growth of mining investments in new mining regions has been accompanied by an increase in conflicts between the foreign investors and local populations. Two mining operations in Papua New Guinea demonstrate the scope of these problems. Ok Tedi, a large copper mining operation on the island of New Guinea, is involved in an ongoing dispute over the waste disposal practices of the mine. Waste from milling operations are currently disposed in a river, and local people are concerned about the environmental effects of this dumping. Local population conflicts with the Bougainville copper mine, which began operation in 1972, turned violent, and the mine owners were forced to shut down operations in 1990. The local population objected to the economic arrangements and environmental damage of the mining operation.[15]

[14] (...continued)
arm/arm_uk_mijn.htm.

[15] For more information, see "Report by the Special Rapporteur on His Mission to Papua New Guinea Island of Bougainville from 23 to 28 October 1995," United Nations Commission on Human Rights, found at *http:// www.unhchr.ch/Huridocda/Huridoca.nsf/TestFrame/ 0312d13126a591208025668d00592637?Opendocument.*

Since 1985, more than 95 countries have instituted reforms of their mining laws either by amending existing laws and regulations or by adopting new regulatory frameworks entirely.[16] Natural resources in many developing countries were previously tightly controlled and mined by Government-owned companies, but this kind of control is changing in many regions as countries embrace regulatory reform, free-market liberalization, and privatization. Worldwide mining privatization peaked in 1997, with approximately 20 sales of government-owned operations worth $4.8 billion.[17] These changes in mining law have encouraged foreign investment in new mining areas by providing mining companies more opportunities for investment and partnerships with local mining concerns.

Many of these new mining countries have also implemented environmental regulations similar to regulations in the traditional mining countries. For example, Chile made the preparation of environmental impact assessments for mining operations mandatory in 1997. Argentina, Brazil, Bolivia, Mexico, and Peru also have requirements for environmental impact assessments. There is an ongoing attempt to harmonize mining environmental regulations throughout the Americas to improve pollution prevention.[18]

Latin American countries, especially Chile, Mexico, and Peru, have been particularly successful in attracting foreign investment in their mining sectors by reforming their mining and investment laws. Chile and Peru have amended their constitutions to strengthen private property rights. Chile, Mexico, and Peru have adopted new mining laws that provide the security, as well as the organizational and financial flexibility, that mining companies desire in order to justify foreign investments. All three countries guarantee stability of investment: Mexico through NAFTA membership, and Chile and Peru through currency stabilization agreements. In a 1995 report, the World Bank singled out Chile's mining reforms for praise, noting that Chilean guarantees of mining property rights, reliability of mining cadaster,[19] security of title, and unrestricted transferability of rights under the Mining Code have all contributed to Chile's popularity as a destination for foreign exploration funds.[20]

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[16] James M. Oto, "Global Changes in Mining Laws, Agreements and Tax Systems," *Resources Policy*, Vol.. 24, No. 2, 1998, pp. 79-86.

[17] "M&A in Mining," *Mining Journal*, July 7, 2000, pp. 6-7.

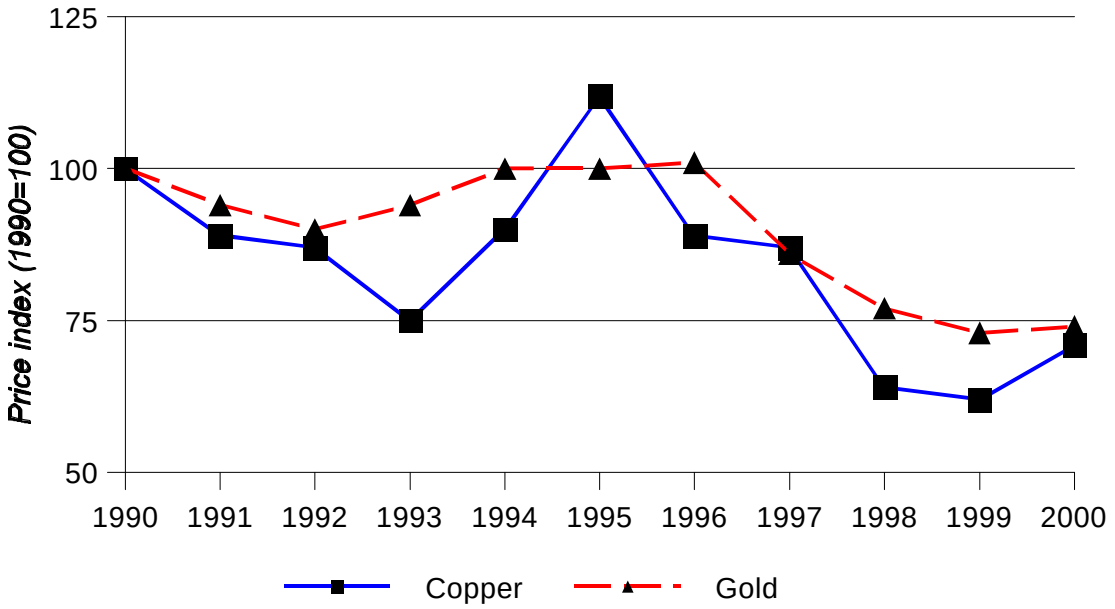
[18] "Pollution Prevention and Mining: A Proposed Framework for the Americas," Washington, DC: Environmental Law Institute, 1999 found at *http://www.eli.org/pdf/rrpollutionmining00.pdf*.

[19] A cadaster is an official record of property boundaries and property valuations, for tax assessment and other legal purposes. The World Bank recommends that "concessions conform to a regular shape, have borders which run only north-south and east-west, and that they be identified by their ULM (Mercator Universal Transverse projection) coordinates." "Characteristics of Successful Mining Legal and Investment Regimes in Latin America and the Caribbean Region," World Bank, Industry and Mining Division, New York: 1995.

[20] Ibid. See also David Lundy, "Investment Opportunities in Latin America's Newly Liberalized Mining Sector," *Industry Trade and Technology Review*, United States International Trade Commission, Washington DC: Oct. 1992, pp. 21-25.

The opening up of new mining regions with rich mineral deposits and relatively low labor costs have given mining companies operating in these regions the opportunity for low-cost operations.[21] This has become especially important in recent years because of the downturn in prices of major commodities such as copper and gold in the 1990s, which rendered existing mines correspondingly less profitable (figure 4).

Figure 4
Downturn in copper and gold prices (1990-2000) affects mining profitability



Source: Based on annual prices from the U.S. Geological Survey. 2000 index reflects Jan.-Sept. price average.

U.S. Regulatory and Environmental Issues

Metal mining in the United States has attracted a great deal of attention during the 1990s. Much of this attention is focused on the environmental effects of mining and the laws that govern mining on public land, some of which date back to the 19th century. There is a strong public debate about metal mining between the industry and those who wish to reform the process of how metal mineral deposits are developed and operated.

[21] Labor costs in the mining sector vary considerably, although in general, wages are higher in the United States than in many developing nations. A 1999 survey, for example, showed that U.S. mining laborers' salaries ranged between $7.80 and $21.12 per hour or between $15,600 and $42,240 per year for a standard 40-hour work week. *Western Mine Engineering 1999 Annual Mining Cost Service U.S. Mine Labor Survey*, Western Mine Engineering found at *http://www.westernmine.com/labcost.htm* on Sept. 19, 2000. A 1992 survey showed that the average per capita wage in Mexico to be $3,470, in Chile to be $2,510, and in Peru to be just $950. Latin American Network Information Center, University of Texas, found at *http://lanic.utexas.edu/la/region/aid/aid94/Social/ PERCAP.html* on Sept. 19, 2000.

At the same time that foreign regulatory reform and privatization are attracting interest overseas, modifications or proposed changes to the U.S. Federal and state mining regulations, and stricter Federal and state environmental guidelines,[22] are likely contributing to less exploration and investment interest in the United States. For example, on Federally owned land in the United States, the total "plans of operations" filed declined by 50 percent between 1992 and 1999.[23] One 1999 study of precious-metal exploration expenditures noted a "substantial" reduction in domestic precious-metal exploration spending since 1994. Whereas U.S. mining companies allocated more than one-half of their precious-metal exploration budgets domestically in 1992, by 1999, this figure was less than 30 percent.[24] The likely prospect of more stringent mining and environmental laws in the future could increase uncertainty and, therefore, the risk associated with U.S. mining investments.

Mining Law Reforms and Implications

The General Mining Act of 1872 (Mining Act), enacted to promote mineral resource development, states that all valuable mineral deposits in land belonging to the U.S. Government should be open to exploration and purchase by U.S. citizens. The Mining Act affects 38 percent of land in the 12 Western States where most hardrock[25] mining occurs.[26] Table 1 shows the amount of Federally owned land in the Western States with the most significant mining operations. Reports by the General Accounting Office and the U.S. Department of the Interior (Interior) estimate that 14-15 percent of the total value of U.S. hardrock mineral production occurred on Federal land in 1990/91 (this is the most recent data available).[27] Although these reports indicate that the amount of Federal land used for metal mining is modest, they do not indicate the amount of exploration activity and, hence, the possible future production on Federal lands (comprehensive data on this type of activity on Federal land are not available).

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[22] Although mining companies commonly note that they observe similar safety and environmental standards worldwide, some specific U.S. environmental regulations can be more strict than foreign regulations. One industry official has noted, for instance, that U.S. copper smelters are now required to capture an average of 95 percent of sulfur emissions, and that this figure is less than 70 percent in South America and Asia and less than 50 percent in Africa, resulting in lower production costs in overseas mining regions. James M. Cowley, Vice President, Sales, Kennecott Utah Copper Corporation, "Copper: Global Competition, Global Collaboration," paper presented at 2000 SME Annual Meeting, Salt Lake City, UT, Mar. 1, 2000.

[23] "Plans of operation" must be submitted to the Bureau of Land Management by mining exploration and development operations that disturb more than 5 acres per year or are near critical environmental areas on Federal land that this agency manages. *Hardrock Mining on Federal Lands.* National Research Council, National Academy Press, Washington, DC: 1999, p. 19.

[24] John L. Dobra and Thomas R. Harris, "Economic Impacts," p. 5.

[25] "Hardrock" mining generally refers to mining minerals that contain metals, such as copper, gold, and molybdenum, but the term also refers to nonmetallic minerals such as fluorspar and barite. Although the Mining Act originally applied to all deposits, subsequent laws removed fuel minerals, such as coal and oil shale, and common materials, such as sand and gravel, from the law's purview.

[26] Bernard A. Gelb, "Hardrock Mining, the 1872 Law, and the U.S. Economy," Congressional Research Service, July 1, 1994, found at *http://www.cnie.org/nle/mine-3.html*.

[27] Ibid.

Table 1
Amount of Federally owned land in selected western states

State	Federally owned land	
	Amount	Federally owned share of state land
	1,000 acres	*Percent*
Alaska	248,010	67.9
Arizona	31,766	43.7
California	41,586	41.5
Colorado	22,774	34.3
Idaho	32,225	60.9
Montana	23,859	25.6
Nevada	58,045	82.6
New Mexico	24,116	31.0
Oregon	28,764	46.7
Utah	32,241	61.2

Note.–Table does not include acquired Federal land (i.e., land acquired by purchase, condemnation, donation, exchange and other methods). The Mining Act does not pertain to acquired Federal land.

Source: U.S. Department of the Interior, Bureau of Land Management, *Public Land Statistics 1999*, found at *http://www.blm.gov/natacq/pls99/99pl1-3.pdf*.

The Mining Act gives a number of rights to U.S. citizens and companies, including rights to prospect for hardrock minerals on Federal lands. It gives citizens and domestic companies the right to stake a claim, to mine the land once a deposit is found, to sell the extracted mineral without reimbursing the Government, and to patent (purchase) the land for $2.50-$5.00 per acre after $500 of development work has been performed.

The mining industry stresses that security of tenure at a mining site is necessary to encourage companies to take the risk of developing mineral deposits, especially during periods of low commodity prices. However, some outside the mining industry object to the easy access that the current version of the law provides to would-be miners, and the lack of control that the U.S. Forest Service, U.S. Environmental Protection Agency (EPA), and Bureau of Land Management (BLM) have over approval of mining operations. Some oppose the easy financial conditions the law imposes on miners: the fact that land purchase costs reflect land prices when the law was originally drafted in 1872, and that no royalties are paid to the Federal Government by mining companies that extract mineral resources from public lands.[28]

[28] Some critics of the mining industry also object to the misuse of land patented under the Mining Law for nonmining purposes. This problem was addressed by the Surface Resources Act of 1955 and the Federal Land Policy and Management Act of 1976. In 1990, the Congressional Subcommittee on Mining and Natural Resources held hearings related to a General Accounting Office report that misuse of land patented under the Mining Law was still occurring. In September 1990, the BLM established a task force to strengthen its ability to prevent unauthorized use of land patented under the Mining Act.

The Mining Act has not been amended since certain reforms in the 1970s, including the imposition of a short-lived 5-percent royalty fee on minerals mined on Federal lands.[29] In 1992, the Clinton Administration's stricter stance on mining, pressure to reduce the budget deficit, and desire to strengthen environmental standards, created new interest in reforming the Mining Act and prompted initiatives in both the U.S. House of Representatives (House) and the Senate in the 1993-94 session.[30] Congress has debated Mining Act reform since that time, and the National Mining Association has characterized the strong philosophical debate over the law[31] as a factor which has hampered a consensus on mining legislation.[32] Although the Mining Act has not been changed, Congress effectively changed a key provision of the law by imposing a moratoria on new patents for hardrock mining claims on Federal lands in 1995. Congress did this by eliminating funding in Interior's budget for processing new patents.[33]

Management of Federal land is another factor that affects mining on public land. The BLM and the Forest Service have administrative authority over most Federal lands. These two agencies exercise management of Federal land under their respective control pursuant to the Federal Land Policy and Management Act, the National Forest Management Act, and the Surface Resources Act.[34] The BLM first issued regulations pursuant to these laws in 1980. These "3809" regulations required exploration and mining operations to file notices or plans of operation with BLM, granted approval authority to BLM in certain cases, and required reclamation of mined-out lands. In January 1997, faced with a deadlock in Congress over Mining Act reform (which might have made changes to "3809" regulations unnecessary), the

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[29] This led to a significant short-term decline in mineral exploration activity, discussed in "General Mining Law," Committee on Resources, Subcommittee on Energy and Mineral Resources, U.S. House of Representatives, found at *http://www.house.gov/resources/106cong/energy/minelawbrief.htm* on Dec. 8, 1999.

[30] For example, the Senate passed The Hardrock Mining Reform Act of 1993, which was approved unanimously on May 25, 1993, and introduced minor new claim and maintenance fees for prospectors on Federal land. On May 3, 1994, the Chairman of the Senate Energy and Natural Resources Committee, advanced the debate further with a "Chairman's Mark," proposing an indexed 2 percent royalty (tied to prices) on revenue from copper and gold mined on Federal lands. Neither of these proposals progressed any further. The Mineral Exploration and Development Act of 1993 was passed by the House on November 18, 1993, but did not progress any further because a House-Senate conference committee did not reach an agreement on the bill. This act would have allowed the Secretaries of the Interior and Agriculture to prohibit mining on some lands, impose some new mining fees, impose some royalty fees on smelted minerals, eliminate patent rights, and required miners to restore mined land to a condition capable of sustaining the same activities the land was able to support before mining. The revenue that would have been generated by the new fees and royalty payments was designated for a new fund to restore abandoned mined areas on Federal land.

[31] "Land Use," National Mining Association, found at *http://www.nma.org/issuesland.html* on Aug. 31, 2000.

[32] For example, in 1999, a rider was attached to the Senate Interior Appropriations Bill (S. 1292) exempting mines on public lands from current waste dumping limits, but was later defeated. A counter amendment attached to the House Interior Appropriations Bill (H.R. 2466) passed on July 14, 1999 with widespread bipartisan support, but did not result in permanent legislation.

[33] The moratoria has been extended every year since 1995. The latest extension was in 1999, to run through 2001 (Omnibus Consolidated Appropriations Act, P.L. 105-277).

[34] 43 U.S.C. §§1701-1784, 16 U.S.C. §§1600-1687, and 30 U.S.C. §612, respectively.

Secretary of the Interior directed the BLM to revise the "3809" regulations.[35] The new regulations, which will take effect on Januzry 20, 2001, broaden and strengthen the agency's oversight functions by, for example, requiring plans of operations for all mining operations (removes the more than 5 acre exception), requiring financial guarantees covering the full cost of reclamation rather than a minimum per-acre amount,[36] and allowing BLM to deny approval of operations that result in substantial irreparable harm to scientific, cultural, or environmental resources.[37]

Royalty Fee Issue

The potential imposition of royalty fees for mining on public land is one of the most controversial proposed reforms of the Mining Act, and constitutes a potential cost to mining companies which, according to some domestic industry officials, could render domestic mining unprofitable.[38] The imposition of a royalty would likely represent a significant change in the management of Federal land. Whereas under existing law, mining companies claim and patent the land (which includes surface and mineral rights) used for hardrock mining,[39] some of the proposed reforms would abolish the claim-patent system in favor of a permitting system in which the U.S. Government would retain ownership, but lease surface and mineral rights and charge royalty fees.

In 1993, for example, both the House and Senate passed legislation to reform or completely alter the patenting system, although neither bill became law and the issue continued to be re-introduced in subsequent sessions of Congress. Many elements of the mining industry initially backed the 1993 Senate bill (S. 775) that retained patenting but required mine operators to pay the Government fair market value for mines, based on surface values only. Many environmental groups backed the House bill (H.R. 322) that eliminated patenting and imposed a permitting system, and set an 8-percent gross income royalty. Gross income royalties

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[35] Congress gave Interior the authority to revise the "3809" regulations in the FY 2000 Interior appropriations bill, but stipulated that these revisions must be consistent with the recommendations of a National Academy Press (NAP) report on hardrock mining. "Hardrock Mining on Federal Land," Washington, DC: National Academy Press, 1999, found at *http://books.nap.edu/books/0309065968/html/R1.html*. Mining industry representatives claim that the final rules are not consistent with the NAP report recommendations (see *http://www.nma.org/issuesland.html#anchor270807*).

[36] Mining companies typically post bonds to fulfill this requirement. However, reclamation costs can exceed bond amounts and taxpayer liability can be substantial if the mining company goes out of business before reclamation is complete. For example, in Colorado, pollution of the Alamosa River attributable to a cyanide spill at a now bankrupt gold mining operation is reported to cost taxpayers more than $100 million in cleanup costs through the Superfund program whereas total taxpayer liability in the State of Nevada associated with 36 bankrupt mining sites reportedly could reach an estimated $840 million. Michael Grunwald, "Babbitt Issues Parting Shots," The Washington Post, Jan. 15, 2001, p. A1.

[37] "BLM Publishes Final "3809" Surface Mining Regulations," found at *http://www-a.blm.gov/nhp/news/releases/pages/2000/pr001121_3809.htm.*

[38] This view was put forward by Douglas B. Silver, President, Balfour Holdings, Inc., Englewood, CO, in "Unforseen Consequences of a New Governmental Royalty," testimony to the Committee on Resources, Subcommittee on Energy and Mineral Resources, Field Hearing, Golden, CO, Oct. 23, 1999.

[39] Mineral production can take place, and often does, on claimed land that has not been patented (purchased).

impose fees on all revenue generated from a mine, even when that mine is unprofitable. An alternative measure meeting with less resistance from mining companies is the net income royalty approach that bases royalty fees on profits realized from a mine. Such an approach, according to industry sources, results in a less onerous burden on mining operations, especially those whose long-term profitability is not assured. The debate about royalty fees is intense; a 1994 study, for example, estimated that the cash flow would be more than 60 percent greater for a typical mining company paying an 8 percent net income royalty compared with the same company paying an 8 percent gross income royalty.[40]

Existing mineral royalties on privately owned land in the United States average 5 percent, and royalties paid to states for minerals extracted from state-owned land can reach 10 percent.[41] Reformers often point to examples where mining companies patent mineral-rich Federal land for small fees to boost support for the imposition of royalty fees.[42] Although many U.S. mining officials do support the imposition of royalty fees--for example, the Northwest Mining Association supports a 5-percent royalty fee for minerals mined on Federal lands[43]--whether royalties ought to be imposed, the level at which they should be set, and their resulting economic impacts, continue to be debated.

A Congressional Research Service (CRS) report listed the results of several studies conducted in 1993 that systematically examined the impact of the proposed mining law reforms, primarily the annual effects on the U.S. economy of the imposition of an 8-percent royalty (table 2). These studies were based on a wide range of assumptions, and predicted a wide range of effects, although the CRS report characterized most effects as negative but small.[44] Certain effects identified in the studies are substantial, particularly the effects estimated by the Evans Economic Institute. Although effects may be small in comparison to the total U.S. economy, effects on certain areas that rely heavily on the mining industry could be substantial. However, the CRS report notes some of these negative effects of a royalty fee provision might be offset by mining that is shifted from Federal to private land.

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[40] Marc Humphries, *Mining Law Reform: The Impact of a Royalty*, Congressional Research Service, Report for Congress, May 12, 1994, made available to the public by The Committee for the National Institute for the Environment, Washington, DC.

[41] Testimony of Stephen D'Esposito, President, Mineral Policy Center, to the Subcommittee on Energy and Mineral Resources, Committee on Resources, U.S. House of Representatives, "An Oversight Hearing on 'Mining Regulatory Issues and Improving the General Mining Laws'," Aug. 3, 1999.

[42] For example, a report by the House Committee on Natural Resources highlighted recent gold patents on federal land. It found that in 1992, for instance, the Homestake Mining Company patented over 61 acres of federal land at the McLaughlin Mine in Sonoma County, California. Although that mine contained 1.8 million ounces in 1993, Homestake Mining paid just $310 for the land. In 1994, American Barrick Resources bought 1,949 acres at the Goldstrike Mine in Elko, Nevada. Although the mine had estimated reserves of 30 million ounces of gold, American Barrick paid just $9,765 for the Federal land. For more information, see *Taking From the Taxpayer: Public Subsidies for Natural Resource Development*, Democratic Staff Report, Subcommittee on Oversight and Investigation, Committee on Natural Resources, U.S. House of Representatives, 103rd Congress, Second Session, Aug. 1994, Washington, DC, Committee Print No. 8.

[43] Laura E. Skaer, Executive Director, Northwest Mining Association, Testimony before the Committee on Resources, Subcommittee on Energy and Mineral Resources, U.S. House of Representatives, Spokane Field Hearing, Sept. 11, 1999.

[44] Humphries, *Mining Law Reform*.

Table 2
Annual effects of 8-percent net smelter return royalty

Study	Change in U.S.: Economic output (except as noted)	Employment	Treasury receipts
U.S. Department of the Interior[1]	-$88 million	-1,100	$133 million
Congressional Budget Office[2]	-$58 to $174 million	-500 to 2,900	$20 to $146 million
Evans Economic Institute	-15 percent in production	-17,800	-$505 million
University of Nevada[1]	-$120 million (including indirect effects)	-1,040	$122 million
Goldman Sachs[1]	2-13 cents per share for certain mining companies	No estimate	$58 million

[1] These studies covered only gold mining (this type of mining accounts for a significant amount of total mining activity, based on value of mined material, on Federal land).

[2] The range of effects includes increases in economic output and employment because this study anticipated increases in spending for mine reclamation and other environmental cleanup activities.

Note.–These studies all assumed an 8-percent net smelter return (NSR) royalty. NSR is the amount of gross revenues net of all post-milling costs.

Source: Marc Humphries, Congressional Research Service, *Mining Law Reform: The Impact of a Royalty*, May 12, 1994, found at *http://www.cnie.org/nle/mine-4.html.*

Mill Site Acreage Restrictions

The debate over Mining Act reform also has focused on options limiting the acreage of mines on public land. Mill site acreage--the amount of land used by plants to process the mined material and to store the waste (also known as tailings) generated at these plants--is crucial to the operation of any mine. Although mining companies have asserted that existing regulations do not limit the number of mill sites allowed per mine,[45] Interior issued a ruling in 1997 under the Mining Act that specifies a one-to-one ratio between mining claims and mill site claims.[46] In July 1999, the Senate and House passed conflicting bills addressing the Interior ruling, with the Senate bill overturning Interior's ruling and the House bill codifying the ruling (making it part of the law). The Interior Appropriations Conference Committee worked out compromise legislation that exempted existing mines and those with a permitting process underway from the Interior ruling, and applied the Interior ruling to mining operations

[45] The BLM's *Handbook for Mineral Examiners* H-3890-1, p. III-8 (1989) states that "(e)ach mill site is limited to a maximum of five acres in size and must be located on non-mineral land . . . Any number of mill sites may be located, but each must be used in connection with the mining or milling operation." *The Bureau of Land Management Manual 3864.1.B (1991)* states that "(a) mill site cannot exceed five acres in size. There is no limit to the number of mill sites that can be held by a single claimant." Quotes from National Mining Association's "Millsite Fact Sheet," found at *http://www.nma.org/MP4-millsite%20fact%20sheet.html* on June 19, 2000.

[46] The first new mining operation affected by this ruling was the Crown Jewel Mine in Okanogan County, Washington, owned by Battle Mountain Gold Company and Crown Resources. After a 7-year, $80-million permitting process, Interior refused Crown Jewel's plan of operations in March, 1999, on the grounds of excessive mill site plans; in May 1999, Congress exempted the mine from the Interior's mill site ruling. See *http://www.agiweb.org/gap/legis106/crownjewel.html* for more information.

that began after November 1997. This compromise was eventually enacted as part of the FY 2000 Appropriations Bill, and allows only one 5-acre mill site to one 20-acre claim on Federal land. The effects of this new, stricter limit have not yet been determined.

Other Issues

As a result of growing concern about environmental effects, mining companies also are facing increasing state regulation and restrictions on mining activity. Wisconsin, for instance, has enacted a new law that imposed stricter permitting requirements.[47] Montana has enacted Citizen Initiative 137 (I-137), which prohibits the use of cyanide (an essential chemical for leaching precious metals out of rock) in some new or expanded open-pit gold and silver mines to prevent it from polluting local rivers.[48] Since narrowly passing in a referendum, the ban has had a noticeable effect on gold mining in Montana; one of the prime targets of the ban, Canyon Resources Corporation, has closed its McDonald Gold Mine in that state, citing its inability to mine without the use of cyanide.[49] In May 2000, Canyon Resources offered nearly 1 million acres of land in western Montana for sale.

Administrative procedural delays in existing mining regulations provides another element of uncertainty in domestic mining. Some domestic mining officials note that a protracted mine permitting process creates uncertainty regarding the ability of companies to develop their mines; California, for example, has been singled out by industry sources as delaying the issuance of mining permits.[50] However, other mining officials attribute delays to environmental concerns and a generally stricter interpretation of existing mining regulations in both state and Federal agencies.[51]

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[47] The Sulfide Mining Moratorium Bill, passed by the Wisconsin State Senate (SB 3) in 1997 and signed by the governor in February 1998, requires that before the state can issue a mining permit, the potential mining company must provide documentation that a metallic sulfide mine in the United States or Canada with similar geology has operated for 10 years without polluting ground or surface waters; and a metallic sulfide mine in the United States or Canada with similar geology has been closed for 10 years without polluting surrounding ground or surface waters. Environmental and industry groups continue to introduce new legislation to modify this law. For more information, see *http://www.dnr.state.wi.us/org/es/science/mining/crandon/moratorium/moratorium.htm*

[48] However, some mines were later exempted from this ban.

[49] Colorado-based Canyon Resources Corporation, has unsuccessfully challenged the ban in state and federal courts. The Montana Mining Association also filed suit against the ban; in 1999, after devoting significant association resources to support this ongoing lawsuit, the Association halted operations. Erin P. Billings, "Operators of Proposed Gold Mine Shut Down Office, Lay Off Workers," *Missoulian* newspaper, found at *http://www.missoulian.com/archives/index.inn?loc=detail&doc=/1999/June/9/553-news8.txt* on Sept. 6, 2000.

[50] J. Kowley, Kennecott Utah Copper Corp., speaking at 2000 SME Annual Meeting, Salt Lake City, UT, February 28, 2000.

[51] *Land Use Issues and Mineral Law* Panel at 2000 SME Annual Meeting, Salt Lake City, UT, Feb. 28, 2000. Panel participants: R.M.S. Corn; T.H. Eye, Gadsden Sonora Holdings; R.K. Brown, Wyo-Ben, Inc.; and W.H. Wahl, IMV Nevada.

In a major annual mining industry survey of investment climates in the United States during the period 1999/2000, the prime mining states of Montana, California, and Washington all received relatively low scores for attracting investment, largely because of uncertainty over future mining legislation and environmental controls.[52] The survey identified Nevada as the most attractive state for mining, and Chile as one of the most attractive countries for mining (table 3).

Table 3
Mining deterrence factors: Share of survey respondents who rate factor a strong deterrent to exploration, 1999

(Percentage)

Factor	Wisconsin	Montana	California	Washington	Nevada	Chile
Environmental regulation	87	45	73	65	5	0
Regulatory duplication or inconsistencies	63	33	46	49	2	2
Land claims uncertainty	24	11	10	11	2	0
Protected areas uncertainty	35	13	57	38	6	2
Uncertainty of administration, interpretation, or enforcement of regulations	83	27	55	62	3	0
Mineral potential	41	33	22	23	0	0

Source: *Mining Companies Rate Investment Attractiveness of Jurisdictions in North America - Who Makes the Grade?*, Survey of mining companies by the Fraser Institute, 1999/2000, found at *http://www.fraserinstitute.ca/publications/surveys/1999_12_mining/section_07.html* on Sept. 7, 2000.

Outlook

The near-term outlook for the U.S. metal mining industry appears discouraging because of better opportunities in foreign countries, current low prices for certain key metals which make higher-cost U.S. operations either unprofitable or marginally profitable, and uncertainty regarding regulatory and environmental issues in the United States. As a result of these factors, it is likely that the industry will contract in the future, at least in relation to production elsewhere in the world.

It is difficult to determine which of these factors has the most significant impact on future prospects for the U.S. metal mining industry. Attractive investment climates and rich mineral deposits in certain countries in Latin America, the Pacific, Africa, and Asia are obviously powerful incentives for exploration and investment interest, and provide the prospect for relatively secure, low-cost mining operations. The current low prices of certain metals provides additional incentive to find and develop low-cost mining operations to ensure a mining company the potential for maximum profits. As a result, the aforementioned regions

[52] *Mining Companies Rate Investment Attractiveness of Jurisdictions in North America - Who Makes the Grade?*, annual survey by the Fraser Institute for 1999/2000, found at *http://www.fraserinstitute.ca/publications/surveys.*

will likely lure a large portion of worldwide exploration and investment in the foreseeable future.

Within the United States, the outlook for the metal mining industry is more variable. Proposed changes in the Mining Act (including prolonged debate without resolution), changes in the interpretation of current laws, and other proposals to institute stricter environmental and mining regulations have created uncertainty in the United States, and a disincentive for exploration and investment. A royalty fee provision in the Mining Act, if it is instituted sometime in the future, has the potential to alter the economics of mining on Federal land. The same is true for some of the proposed environmental and mining legislation. In addition, certain states--most notably Montana, Wisconsin, Washington, and California, which have significant mining industries and potential for new mineral discoveries--have passed strict environmental laws which have discouraged mining companies from planning new mining projects. On the other hand, if the Mining Act is reformed with an equitable royalty fee provision, additional uncertainty surrounding regulatory issues is mitigated, and metal prices increase, then the outlook for the U.S. metal mining industry would likely be much improved. This would be especially true in states that are more receptive of the mining industry and remain inviting to mining companies. Nevada and Alaska, for example, remain strong mining areas where companies report high degrees of confidence in mineral exploration.

Mining will continue to be a controversial industry because of the potential environmental impacts. Most mining operations will be subjected to scrutiny, and the prospect for new laws regulating the industry is high. However, this will be true in the United States as well as the new mining regions that will likely develop more comprehensive environmental laws and enforcement capabilities in the future.**#**

Factors Affecting the Competitive Position of the Indian Software Industry

Theresa H. Canavan[1]
tcanavan@usitc.gov
(202) 205-3442

Although the United States is the global technology leader and is the world's largest producer and consumer in the $154-billion packaged software industry,[2] many other countries such as India have small but rapidly growing software industries. Historically, Indian software firms have acted primarily as outsourcing operations for foreign firms, but the industry is experiencing a shift toward in-house design and development of software. The growth of electronic commerce is encouraging this trend. Although in 1999 India accounted for less than one-half of 1 percent of global software industry revenues,[3] its software industry is one of the world's fastest growing, with revenues increasing by an average of 56 percent per year during the years 1995 through 2000.[4] This article examines the competitive position of India's software industry, the factors driving its growth, and the outlook for the industry's future.

India's software industry has experienced tremendous growth during the past few years. From $991 million in fiscal year (FY) 1995-96, revenues have increased to $5.7 billion in FY 1999-2000 (figure 1), and are projected to reach $8.75 billion during FY 2000-01.[5] There is significant growth potential for companies located in the country because the domestic demand for software will continue to increase, and many export markets (e.g. Europe and Japan) have barely been tapped. Recognizing this potential, the Indian Ministry of Information Technology has set an ambitious software export target of $50 billion and a domestic sales target of $37 billion by 2008.[6] To assist the software industry, the Government

[1] The views expressed in this article are those of the author. They are not the views of the U.S. International Trade Commission as a whole or of any individual Commissioner.

[2] The United States dominates the global software industry, accounting for 47 percent of global sales. U.S. Department of Commerce (USDOC), U.S. Industry and Trade Outlook 2000: Computer Software and Networking, p. 28-1; and International Data Corp., "IDC Puts the Worldwide Packaged Software Market at $154 billion in 1999," found at *http://www.idc.com/software/press/PR/sw012500PR.stm*, retrieved Nov. 20, 2000.

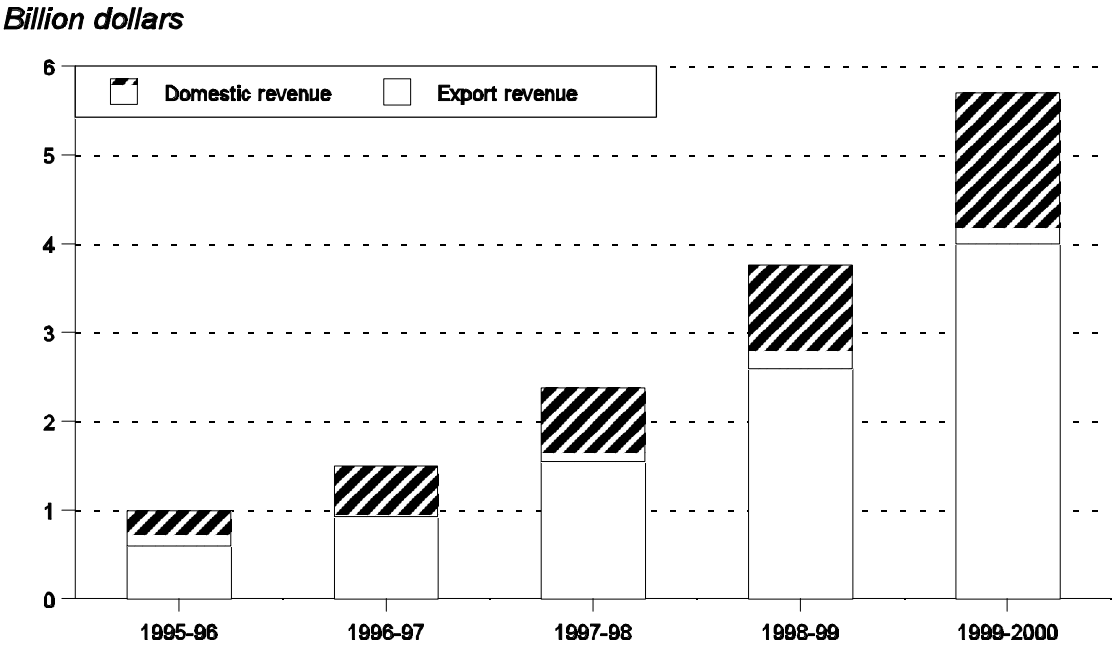
[3] USDOC, International Trade Administration (ITA), "Market Research Reports: International Market Insights: Indian Software Industry," found at *http://www.stat-usa.gov/*, retrieved Jan. 31, 2000.

[4] National Association of Software and Service Companies (NASSCOM), "Indian Software Industry," found at *http://www.nasscom.org/*, retrieved Mar. 4, 2000.

[5] NASSCOM, "Indian Software Industry," found at *http://www.nasscom.org/*, retrieved Dec. 7, 2000.

[6] Indian Ministry of Information Technology, *Annual Report 1999-2000*, p. 14, found at *http://www.mit.gov.in/sitemap/index.html*, retrieved May 8, 2000.

Figure 1
Export revenue drives growth in the Indian software industry (FY 1995-2000)[1]



[1] Based on a currency conversion rate of 42.259 rupees per dollar, the average exchange rate for 1998. International Monetary Fund, *International Financial Statistics*. The rupee has steadily lost value against the dollar during this period. Revenues shown in rupees would therefore be larger.

Source: National Association of Software and Service Companies (NASSCOM), "Indian Software Industry," found at http://www.nasscom.org, retrieved Mar. 4, 2000.

of India has implemented several incentive programs, enacted new legislation, and negotiated multilateral agreements.[7]

During the years 1998 to 1999, the domestic Indian software market experienced exceptional growth in several segments. Sales of CAD/CAM software and enterprise resource planning packages increased by about 40 percent, and sales of relational database management systems and financial packages rose by one-third.[8] New products fueled this growth in the Indian market, as more than 122 new software products were launched by indigenous Indian software companies and over 158 new software products were launched by overseas companies.[9] The Indian market is projected to grow significantly due to the expected increased demand for computers,[10] greater control of software piracy, and the growth of electronic commerce.

[7] These incentives are discussed in more detail in the section "The Impact of Government Policy."

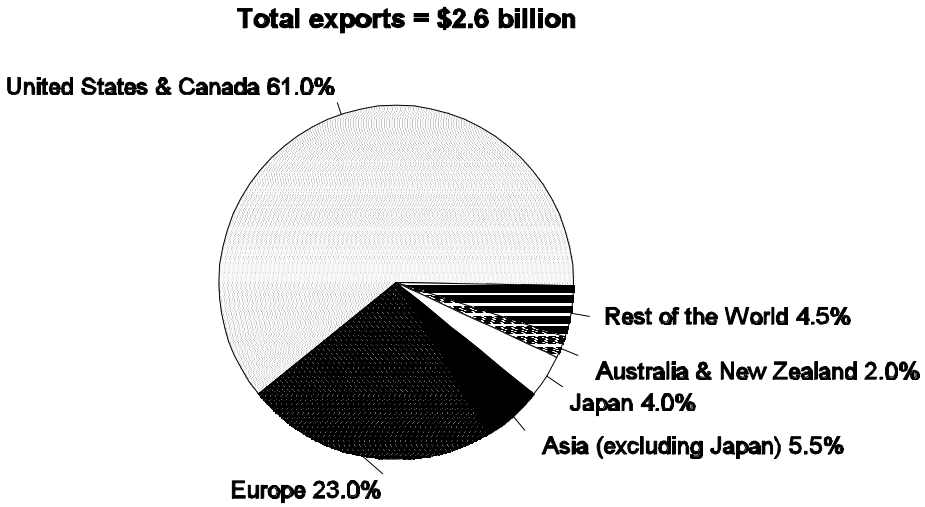
[8] NASSCOM, electronic communication, USITC staff, Mar. 4, 2000.

[9] Ibid.

[10] India's installed base of computers has reached 5 million. Shipments have grown from 1,200 in 1984 to 1 million each year since 1997. Although India's installed base is low compared to many countries, a compound annual growth rate for shipments of 47 percent is projected through 2004. Yograj Varma, "The Five Million Mark," *Dataquest*, found at *http://dqindia.ciol.commakesections.asp/00120702.asp*, retrieved Dec. 7, 2000.

Growth in the Indian software industry has also been driven by the cost-cutting strategy of outsourcing[11] practiced by many industry-leading firms, and from a growing global need for qualified software programmers. India's major export markets are developed countries that outsource to take advantage of India's lower labor costs, educated workforce, and increasingly, its rising level of product sophistication.[12] India's primary export destinations are the United States and Canada, which receive 61 percent of exports, and Europe (primarily the United Kingdom, Germany, France, and Italy), which receives 23 percent of exports (figure 2). Indian exports to South America, Asia, and Australia are expected to rise during the next 2 years, and Latin America, Korea, South Africa, and other parts of Europe are being explored as potential export markets.[13]

Figure 2
North America and Europe are dominant markets for Indian software exports (FY 1998-99)



Source: National Association of Software and Service Companies (NASSCOM), "Indian Software Industry," found at Internet address http://www.nasscom.org, retrieved Mar. 4, 2000.

[11] Outsourcing is a process wherein firms typically receive design specifications or unfinished software from client firms. After creating or modifying programming code, the resulting product is sent back to the originating firm. Outsourcing is discussed in more detail in the next section.

[12] Indian information technology (IT) representative, interview by USITC staff, Mar. 28, 2000; and Khozem Merchant, "Companies Gear Up For Expansion," *Financial Times*, July 4, 2000, p. III.

[13] Indian IT representative, interview by USITC staff, Mar. 28, 2000; and NASSCOM, "Indian Software Industry," found at *http://www.nasscom.org/*, retrieved Feb. 9, 2000.

The Indian software industry's origins were largely based on export, and the proportion of export revenues to total industry revenues has increased over the past several years, rising from 60 percent in FY 1995-96 to 70 percent in FY 1999-2000. Software exports constitute a rising percentage of India's total exports, accounting for 10.5 percent during FY 1999-2000.[14] Thus, Indian firms generate a very high proportion of their earnings from exports. For example, Infosys Technologies Ltd. (Infosys), a leading Indian producer, reported that its exports accounted for 94 percent of FY 2000 revenue (slightly less than the prior fiscal year, when exports accounted for 98 percent of revenue). The company's major export markets were the United States (77 percent) and Europe (14 percent). Infosys is actively working to increase its exports to Europe and Asia.[15] In comparison, Microsoft Corp. reported that its exports accounted for 43 percent of its 1999 revenue, a decrease from 1998, when exports constituted 51 percent of revenue.[16] Although the Indian software industry consists of over 600 participants with more than 250,000 employees, almost one-half of 1998-99 software exports were generated by 11 Indian producers (table 1).[17] Many software firms operate in niche markets or play support roles in the industry. These firms may produce a narrow range of products or assist others in the production process. Generally, rather than focusing on the in-house development of complete, commercially available software products, these companies concentrate on developing other competencies, such as performing maintenance or testing of programming code.

India is a Major Outsourcing Destination for Software Development

Industry-leading firms typically conduct most higher value-added software development activities, such as concept and design, in-house, whereas lower value-added, more labor-intensive activities, such as programming, testing, and maintenance, may be outsourced to foreign firms. India is a major destination for outsourced work; in 1999, 20 percent of Fortune 1,000 companies outsourced development to Indian firms.[18] Overall, one-third of India's software development activity consists of outsourced work.[19] Over the past few years, outsourcing activities in India have gone beyond primarily maintenance and testing activities to become, in some cases, replacements for, or extensions of, in-house development activity. The top Indian software exporting firm, Tata Consultancy Services,

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[14] NASSCOM, "Indian Software Industry," found at *http://www.nasscom.org/*, retrieved Dec. 7, 2000.

[15] Infosys Technologies Ltd., *Annual Report, Fiscal Year Ended March 31, 2000*, found at *http://www.inf.com/investor-relations/reports/annual/1998-99/index.html*, retrieved Sept. 12, 2000.

[16] Microsoft Corp., *1999 Annual Report Notes*, found at *http://www.microsoft.com/msft/ar99/notes9.htm*, retrieved Sept. 12, 2000.

[17] Data for employment current as of March 31, 1999. NASSCOM, "Indian Software Industry," found at *http://www.nasscom.org/*, retrieved Mar. 4, 2000; data for participants current as of July 14, 1999. USDOC, ITA, "Market Research Reports: International Market Insights: Indian Software Industry," found at *http://www.stat-usa.gov/*, retrieved Jan. 31, 2000; and NASSCOM, electronic communication, USITC staff, Mar. 4, 2000.

[18] David Batstone, "Why Tech Companies Have an India Jones," *eCompanyNow*, June 2000, found at *http://www.ecompany.com/articles/mag/0,1640,6607,00.html*, retrieved Dec. 7, 2000.

[19] NASSCOM, "Indian Software Industry," found at *http://www.nasscom.org/*, retrieved May 4, 2000.

Table 1
Leading Indian software-exporting companies, FY 1998-99

Company	Corporate headquarters	Exports
		Millions dollars[1]
Tata Consultancy Services	Mumbai (formerly known as Bombay)	359.3
Wipro Limited	Bangalore	149.7
Pentafour Software & Exports Ltd.	Chennai (formerly known as Madras)	121.1
Infosys Technologies Limited	Bangalore	118.4
NIIT Limited	New Delhi	93.5
Satyam Computer Services Ltd.	Secunderabad	89.1
Cognizant Technology Solutions	Teaneck, NJ (USA)	68.6
IBM Global Services India Pvt Ltd.	Armonk, NY (USA)	53.9
DSQ Software Limited	Chennai	52.8
Tata Infotech Limited	Mumbai	52.3
Patni Computer Systems Ltd.	Mumbai	52.0
Total for selected companies		1,210.7
Industry total		2,600.0

[1] Based on a currency conversion rate of 42.259 rupees per dollar, the average exchange rate for 1998. International Monetary Fund, *International Financial Statistics*. The rupee has steadily lost value against the dollar during this period. Revenues shown in rupees would therefore be larger.

Source: National Association of Software and Service Companies (NASSCOM), electronic communication, USITC staff, Mar. 4, 2000.

which posted FY 1998-99 export revenues of $359.3 million,[20] acts as a development partner for a number of U.S. firms. At its development facility in Secunderabad, Tata performs work for Lucent Technologies in telecom software and switch adjuncts, communications software, and testing tools. For US West, Tata's Chennai facility develops software for capacity provisioning, workflow management, customer service, billing, and mobile sales systems.[21]

Outsourcing reduces insurance and pension costs for U.S. firms and eliminates capital expenditures for plant and equipment by enabling firms to shift these costs upstream to suppliers rather than making the long-term commitment of setting up a software development facility. Companies that establish facilities in India or form close partnerships with Indian firms gain several additional benefits.[22] An Indian facility and workers generally perform work for a single foreign company, and are linked to that company via dedicated telecommunications lines, an arrangement that allows the company to maintain control over its proprietary information. Also, by locating a facility in India and employing local workers, companies gain access to the Indian market and proximity to current and potential customers. Additionally, the Government of India provides attractive tax and investment incentives to encourage the growth and development of software firms.

[20] NASSCOM, electronic communication, USITC staff, Mar. 4, 2000. Based on a currency conversion rate of 42.259 rupees per dollar, the average exchange rate for 1998. International Monetary Fund, *International Financial Statistics*.

[21] Tata Consultancy Services, "Offshore Capabilities," found at *http://www.tcs.com/about_us/htdocs/offshore_capabilities.htm*, retrieved Sept. 11, 2000.

[22] Indian IT representative, interview by USITC staff, Mar. 28, 2000; and U.S. industry representative, electronic communication, USITC staff, Apr. 24, 2000.

The outsourcing trend in the global software industry is driven not only by cost factors and time-to-market concerns, which make access to inexpensive, trained labor and sophisticated networks and hardware desirable, but by two additional factors. First, over the last 10 years, software development has become increasingly based upon principles of component programming (the reuse of software components or pieces of code) driven by the need to cut costs and speed development time. Component programming allows programmers located in different facilities to work independently on pieces of code that can later be integrated to create a complete piece of software. Once written, these components can frequently be reused to create different programs. The Indian software export industry has benefitted from this trend toward component programming. Second, improvements in communications technology have reduced the challenges presented by geographic distance. The electronic transmission of data across high-speed connections accelerates the software development process by enabling instantaneous communication and interactive software development between foreign firms and their Indian operations.[23]

India's Advantages in Software Development Parallel Key Industry Competitive Factors

In order to understand the reasons for the Indian software industry's successful growth, it is useful to discuss the factors that determine competitiveness in the global software industry. The competitive position of a firm is determined by factors internal and external to the firm and the interaction between the two. Internal factors include: access to key resources, including skilled workers and powerful computer hardware products; robust research and development, which are essential to the creation of innovative products; and rapid product turn-around and continual product improvement capabilities necessary to meet customer needs. The benefits associated with being the first to develop and release a new product enhance a firm's competitive position, as does the ability to position a product as an industry standard.[24]

An external environment that supports the rise of new firms and new ideas contributes to the development of a software industry. Other key factors include: a legal framework that protects intellectual property rights coupled with strong enforcement; access to financing, including venture capital; and government-sponsored incentives to business, including favorable tax conditions. The development of strategic alliances with former competitors or new entrants to the market is another important way that firms enhance their competitiveness. Through these relationships, firms can acquire new technology and expertise, broaden their product line and customer base, and improve market access.

[23] Indian IT representative, interview by USITC staff, May 11, 2000; and NASSCOM, "Indian Software Industry," found at *http://www.nasscom.org/*, retrieved Feb. 9, 2000.

[24] Outsourcing enhances a firm's ability to rapidly bring a product to market. In the fast-moving software industry, first-to-market advantage assists a firm in positioning a product as an industry standard.

The Indian industry's rapid growth and competitiveness can be attributed to a combination of internal and external factors that have created the environment in which the Indian software industry flourishes both domestically and as an offshore partner for foreign firms.[25]

- **A large, highly skilled, low-cost workforce**

  India's extensive network of higher education and technical training facilities provides the skilled labor pool that software development requires. Four hundred universities grant computer education degrees, and more than 10,000 private-sector institutes provide computer training,[26] producing more than 73,000 information technology (IT) graduates each year--more than twice the number in the United States.[27] Further, many Indians have received advanced technical training in the United States.[28] As a result of its large, highly trained workforce, India offers firms immediate access to specialized computer skills.[29] Due to the competitive significance of time-to-market concerns in the software industry, access to a trained workforce is often critical to project success. India's low wages provide an additional competitive advantage. In comparison to the United States, where the average skilled workers costs as much as $200 per hour, an equivalent Indian worker costs as little as $35 per hour.[30] These characteristics of the Indian labor market mean that major Indian outsourcing firms, such as Tata Consultancy Services, can mobilize a team of skilled programmers much more rapidly and economically than its client companies can hire and train employees for a new project.

- **English fluency**

  English is a primary language for business communication worldwide, and English fluency is valued by U.S. and other multinational firms because a common language reduces communication barriers. Although the Republic of India has 16 official languages and Hindi is the primary language of 30 percent of its residents, English is the most important language for national, political, and commercial communication.[31] In addition, English fluency is key to obtaining software knowledge, as most computer science courses in India (and elsewhere) are taught in English.

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[25] Indian IT representative, interview by USITC staff, Mar. 28, 2000.

[26] USDOC, ITA, "Market Research Reports: Industry Sector Analyses: India - CAD/CAM/CAE" Apr. 1, 1997, found at *http://www.stat-usa.gov/*, retrieved Jan. 31, 2000.

[27] Batstone, "Why Tech Companies Have an India Jones," *eCompanyNow*, June 2000, found at *http://www.ecompany.com/articles/mag/0,1640,6607,00.html*, retrieved Dec. 7, 2000.

[28] USDOC, ITA, "Market Research Reports: Industry Sector Analyses: India - CAD/CAM/CAE" Apr. 1, 1997, found at *http://www.stat-usa.gov/*, retrieved Jan. 31, 2000.

[29] Indian IT representative, interview by USITC staff, May 11, 2000.

[30] David James, President, Business Strategies International, interview by USITC staff, Feb. 24, 2000.

[31] Central Intelligence Agency, *The World Factbook 1999*: India, found at *http://www.odci.gov/cia/publications/factbook/in.html*, retrieved Jan. 31, 2000.

! Advances in communications technology

The Internet and the instantaneous communication permitted by high- speed data links have enabled Indian companies to operate as offshore development partners for foreign firms. As of June 30, 2000, more than 1,200 dedicated high-speed data communication links were being used by software exporting companies, a dramatic increase from 1992, when only 10 such links were used.[32] Videsh Sanchar Nigam Limited (VSNL) is the Government's telecommunication service provider, and operates 12 Internet nodes across India. The Indian Department of Transportation operates another 41 nodes. VSNL also provides Internet access, and promotes telecommunication growth in India. Software Technology Parks of India (STPI), an autonomous body of the Indian Ministry of Information Technology, offers state-of-the-art facilities to software exporting units. Four STPI complexes offer centralized computing facilities, where software exporters pay according to their usage, and six complexes provide access to high-speed communication links.[33] In November 1998, the Internet service provider business was opened to competition, and as a result private companies have also begun to build communications infrastructure.[34] The Government has also announced that VSNL's monopoly on international Internet access will end 2 years earlier than scheduled, in 2002. This change is expected to further encourage the growth of Internet services in the country by increasing capacity and lowering the price of bandwidth.[35]

! An infrastructure capable of supporting high-tech industry

Although the level of infrastructure development varies widely across India, Indian companies that perform programming tasks for foreign companies are located in areas that have access to high-quality infrastructure and state-of-the-art technology.[36] Outside of these areas, India's infrastructure is reportedly quite poor and will need to be developed or upgraded if growth is to continue.[37] For example, the energy, telecommunications, and transportation sectors all require extensive investment and development. Power generation, transmission, and distribution are particularly critical, as many areas of the country frequently experience brownouts and blackouts. Although demand projections may be less than expected, it is anticipated that India will need to double its current power generating capacity during the

[32] VSNL, "Internet," found at *http://www.vsnl.net.in/english/internet/index.html*, retrieved Dec. 7, 2000.

[33] Software Technology Parks of India,"Infrastructure Facilities of STPIs," found at *http://www.stpi.soft.net/*, retrieved Dec. 7, 2000.

[34] Frederick Noronha, "India in Need of Serious Rewiring," *Wired News*, found at *http://www.wired.com/news/print/0,1294,37232,00.html*, retrieved Nov. 16, 2000.

[35] Uday Lal Pai, "VSNL Bandwidth Monopoly Ends," *India.Internet.Com*, found at *http://india.internet.com/news/print/0,,1281_415581,00.html*, retrieved Dec. 27, 2000.

[36] STPI complexes have been set up in Bangalore, Hyderabad, Mumbai, and in 12 other cities throughout India. Software Technology Parks of India, "STPI Bangalore: STPI Centers," found at *http://www.stpi.soft.net/*, retrieved Dec. 7, 2000.

[37] Indian IT representative, interview by USITC staff, May 11, 2000.

next 10 years.[38] Continued growth and development in software and other high-tech industries depend on significant investment to improve India's infrastructure.

Many countries are encouraging growth in their domestic software industries. Ireland, Israel, and the Philippines are most frequently cited as competitors to the Indian industry, although several differences limit direct competition.[39] Labor costs in India reportedly are lower than in Ireland and Israel, and India's infrastructure is more developed and its workforce more highly trained than in the Philippines. India also has a larger labor pool than its competitors, enabling the assembly of a 300-person development team for large software development projects in as little as 1 month,[40] whereas this would be much more difficult in most other countries. Indian companies have leveraged their distance to create an advantage for U.S. firms; the 12-hour time difference provides for 2 workdays in a 24-hour period. This production schedule not only reduces overtime and associated costs, but also decreases product time-to-market, an important factor in a software firm's ability to compete globally.

The Impact of Government Policy

Government policy in India is an important factor in the Indian software industry's success. The government has established a Ministry of Information Technology to promote the IT industry, and has designated software a "high priority" industry. The government has also begun to create the necessary framework to support a technology-driven economy by negotiating multilateral agreements, enacting new legislation,[41] and providing incentives for domestic and foreign investment.

India's participation in the Information Technology Agreement (ITA) and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) promotes greater market access and facilitates the duty-free import of computers and the related IT hardware required for expanding India's high-technology infrastructure. This benefits software producers by reducing their equipment costs while increasing the overall size of the domestic IT market as more companies and individuals are able to afford information technology equipment. By signing the TRIPS Agreement, India has made a commitment to strengthen intellectual property rights (IPR) protection. Industry sources contend that stronger IPR enforcement by India will reduce lost sales attributable to counterfeit software and encourage the development of new products in India.

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[38] U.S. Department of State, *Country Commercial Guides: India*, p. 20, found at *http://www.state.gov*, retrieved Feb. 11, 2000.

[39] Indian IT representatives, interviews by USITC staff, Mar. 28 and May 11, 2000.

[40] Indian IT representative, interview by USITC staff, Mar. 28, 2000.

[41] Selected Indian laws include: the Indian Income Tax Act of 1961, as amended (exempts export earnings from corporate income tax for both Indian and foreign firms); the Indian Copyright Act of 1957, amended 1995 (provides stiff mandatory penalties for copyright infringement); the Prevention of Corruption Act, 1988 (makes giving or accepting a bribe a criminal act); the Depositories Act of 1996 (permits transfer of securities through electronic book entry); the Arbitration and Conciliation Act of 1996 (attempts to unify the adjudication process on commercial contracts in India with the rest of the world); and the Information Technology Act 2000 (recognizes digital signatures as valid and binding, establishing a framework for electronic commerce).

Four laws govern IPR protection in India: the Designs Act, the Copy Right Act, the Trade and Merchandise Marks Act, and the Patents Act. In February 1992, the Office of the United States Trade Representative (USTR) determined that India's enforcement of IPR laws was inadequate and restrictive of U.S. trade, particularly in the area of patent protection, and identified India as a Special 301 "priority foreign country."[42] Revisions in May 1994 to India's copyright law resulted in a change of status for India from a "priority foreign country" to the "priority watch list," where India remains today.[43] The Software & Information Industry Association's (SIIA) 2000 report to the USTR recommends that India remain on the priority watch list.[44] The SIIA maintains that poor enforcement by Indian Government authorities has continued to encourage a high rate of software piracy, and estimates that approximately 61 percent of all personal computer business software used in India in 1999 was illegally copied, costing U.S. software publishers in excess of $147 million in lost revenue.[45]

The Indian Government has issued a series of initiatives designed to encourage foreign and domestic investment in the technology sector for firms that export.[46] Under the Government's Exim Policy 1997-2002, companies in India that export their entire production of goods and services may be established under one of the following programs: the Export Oriented Unit Scheme, the Export Processing Zone Scheme, the Electronic Hardware Technology Park Scheme, or the Software Technology Park Scheme.[47] The export of computer software receives particular emphasis, and software companies are encouraged to take advantage of one of these programs. Among the benefits offered to participants are the duty-free importation of all software and hardware equipment required for operation, and a corporate income tax exemption for a period of 10 years. Foreign entities may own up to 100 percent of companies in these export programs and are permitted to repatriate their profits.[48] During 1997-98,

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[42] Section 182 of the Trade Act of 1974 (19 U.S.C. 2242), the so-called "special 301" provision, which was added by the Omnibus Trade and Competitiveness Act of 1988 requires the USTR annually to identify those countries that deny adequate and effective protection for IPR or deny fair and equitable market access for persons that rely on IPR protection.

[43] A "priority foreign country" designation is given to "countries that have the most onerous or egregious practices and whose practices have the greatest adverse impact on the relevant U.S. products." These countries are subject to section 301 investigations. A "priority watch list" designation is given to "countries with particular problems of protection or enforcement of intellectual property rights" which are monitored closely for progress. USTR, "Fact Sheet: Monitoring and Enforcing Trade Laws and Agreements," found at *http://192.239.92.165/ html/fact.html*, retrieved Dec. 27, 2000.

[44] The SIIA represents 1,200 companies in the software and information industry.

[45] SIIA, "2000 Special 301 Recommendations," Feb. 18, 2000.

[46] Among the benefits accorded to high-priority industries such as software is automatic approval within 2 weeks by the Reserve Bank of India for direct foreign investment of up to 51 percent foreign equity, provided certain requirements are met. *India Times*, "Foreign Direct Investment," found at *http://india-times.com/frinvest/fr_dir.html*, retrieved Feb. 23, 2000.

[47] The Software Technology Park Scheme is a 100-percent export-oriented program for the development and export of computer software using data communication links or in the form of physical media including the export of professional services. A more detailed explanation of these programs can be found at *http://www.nic.in/eximpol/pol-09.htm, http://www.stpi.soft.net and http://www.ehtp.com*.

[48] Indian Ministry of Commerce, Directorate General of Foreign Trade, *Exim Policy 1997-2002*, found at *http://www.nic.in/eximpol/pol-09.htm*, retrieved Feb. 14, 2000.

companies participating in Software Technology Park Schemes accounted for 53 percent of national software exports.[49]

The individual Indian states also have a significant role in industrial development and the promotion of the software industry. Each state identifies its own priority sectors and provides investment incentives to encourage growth in these sectors. Whereas some states have targeted industries dependent on specific natural resources, the southern state of Karnataka, where the high-tech city of Bangalore is located, has identified software as a priority sector.[50] Karnataka's industrial policy aims to promote the development of infrastructure and to encourage growth in exports. Incentives for the software industry include numerous capital investment subsidies,[51] sales tax exemptions, and a 5-year tax exemption for electricity generated for self-consumption.[52]

Outlook

As the Indian software industry continues to evolve, three significant trends are shaping its growth: an increase in the number of mergers, acquisitions, and strategic alliances; a tendency toward higher value-added software development activities; and a growth in the number of indigenous firms.

Mergers and acquisitions (M&A) have become increasingly common in India.[53] This consolidation trend is driven principally by a desire to increase and diversify technological expertise, rather than to increase productive capacity. Merged companies share research and development costs, reduce marketing costs, increase their customer base, and provide a more complete set of products, enabling them to become a "one-stop" solution provider. Increased globalization, the convergence of technologies,[54] and shortening product cycles have also contributed to the increase in M&A activity, both in India and worldwide. The rapid pace of technological growth in the software industry can also motivate firms to acquire competitors. For example, leading Indian software development firms, such as NIIT Ltd. and Satyam Computer Services Ltd. (Satyam), have announced their intentions to acquire foreign firms. The Indian software development firm HCL Infosystems acquired FEC Singapore Private

[49] Indian Ministry of Information Technology, *Annual Report 1998*, "Software Technology Parks of India," found at *http://www.mit.gov.in/ar98.htm*, retrieved Feb. 8, 2000.

[50] Indian Investment Centre, "India's Investment Climate," found at *http://iic.nic.in/vsiic/iic2_a.htm*, retrieved Feb. 15, 2000.

[51] According to the Indian Investment Centre, subsidies include capital investment subsidies of 25 percent to 30 percent of fixed capital (up to approximately $65,000) for certain industries in predetermined zones. The state also offers an investment subsidy of 10 percent for installing renewable energy equipment, up to $12,000. Indian Investment Centre, "Indian States - A Profile: Karnataka," found at *http://iic.nic.in/vsiic/iic2_bka.htm.*, retrieved Sept. 11, 2000.

[52] Ibid; and Indian IT representative, interview by USITC staff, May 11, 2000.

[53] Embassy of India, "Indian Infotech Companies to Spend US$3 Billion on Acquisitions," *Economic News*, Oct. 30-Nov. 5, 1999, found at *http://www.indianembassy.org/*, retrieved Feb. 14, 2000.

[54] The convergence of networked systems, wireless computing appliances (devices with minimal memory, disk storage, and processor power designed to connect to a network, especially the Internet), and other computing hardware encourages both software and hardware firms to form alliances in order to improve their ability to compete.

Ltd., a systems development and integration firm, in October 1999.[55] Infosys has also announced that it is actively pursuing acquisition opportunities.

In addition to M&A, companies such as Infosys and Wipro Ltd. are forming a variety of strategic alliances with other firms as part of a worldwide growth strategy. Infosys has partnered with a number of firms, including a privately held Australian software company which has developed software technology for Internet and wireless applications, a U.S. communication technologies and services firm, and a U.S. company that develops components for optical networking. Small and medium-sized Indian firms are also seeking partnerships with larger firms, both foreign and domestic. For example, in October 1999, the Indian National Small Scale Industries Corporation (NSIC) entered into a Memorandum of Understanding (MOU) with the North West Regional Technology Center of the United Kingdom in order to promote joint ventures and technology transfer.[56] NSIC is active in establishing software technology parks in India.

As the Indian software industry matures, a second trend is emerging in which Indian firms are beginning to move beyond lower value-added software development activities. Major Indian software companies, such as Wipro, Infosys, and Satyam, have started to focus on higher value-added activities, which require more training and expertise, and which are less likely to be outsourced by foreign companies. The growth of electronic commerce is helping to drive this shift by creating new opportunities for software developers.[57] As traditional "bricks and mortar" companies develop Internet strategies and as newly launched Internet-only firms establish their businesses, developers are needed to create software to perform electronic commerce activities (e.g., interactive and up-to-date inventory management software, secure purchasing and billing software, and customer relationship management software). In FY 1999-2000, Indian e-commerce software exports were $500 million, but are expected to reach $1.4 billion in FY 2000-01.[58]

Another factor driving the focus toward higher value-added activities is Indian firms' desire to maintain their competitive advantage. As India develops economically and loses some of its cost advantages, lower value-added activities will likely shift to less developed industries such as that of the Philippines. Indian firms recognize that to remain competitive they can no longer compete primarily on cost, and therefore have begun to promote their expertise in higher value-added activities, where cost considerations are less important. For example, the rapid growth of electronic commerce has increased the importance of quickly bringing software products to market, and e-businesses are generally willing to trade lower costs for rapid product delivery.[59] The large number of highly trained Indian workers enables Indian firms to compete effectively in this area, as they can mobilize labor as needed to meet deadlines more rapidly than many of their competitors.

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[55] Embassy of India, "HCL Infosystems Acquires FEC Singapore for RS 60.78 Million," *Economic News*, Oct. 24-30, 1999, found at *http://www.indianembassy.org/*, retrieved Feb. 14, 2000.

[56] Embassy of India, "Engineering Goods, Software Potential Sectors for Indo-British Tie-ups," *Economic News*, Oct. 24-30, 1999, found at *http://www.indianembassy.org/*, retrieved Feb. 14, 2000.

[57] Merchant, "Companies Gear Up for Expansion," *Financial Times*, July 4, 2000, p. III.

[58] NASSCOM, "Indian IT Software & Services Industry," found at *http://www.nasscom.org/template/itinindia.htm*, retrieved Dec. 7, 2000.

[59] Merchant, "Companies Gear Up for Expansion," *Financial Times*, July 4, 2000, p. III.

A third trend is the increasing number of indigenous software companies and products. This expansion is being driven by domestic market growth and the increase in venture capital received by Indian software firms.[60] In April 2000, for example, software development firms accounted for 68 percent of initial public offerings on the Securities and Exchange Board of India.[61] The growing number of new firms reportedly is expected to strengthen the Indian software industry and drive future development. India's domestic market is growing rapidly, and the demand for software is expected to increase as PC penetration levels rise and Internet connectivity expands. These same trends drive the global demand for software, which is also expected to rise. This potential for growth encourages Indian firms to develop products for the global market.**#**

[60] Indian IT representative, interview by USITC staff, May 11, 2000; and *The Economic Times*, "India Still Red Hot, Says Wharton VC Forum," found at *http://www.economictimes.com/today/bn04a.htm*, retrieved Nov. 27, 2000. The Indian Institute of Technology in Bombay has even established a pilot project to help students launch their own technology companies. Chaudhry, Lakshmi, "Incubating a New Indian Economy," *Wired News*, found at *http://www.wired.com/news/print/0,1294,34927,00.html*, retrieved Nov. 16, 2000.

[61] Compiled by Commission staff from Securities and Exchange Board of India data, found at *http://www.sebi.com*, retrieved July 5, 2000.

Manufacturing Strategies of the North American Major Household Appliance Industry

Ruben Mata[1]
Mata@usitc.gov
(202) 205-3403

Major household appliance firms in the United States first set up manufacturing subsidiaries or joint ventures in Canada and Mexico in the 1970s and 1980s, to overcome tariff barriers in supplying their products to these markets. Subsequent U.S. trade agreements with Canada (1989) and Mexico (1994) made it possible for major appliance firms to implement manufacturing strategies of cost reduction through consolidation and rationalization of production across national boundaries throughout North America. Improved efficiencies and price competitiveness among North American producers of major appliances have largely discouraged imports from Europe and Asia into the U.S. and Canadian markets. This article profiles the leading major appliance producers in North America and examines changes in their manufacturing strategies in response to competitive pressures to reduce costs and expand market shares.

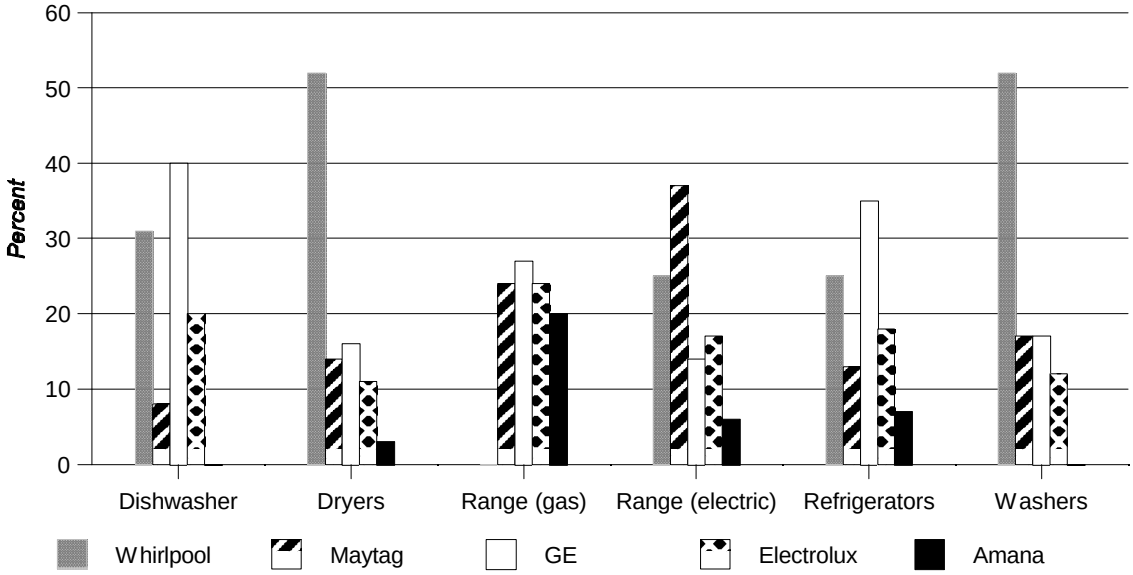
The United States, the world's largest single-country market for household appliances, is dominated by five companies: General Electric-Appliance Group (GE), Whirlpool Corp., Electrolux (makers of Frigidaire and Westinghouse brands), Maytag Corp., and Goodman Industries (Amana). U.S. producers' shipments (chiefly major appliances) totaled $23.1 billion in 1999, of which $5.5 billion was exported to foreign markets (principally to Canada and Mexico). Each of the leading firms produces a full line of major appliances: refrigerators, freezers, gas and electric stoves, dishwashers, and clothes washers and dryers. In 1999, these firms accounted for approximately 98 percent of total U.S. production of major household appliances.[2] Major appliances have changed only slightly over recent decades, and there is little to differentiate one manufacturer's products from another.[3] As a result, companies have experienced only a modest change in U.S. market share for these products since 1994 as noted in figures 1 and 2. U.S. appliance imports, totaling $7.3 billion in 1999, consisted predominantly of smaller, portable appliances.

[1] The views expressed in this article are those of the author. They are not the views of the U.S. International Trade Commission as a whole or of any individual Commissioner.

[2] There are numerous other smaller producers of major household appliances that manufacture a specialized or select line of products. Employment in the entire U.S. appliance industry was estimated at 118,000 workers in 1999.

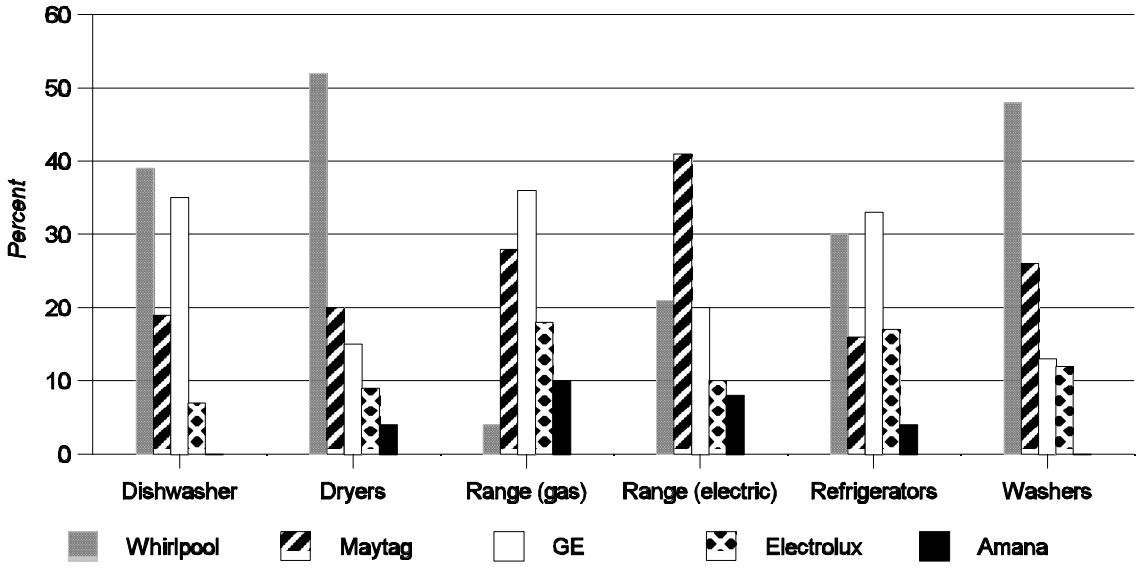
[3] Justification for higher prices to the consumer for certain models is based on brand recognition, size, style, and added features whereas basic functions (cooling, cooking, and cleaning) are comparable.

Figure 1
U.S. market shares[1] of major appliance manufacturers, 1994



Source: "2000 Market Profile," *Appliance Manufacturer*, Business News Publishing Company

Figure 2
U.S. market shares[1] of major appliance manufacturers, 1999



Source: "2000 Market Profile," *Appliance Manufacturer*, Business News Publishing Company

[1] The principal changes in market shares of the leading suppliers comparing 1999 with 1994 were as follows: Whirlpool and Maytag increased their shares of the U.S. dishwasher market relative to Electrolux; Maytag's share of the clothes dryer market rose while that of Electrolux fell; GE and Whirlpool gained greater shares of the gas range market whereas shares held by Electrolux and Amana declined; shares of the electric range market held by Maytag and GE rose whereas shares held by Whirlpool, Electrolux, and Amana fell; Whirlpool's share of refrigerators gained, chiefly at the expense of GE and Amana; and Maytag increased it share of the clothes washer market, whereas shares held by Whirlpool and GE declined.

The pace of globalization[4] in the North American major household appliance industry[5] has been accelerating since the late 1980's, when four of the five leading U.S. producers began to implement regional manufacturing strategies to meet the needs of a generally mature and increasingly price competitive domestic market. Because demand for household appliances had leveled off in an increasingly saturated domestic market, some of the top U.S. appliance firms developed growth strategies based on expansion abroad.[6] At the same time, innovations and advances in manufacturing technologies raised productivity and contributed to excess capacity, further encouraging efforts to sell abroad. This resulted in a transformation of the manufacturing strategies of the U.S. major household appliance industry to include joint-ventures, acquisitions, and mergers in Europe and Latin America (table 1).

The primary goals of leading appliance firms were to (1) reduce unit costs through greater economies of scale, (2) increase market shares, and (3) improve profits. For example, producers such as Whirlpool and GE have sought out foreign partners[7] as both low-cost sources of appliances and as a means of increasing sales to rapidly growing markets in newly industrialized countries.

Whirlpool also acquired the major household appliance division of Europe's largest producer, the Netherlands-based Philips N.V., in 1989. Other producers followed suit as, AB Electrolux of Sweden purchased U.S.-based White Consolidated Industries (Frigidaire, Kelvinator, and White-Westinghouse brands); and Maytag acquired U.S. vacuum-cleaner producer Hoover, along with its appliance-producing subsidiaries in Europe and Australia. Subsequently, Maytag sold its European operations to Italy's Candy and its appliance operations

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[4] Globalization for the U.S. major household appliance industry involves sourcing components from foreign manufacturers, contracting out production or licensing the use of proprietary brand names to foreign producers, forming joint ventures with foreign manufacturers, investing in foreign production facilities, the purchase of U.S. producers by foreign interests, and foreign direct investment in manufacturing facilities in the United States.

[5] U.S. producers of "smaller" household appliances (typically for counter top use in the kitchen or bathroom) contracted out or shifted much of their production in the 1960s and 1970s to low-cost producers in Asia or assembly plants in Mexico. However, this article will focus on the industry producing "major" household appliances, which include electric and gas ranges, refrigerators, dishwashers, and clothes washers and dryers.

[6] Replacement of older appliances forms the largest part of U.S. and Canadian markets for major household appliances. Market trends, however, are heavily influenced by housing starts and home renovations. The growth in demand for major household appliances tends to fluctuate in inverse proportion to changes in interest rates. High interest rates discourage home purchases and renovation, and hence purchases of major household appliances. Growing Federal budget deficits in the late 1980's drove up interest rates, leading U.S. appliance producers to explore foreign markets for expanded sales. Although growth in the U.S. economy in the late 1990s, accompanied by lower Federal budget deficits and lower interest rates, took pressure off appliance firms to expand into foreign markets, two of the five leading U.S. appliance firms continued to increase their participation in Latin American markets through affiliated production facilities in Mexico and Brazil.

[7] Whirlpool purchased a 49-percent ownership in Mexico's major household appliance producer Vitromatic (based in Monterrey) in 1987. Subsequently, GE entered into a joint-venture agreement with Mexico's largest appliance producer, Controladora MABE, and eventually purchased 48 percent of the company.

Table 1
Major household appliance producers and ownership structure in North America

U.S. company (location)/ *foreign ownership*	Partner or company (country)	Business type/ Start-up year	Location of plants	Products manufactured	Brand names
General Electric – Appliance Group (GE) (Louisville, KY)		Parent 1889	Louisville, KY Bloomington, IN Cicero, IL Decatur, AL	Electric and gas ranges Dishwashers Refrigerators	GE GE Profile GE Performance GE Monogram GE Hotpoint Roper
	CAMCO (Canada)	Affiliate 1977	Montreal, Quebec; Hamilton, Ontario	Electric ranges Refrigerators Dishwashers Clothes dryers	GE Hotpoint Moffat McClary Concept II Kenmore Bulmark
	MABE (Mexico)	Joint-venture 1987	San Luis Potosi; Queretaro; Celaya, Guanajuato	Gas ranges Refrigerators Clothes washers	GE GE Hotpoint
Whirlpool Corp. (Benton Harbor, MI)		Parent 1911	Benton Harbor, MI; Clyde, OH Evansville, IN Ft. Smith, AR Greenville, OH Findlay, OH LaVergne, TN Marion, OH Oxford, MS Tulsa, OK	Refrigerators Dishwashers Freezers Electric and gas ranges Clothes washers and dryers	Whirlpool KitchenAid Roper Estate
	Vitromatic Corp. (Mexico)	Joint-venture 1988	Monterrey, Nuevo Leon; Celaya, Guanajuato	Refrigerators Clothes washers Gas ranges	Whirlpool
	Inglis Ltd. (Canada)	Subsidiary 1859	Montmagny, Ontario	Electric and gas ranges	Whirlpool Inglis Kitchen Aid Roper Admiral Estate Kenmore

Table 1–*Continued*
Major household appliance producers and ownership structure in North America

U.S. company (location)/ *foreign ownership*	**Partner or company (country)**	**Business type/Start-up year**	**Location of plants**	**Products manufactured**	**Brand names**
White Consolidated Industries (WCI) (Augusta, GA)/ *Electrolux Home Products (Sweden)*		Parent 1901	Greenville, MI Anderson, SC St. Cloud, MN Webster City, IA Kingston, NC Springfield, TN	Refrigerators Freezers Stoves and ranges Dishwashers Clothes washers and dryers	Frigidaire Kelvinator Tappan White-Westinghouse Gibson
White Consolidated Industries (WCI) – International (Pittsburgh, PA)/ *Electrolux Home Products (Sweden)*	Frigidaire (Canada)	Subsidiary 1986	L'Assomption, Quebec	Electric stoves and ovens	Frigidaire Frigidaire-Gallery Kelvinator Tappan Gibson Roy White-Westinghouse Kenmore
Maytag Corp. (Newton, IA)	None	1907	Newton, IA Herin, IL Cleveland, TN Jackson, TN Galesburg, IL	Dishwashers Refrigerators Electric and gas ranges Clothes washers and dryers	Maytag Jenn-Air Magic Chef Performa by Maytag Admiral
Amana Corp. (Amana, Iowa) subsidiary of Goodman Corp. (Houston, TX)	None	1934	Amana, IA Florence, SC Sercy, AR Fayetteville, TN	Refrigerators Freezers Dishwashers Electric and gas ranges	Amana Caloric Modern Maid
W.C. Wood Co. (Canada)		Parent 1930	Guelph, Ontario	Freezers and refrigerators	Woods Quickfreeze ArticAire Frost Queen Private labels
	W.C. Woods Co. (United States)	Affiliate 1992	Ottowa, Ohio	Freezers and refrigerators	Woods Quickfreeze Frost Queen Emerson Private label
Haier America, (Camden, SC)/ *Haier Group Co. (Qingdao,China)*	None	2000	Camden, SC	Compact refrigerators	Haier
Sanyo E&E Corp. (San Diego, CA)/ *Sanyo (Japan)*		Parent 1979	San Diego, CA	Small refrigerators Freezers	Sanyo Private labels

Table 1–*Continued*
Major household appliance producers and ownership structure in North America

U.S. company (location)/ *foreign ownership*	Partner or company (country)	Business type/Start-up year	Location of plants	Products manufactured	Brand names
	Sia Electronica (Mexico)	Maquila 1979	Tijuana, Baja California Norte	Small refrigerators Freezers	Sanyo Private label
Bosch, Siemens Hausgerate (BSH) (Germany)	BSH Home Appliances (United States)	Subsidiary 1997	New Bern, NC	Dishwashers Wall ovens	Bosch Gaggenau Thermadore
Daewoo (Korea)	Daewoo de Mexico (Mexico)	Subsidiary 1996	El Marques, Queretaro	Dishwashers Clothes washers Refrigerators	Daewoo Private label
LG Electronics (Korea)	LG Electronics (Mexico)	Subsidiary 2001	Monterrey, Nuevo Leon	Refrigerators (2001)	LG

Source: *Appliance Magazine* (various issues) and interviews with industry representatives by U.S. International Trade Commission staff.

in Australia to Southcorp Holdings Ltd.[8] Such strategic moves are considered to be watershed events in the globalization of the major appliance industries in Europe and North America (see table 1).[9]

U. S. Producer Profiles

Since the 1980s, the domestic appliance industry has experienced major structural changes resulting from a number of acquisitions and mergers.[10] These developments and the consolidation of duplicative operations have concentrated the industry, resulting in a small number of large companies that dominate North American production. Further industry consolidation could result as appliance companies with marginal financial performance may become takeover targets. Although the number of U.S. companies manufacturing household

[8] Maytag later entered into a joint venture with a manufacturer in China to supply major household appliances to the market there and to export to markets in Asia.

[9] Robert L. Holding, "Globalization: The Second Decade," *Appliance Manufacturer*, vol. 47, No. 5, May 1999, p. 34.

[10] Some manufacturers have been takeover targets by stronger companies looking to expand their product lines and market shares. Examples include the purchase of several appliance producers by White Consolidated Industries, followed by the Electrolux purchase of the White Consolidated Industries.

appliances has decreased, the number of brand names in specific categories has increased as companies have taken steps to establish full-product-line brands.[11]

Four of the leading U.S. producers of major appliances -- Maytag, Whirlpool, GE, and Electrolux -- are publicly held. However, only Maytag and Whirlpool are predominantly in the business of making appliances.[12] Although each of the leading producers has employed similar strategies with regard to product differentiation and brand diversification, three of the five have "globalized" their North American production of appliances and two have not. Whirlpool and GE have rationalized their production among factories in all three North American Free-Trade Agreement (NAFTA) partners, yielding increasing cross-border flows of parts and finished appliances. Electrolux has limited its integration of manufacturing in the North American market to the United States and Canada. To a large extent, Electrolux supplies the Mexican market from its Latin American manufacturing and distribution base in Brazil. Maytag does not invest extensively in plant and equipment outside of the United States and depends on its Chinese joint venture partner to supply regional exports of household appliances.[13] Amana supplies the North American major appliance market solely from U.S. factories.

Industry consolidation has promoted growth as well as product diversification and price distinctions. As larger producers acquired smaller producers that had loyal brand following, producers offered additional appliances under these strong brand names. For example, after acquiring appliance producers Jenn-Air and Magic Chef to increase its overall sales and product mix, Maytag expanded its product line offering under each brand name. The upscale Jenn-Air line, previously restricted to gas ranges, now includes dishwashers and refrigerators whereas the lower price Magic Chef line has grown from comprising primarily cooking equipment to include refrigerators and dishwashers. The dishwasher line introduced a few years ago under the Maytag brand name now controls a market share as strong as Maytag's laundry equipment product line. Further, the mid-priced Maytag line has been expanded to include cooking equipment, dishwashers, and refrigerators. Whirlpool adopted a similar product strategy through its acquisitions of the high-end Kitchen Aid line and low-end Roper line in the late 1980s. GE and Electrolux have also followed suit -- not through acquisitions, but through expanding their product lines to include appliances in all price ranges.[14]

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[11] Association of Home Appliance Manufactures (AHAM), *Major Home Appliance Industry Factbook*, Washington, DC, 1998/99.

[12] Standard & Poor's, *Industry Surveys-Household Durables*, Sept. 23, 2000, p. 12. GE and Electrolux manufacture a variety of electrical products, ranging from power plants, jet engines, and medical diagnostic equipment to vacuum cleaners and light bulbs. Amana, the lone privately held company, reportedly derives the bulk of its income from sales of heating, air-conditioning, and refrigeration equipment to building contractors.

[13] Maytag, with its Chinese joint-venture partner Hefei Rongshide, produces washing machines under the RSD brand name for the Chinese appliance market. The RSD brand washing machines are sold by department stores and wholesalers throughout China. The Maytag-Rongshide joint venture opened a refrigerator plant for the Chinese market in 1998. Maytag retains 51 percent ownership in the venture.

[14] Standard & Poor's, *Industry Surveys-Household Durables*, Sept. 23, 1999, p. 19.

The leading U.S. producers of major household appliances view brand loyalty as a key determinant of industry growth, particularly in the replacement market that these firms consider as crucial to maintain or improve market share.[15] Additional steps being undertaken to gain or simply maintain market share include offering consumers upgraded products (more energy-efficient and with added product features) at lower prices, improving relationships with major retail distributors (e.g., Sears, Lowes, Home Depot, Wal-Mart, and Best Buy Inc.), and minimizing operating costs.

Cross-Border Integration of Manufacturing

Manufacturing strategies (including plant location decisions) in the major household appliance sector are influenced by transportation costs, national consumer preferences, availability and cost of skilled workers, proximity of suppliers for components and raw materials, quality of transportation and manufacturing infrastructure, availability of support services, and local laws and practices regarding foreign investment. For the most part, producers make appliances targeted to match the consumer preferences of their national or regional markets. The U.S. and Canadian markets (and industries) are typically oriented towards large appliances with special features. European and Japanese markets and industries are oriented towards high quality, energy-efficient, but smaller appliances. Producers in Mexico, Brazil, Korea, China, and India make entry-level, small-sized appliances in order to keep costs low and maximize the number of people in their national or regional markets that can afford to buy them.

Companies tend to export appliances to markets with similar consumer preferences. For example, appliances made in Korea have a small-but-growing share of the Mexican market,[16] whereas appliances made in Mexico supply markets for appliances in Central America and the Caribbean Basin. Rarely do foreign companies modify their manufacturing lines to produce appliances specifically for the U.S. market. When they do, it is usually in conjunction with an established U.S. producer that is attempting to complement its high-end U.S. production with imports of less-expensive products from countries with lower labor costs. Some Asian and European producers have established production facilities in the United States, Canada, and/or Mexico to supply the North American market (Bosch, Electrolux, Haier, and Sanyo in table 1). Conversely, most U.S. producers have established plants or joint ventures in Europe, Mexico, Brazil, Australia, and China to make appliances designed for local national or regional markets. In most cases, U.S. appliance firms rely on these countries as a base to export to other countries in their manufacturing regions. U.S. producers continue to export top-of-the-line appliances from the United States to niche markets for these products throughout the world.

[15] According to *Appliance* magazine, the average life span of a major appliance is 10 to 15 years. Replacement demand accounts for up to 70 percent of GE's appliance sales.

[16] The two largest appliance producers in Mexico, MABE and Virtomatic, filed a complaint with the Ministry of Trade and Industrial Development (SECOFI) on September 11, 2000, alleging that major household appliances imported from Korea were being sold at less than their fair market value and were causing serious injury to the Mexican industry. Grupo Vitro, "Third Quarter Results," Oct. 20, 2000, p. 8.

U.S. appliance producers have taken different approaches toward investment in foreign production facilities. Both Whirlpool and GE, the two largest domestic appliance firms, have a strong presence in most of the important appliance markets worldwide in addition to their rationalized North American operations. Both firms are known for collaborating on engineering breakthroughs across manufacturing regions and for local purchasing of raw materials and components.[17] While Electrolux services the U.S. and Canadian markets from plants in both countries, it supplies Mexico and other markets in Latin America from plants in Brazil and the European market from its home-base plants in that region. In contrast, Amana has continued to focus primarily on the U.S. market and has not established foreign factories.[18]

Recent trade trends shown in table 2 reflect developments in the cross-border integration of manufacturing in North America. The U.S. trade deficit with Mexico of $501 million in 1999 reflects the shift of production of certain entry-level major household appliances from the United States to joint ventures in Mexico as Whirlpool and GE sought to reduce costs and build market share.[19] The U.S. trade surplus with Canada of $291 million in 1999 reflects the consolidation and rationalization of production in North America, with much of the Canadian market for mid-priced and higher-quality appliances being supplied from U.S. factories. Nonetheless, there is a significant cross-border flow of parts and finished appliances among all three countries in North America. Mexico and Canada accounted for 57 percent ($1.13 billion) of U.S. imports and 51 percent ($941 million) of U.S. exports of major household appliances in 1999.

Several developments likely contributed to the sharp decline in U.S. exports of appliances and parts to China during 1997-99 (see table 2). The highly competitive and saturated U.S. appliance market encouraged domestic producers Whirlpool (Kelon brand) and Maytag Corp. (Rongshida brand) to enter the Chinese appliance market via joint-venture agreements during 1994-1996. Whirlpool entered into four joint-ventures in China with existing manufacturers to produce ovens, refrigerators, washing machines, and air-conditioners. Whirlpool subsequently terminated (1999) two of its Chinese joint-ventures, citing very high cost structures. Nonetheless, Whirlpool has made use of its existing Chinese joint-ventures to export to other countries in the region.[20] Maytag's strategic alliance in the Chinese market faces intense price and market share competition from domestic Chinese producers

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[17] Joel Millman, "Household Appliances Find a New Home in Mexico," *The Asian Wall Street Journal*, Aug. 24, 1999, p. 9.

[18] Standard & Poor's, *Industry Surveys-Household Durables*, Sept. 23, 1999, p. 19.

[19] Gas stoves accounted for 37 percent ($241 million) and refrigerators for 35 percent ($229 million) of all U.S. imports of major household appliances from Mexico in 1999. Trade data for major household appliances appearing in earlier Commission publications may vary from data appearing in more recent reports, as gas-powered appliances (such as stoves and clothes dryers) have been included in the Commission's coverage of major household appliances since January 1, 2000. In contrast to the composition of imports from Mexico, clothes dryers accounted for 23 percent ($111 million) of U.S. appliance imports from Canada, and electric stoves, 17 percent ($83 million). Electric stoves were the leading type of appliance imported from China in 1999, accounting for 53 percent ($136 million).

[20] Standard & Poor's, *Industry Surveys-Household Durable*, Sep. 23, 1999, p. 13.

Table 2
Major household appliances and parts: U.S. exports of domestic merchandise, U.S. imports for consumption, and merchandise trade balances with selected partners, 1997-99

(*Million dollars*)

Type of trade/country	1997	1998	1999	Change, 1997 from 1999 Absolute	Change, 1997 from 1999 Percent
U.S. exports of domestic merchandise:					
Canada	630	708	769	139	22.1
Mexico	142	161	151	9	6.3
China	33	24	9	-24	-72.7
All other	1,169	1,150	927	-242	-20.7
Total	1,974	2,043	1,856	-118	-6.0
U.S. imports for consumption:					
Canada	341	386	478	137	40.2
Mexico	567	597	652	85	15.0
China	253	210	258	5	2.0
All other	525	556	679	154	29.3
Total	1,686	1,749	2,067	381	22.6
U.S. merchandise trade balance:					
Canada	289	322	291	2	0.7
Mexico	-425	-436	-501	-76	17.9
China	-220	-186	-249	-29	13.2
All other	644	594	248	-396	-61.5
Total	288	294	-211	-499	-173.3

Source: Compiled from official statistics of the U.S. Department of Commerce.

Haier Group and Guangdong Kelon Electrical Holding Co. In 1999, consumer demand for major appliances in China dampened as GDP growth slowed after severe flooding destroyed crops and manufacturing plants in some regions. [21] Although Maytag Corp. incurred slower sales growth in major appliances in China, it continued to maintain high profitability and also began to make use of China as a based to export to other countries in the region.[22]

U.S.-Mexico

The elimination of cross-border duties on appliances and parts under NAFTA along with the liberalization of investment regulations were key elements in the decisions of Whirlpool and GE to expand their joint ventures with Mexico's two largest appliance manufacturers. With these investments, Mexico has emerged as a major supplier of low-cost, entry-level kitchen ranges and stoves, refrigerators, and washing machines to the U.S. market. Although the major household appliance sector is relatively small, accounting for less than 1 percent ($398 million) of U.S. imports from Mexico in 1999, it has emerged as one of Mexico's fastest-growing industries and is one of the leading sectors experiencing cross-border integration of manufacturing operations. Major appliance production primarily takes place in the interior cities of Monterrey, San Luis Potosi, Queretaro, and Celaya. These cities give the U.S.-Mexican joint ventures access to relatively well-educated production line workers

[21] Kai-Alexander Schlevogt, "The Branding Revolution in China," *The Chinese Business Review*, May/June 2000, pp. 52-57.

[22] James Leung, "Bearing the Chill," *Asian Wall Street Journal*, Vol 35, Apr. 1999 p. 14.

(high school graduates with English-language training). As university towns, they also provide the companies with a steady supply of engineers and managers. Moreover, the expanding middle class in these and other cities of northern and central Mexico provide appliance plants with a growing domestic market.[23]

Whirlpool-Vitromatic

Whirlpool's joint venture with Mexican appliance producer Vitromatic Corp. (Vitro), primarily involves manufacturing a line of small household refrigerators (19 cubic feet or less in capacity) and entry level washers and dryers for the highly price-competitive segment of the U.S. appliance market. In 1998, Vitro generated approximately $500 million in sales with approximately 50 percent of its exports consisting of small-sized refrigerators.[24] Whirlpool's production of larger-sized refrigerators (larger than 19 cubic feet) and more expensive models (with added features) remain in the United States and Canada.

According to an official of the joint-venture, the U.S. appliance industry was experiencing growing competition in the low-priced refrigerator segment of the U.S. market when Whirlpool entered into the joint venture agreement with Vitro. For Whirlpool, the alternative to shifting U.S. production of smaller refrigerators to Mexico was to cease domestic production entirely because the company reportedly could not produce smaller refrigerators at competitive prices in the United States nor could it stay in business producing only top-of-the-line refrigerators.[25]

Both the smaller Mexican-made appliances and the larger, more sophisticated U.S.-made appliances are sold in the United States and Canada through Whirlpool's distribution network, including private-label customers, and in Mexico through Vitro's distribution network. Whirlpool also supplies the Central American market from its joint venture with Vitro. Additionally, Whirlpool's Canadian, U.S., and Mexican management and marketing structure was consolidated into a North American Appliance Group (NAAG). The primary goal of this consolidation was to enhance manufacturing efficiency, achieve economies of scale, and improve the cost effectiveness in all of its North American operations.[26]

GE/MABE

According to GE officials, declining profit margins in a mature U.S. market, the growth potential of the Mexican market, and the desire to maintain its competitive position with appliance rival Whirlpool, led GE to form an alliance with Mexican appliance manufacturer MABE. The GE/MABE joint venture manufactures gas ranges in San Luis Potosi and Queretaro and is reported to be the largest supplier of gas ranges to both the U.S. and

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[23] Joel Millman, "Mexico Builds A Home-Appliance Bonanza," *Wall Street Journal*, Aug. 23, 1999.

[24] Ibid.

[25] USITC staff interview with Juan Bendick Lopez, Gerente Efectividad Organizacional, Supermatic, S.A. de CV., Apodaca, Nuevo Leon, Mexico, June 19, 1997.

[26] William Marohn, executive vice president, North American Appliance Group, quoted in Anne Henry, "The Consolidation Story," *Appliance,* June 1991, W-83.

Mexican markets.[27] In 1998, MABE produced nearly 1 million gas ranges and 650,000 electric ranges, most of which are sold in the North American market under GE brand names, as well as Sears & Roebuck's Kenmore brand name.[28] It is estimated, based on industry sources, that by the end of year 2000, MABE could produce 40 percent of GE ranges sold in the United States.

Additionally, GE has invested $250 million to build a facility in Celaya, Guanajuato, to supply small refrigerators to the entire North American market. This new refrigerator plant will produce lower volume, higher price models, and is reportedly instrumental in the GE downsizing of its Bloomington, Indiana, refrigerator facility by the end of 2001, reportedly eliminating 850 production workers of the total 3,200 jobs at the Bloomington complex.[29] Company officials indicate this new production of small-size refrigerators by MABE facilities in Mexico will complement the production of large side-by-side refrigerators at the GE plant in Ft. Smith, Arkansas.

The GE/MABE strategic alliance in Mexico has also led parts suppliers to establish assembly plants in San Luis Potosi to provide GE/MABE with essential appliance components.[30] Such investments, and efforts by certain Mexican steel makers to address the needs of the major household appliance industry, have contributed to the reported decline in the share of U.S.-made parts and materials used in the assembly of GE/MABE appliances in Mexico from 84 percent in 1997 to 70 percent in 1999.[31]

Asian Investors

Japan-based Sanyo E&E Corp. has produced refrigerators in the San Diego/Tijuana region since 1979. Medium-size refrigerators are made in the Otay Mesa industrial park on the U.S. side of the border and small-size refrigerators, a few miles away in Tijuana. Various aspects of production have been rationalized between the two plants, with the Otay Mesa plant supplying certain parts to the Tijuana plant and the latter assembling wiring harnesses for use in both plants. Outside maquiladora vendors supply motors for the refrigerators assembled in both plants, whereas compressors are imported from Sanyo's factories in Asia. For the most

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[27] Joel Millman, "The World's New Tiger On the Export Scene Isn't Asian; It's Mexico," *Wall Street Journal*, May 9, 2000.

[28] Joel Millman, "GE Boost Mexican Output As Labor Talks in U.S. Near," Wall Street Journal, p. A17.

[29] "GE News: General Electric to Cut 1,400 of the 3,200 jobs in Bloomington, IN, Refrigerator Plant," *Appliance Manufacturer*, Mar. 3, 2000, No. 3, p.19. According to officials of the Bloomington Economic Development Commission in an interview with USITC staff in November 2000, GE reduced its estimate of the number of jobs that would be lost at the Bloomington complex from 1,400 to 850.

[30] Examples of U.S. suppliers that have established parts manufacturing operations close to GE/MABE appliance factories in Mexico include Gemtron (TN), Harper-Wyman (IL; stove burners), and Maxitrol (MI; pressure regulators for gas and electric stoves). In addition, USX Corp. established a joint venture facility in San Luis Potosi in 1998 that stores and slits U.S.-made coiled steel sheet supplied to GE/MABE as well as customers in the motor vehicle industry.

[31] Joel Millman, "Mexico Builds A Home-Appliance Bonanza," *Wall Street Journal*, Aug. 23, 1999, p. A12.

part, steel and other inputs are made in the United States. The bulk of production from both plants is sold in the United States.

Daewoo de Mexico, a subsidiary of the Korean conglomerate Daewoo, makes dishwashers, refrigerators, and washing machines in Queretaro. Production is marketed primarily in Mexico and Central America. However, exports to the United States and the use of U.S.-made components are minimal. Another Korea-based company, LG Electronics, plans to begin making refrigerators for the Mexican market in Monterrey in 2001.

U.S.-Canada

Prior to the entry into force of the U.S.-Canada Free Trade Agreement (CFTA) in 1989, several U.S. companies operated manufacturing subsidiaries in Canada to supply that market. However, reciprocal reduction of tariffs under the CFTA reduced the incentive to maintain duplicative production facilities in both countries. Subsequent rationalization and consolidation in the U.S. and Canadian appliance industries led to the closure of some Canadian facilities.

The Canadian major appliance industry consists of four major firms producing a full or partial line of household appliances. Three of the four leading Canadian firms (i.e., Camco, Inglis, and Frigidaire) are affiliates of the principal U.S. major household appliance firms. Together, these companies dominate Canadian domestic shipments with a market share of 85 percent. The W.C. Wood Co., which makes refrigerators and freezers, is the only significant Canadian major appliance producer that is not affiliated with a U.S. appliance manufacturer. The Canadian appliance industry is concentrated in Ontario (54 percent) and Quebec (44 percent), with smaller operations in New Brunswick (2 percent).[32]

Camco, with 1,500 employees, is 51-percent owned by GE Canada. It is Canada's sole producer of dishwashers and clothes dryers, and a major producer of top-mounted refrigerators (12 to 22 cubic feet) and electric ranges. At the same time, Camco imports 16- and 18-cubic-foot, top-mounted refrigerators from GE in the United States to supplement its product line.[33] Camco also imports 14-cubic-foot, small-size refrigerators from MABE in Mexico.[34]

Inglis is a wholly owned subsidiary of Whirlpool that manufactures electric ranges at its plant in Montmagny, Quebec, and imports certain refrigerators, freezers, dishwashers, dryers, washing machines, stoves, and ovens from Whirlpool's U.S. and Mexican facilities for distribution in Canada. Beginning in 1990, Whirlpool consolidated production and design of some products from Inglis' Canadian factories to larger plants in the United States to gain greater economies of scale. According to Inglis, this move increased efficiencies and leveraged investment already being made in the United States, thereby permitting Inglis to

[32] Ibid.

[33] "Camco Sourcing Agreement," *Appliance Manufacturer*, vol, 48 il, Jan. 2000, p. 22.

[34] Canada Customs and Revenue, "Preliminary Determination---Certain Household Appliances" Nov. 30,1999, found at *http://www.ccra-adrc.gc.ca/customs/business/sima/reports.htm*, retrieved May 4, 2000.

introduce, along with other improvements and innovations, more energy-efficient refrigerators, dishwashers, and dryers with advanced electronic controls.

Frigidaire Home Products Division (WCI of Canada) and U.S. appliance producer White Consolidated Industries are wholly owned subsidiaries of U.S.-based White Consolidated Holdings Inc., which, in turn, is owned by AB Electrolux of Sweden. WCI of Canada makes certain electric cooking ranges, built-in ovens, and cooktop stoves in L'Assomption, Quebec. The remainder of its product line is imported from its sister company in the United States. Prior to 1990, WCI of Canada made refrigerators, dishwashers, and dryers in Canada. Electrolux took advantage of the elimination of tariffs under the CFTA by consolidating much of its North American production to its U.S. facilities, discontinuing production of dishwashers (1990) and refrigerators (1993) in Canada.

Canadian production of household appliances consists largely of cooking stoves, ovens, electric ranges, laundry equipment, freezers, and refrigerators. Canadian producers are largely restricted to forming, stamping, and finishing metal for manufacturing appliances and assembly operations. This industry continues to be labor intensive despite continuing introduction of more automated production technologies. The bulk of major inputs, such as cold-rolled steel sheet and coil, aluminum mill products, tubing and pipes, plastics, chemicals, electric motors, and various controls are purchased from Canadian sources. However, higher valued components such as fractional refrigeration compressors, condensers, pumps, heat sensors, touch-sensor controls, and microprocessor controls are typically imported from the United States, Korea, and Brazil.

Consolidation in the Canadian appliance industry accelerated in 1994 with both the completion of staged tariff elimination under the CFTA and the entry into force of NAFTA. Further industry consolidation followed after the 1998 Canadian recession. The number of Canadian appliance establishments declined from 35 in 1986 to less than 20 in 1999. The sluggish domestic demand for major household appliances led Canadian firms to export a higher proportion of their domestic output, with 92 percent of all its major appliance exports destined for the United States, and 1 percent each for the United Kingdom and Mexico. The share of Canada's producers' shipments that were exported rose from 14 percent in 1990 to 58 percent in 1998.[35]

Outlook

Faced with limited prospects for domestic growth, continued diminishing industry profit margins, and marginal product differentiation between brand name producers, major U.S. household appliance producers are likely to look abroad for future growth. Increasing wealth in some of the world's emerging markets such as Mexico, China, and India, will continue to attract major producers of household appliances in the form of increased foreign investment via joint-venture agreements, mergers, or acquisitions of local producers. These emerging markets provide expanding opportunities to major appliance producers where product

[35] Industry Canada, "Major Appliance Industry (Electric and Non-Electric)," May 5, 2000, found at *http://strategis.gc.ca/SSG/io33217e.html.* retrieved Nov. 5, 2000.

saturation levels are low and populations are rapidly rising.[36] However, consumers in developing markets often gravitate to lower-end household appliance brands with narrower profit margins which may reduce incentives to invest in this market sector. Nonetheless, high transportation costs and the need to design appliances to match foreign consumer preferences dictate that U.S. producers will likely establish regional manufacturing operations to service these emerging markets. As a result, participation by U.S. companies in many of these specific emerging markets will likely lead to only minimal growth in U.S. exports.

Unlike other emerging markets, however, growth in consumer demand for major household appliances in Central America, the Caribbean Islands, and the northern Andean region of South America[37] should lead to an expansion of U.S. exports. Most of this increase in exports will likely be in components and materials shipped to appliance assembly plants in Mexico. The GE/MABE and Whirlpool/Vitro joint ventures in Mexico are already supplying entry level appliances to customers in these regions. Industry officials in the United States and Mexico have indicated that products from these facilities benefit from lower production costs compared with appliances made in the United States, and lower transportation costs than appliances exported to these regions from suppliers in Asia, Europe, and Brazil.[38] Further, Mexico's free trade agreements with most countries in the Caribbean and Andean regions gives appliances made in Mexico another competitive advantage in these markets.**#**

[36] Top-of-the-line U.S.-made appliances are popular among affluent customers throughout the world. Sales to these niche markets are believed to account for a significant portion of total U.S. appliance exports.

[37] The northern Andean region of South America includes Colombia, Ecuador, Peru, and Venezuela. The southern Andean region/Southern Cone of South America includes Argentina, Bolivia, Brazil, Chile, Paraguay, and Uruguay. All are founding members or associate members of Mercosur. Factories in Brazil (some affiliated with U.S. producers) supply the bulk of the major household appliances sold in this region.

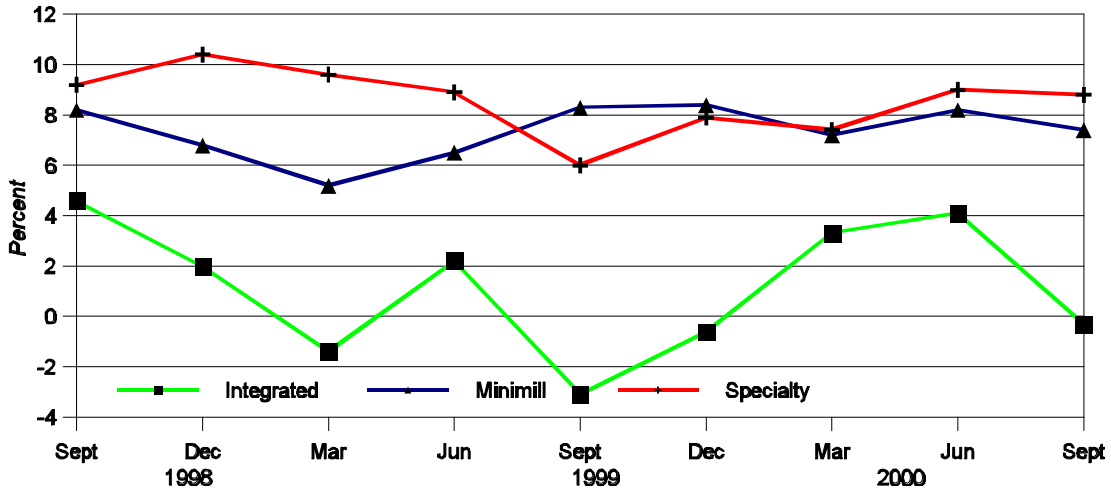
[38] The incentives for investing in Mexico have been a recurring theme in USITC staff interviews with U.S. and Mexican appliance producers over the past decade.

APPENDIX A
KEY PERFORMANCE INDICATORS OF SELECTED INDUSTRIES AND REGIONS

- **STEEL** (Karl Tsuji, 202-205-3434/tsuji@usitc.gov)
- **AUTOMOBILES** (Laura A. Polly, 202-205-3408/polly@usitc.gov)
- **ALUMINUM** (Karl Tsuji, 202-205-3434/tsuji@usitc.gov)
- **FLAT GLASS** (James Lukes, 202-205-3426/lukes@usitc.gov)
- **SERVICES** (Tsedale Assefa, 202-205-2374/assefa@usitc.gov)
- **NORTH AMERICAN TRADE** (Ruben Mata, 202-205-3403/mata@usitc.gov)

STEEL

Figure A-1
Integrated steel posts a slight loss for the quarter ending September 2000



[1] Operating profit as a percent of sales. Integrated group contains 9 firms. Minimill group contains 8 firms. Specialty group contains 4 firms.

Source: Individual company financial statements.

- All U.S. steel sectors experienced lower operating income for third quarter 2000, attributed by companies primarily to increased energy costs and downward pressure on product prices related to increased import volumes and high inventory levels. Certain producers in the integrated sector faced added costs associated with various production outages. However, the specialty sector benefitted from improved sales of higher-value products and more favorable raw material surcharge base levels that somewhat offset higher energy costs.
- Wheeling-Pittsburgh (November), Northwestern Steel and Wire (December), and LTV (December) are the latest steelmakers to file for Chapter 11 bankruptcy protection, joining Acme Metals, Geneva, Gulf States, Laclede, and Qualitech. However, Geneva emerged from Chapter 11 bankruptcy as its restructuring plan was approved by the Bankruptcy Court in November, whereas Gulf States closed down its operations in August.
- Virtually all U.S. producers experienced significant declines in market capitalization. Depressed stock prices knocked Bethlehem Steel out of both the Standard & Poor's 100 and 500 Indexes in early December.

Table A-1
Imports of finished steel products continue to exceed 1999 levels

Item	Q3 2000	Percentage change, Q3 2000 from Q3 1999[1]	YTD 2000	Percentage change, YTD 2000 from YTD 1999[1]
Producers' shipments *(1,000 short tons)*	26,490	-1.2	83,801	9.6
Finished imports *(1,000 short tons)*	7,918	8.9	38,723	15.2
Ingots, blooms, billets, and slabs *(1,000 short tons)*	2,263	-6.0	7,085	14.4
Exports *(1,000 short tons)*	1,615	14.2	4,920	29.0
Apparent supply, finished *(1,000 short tons)*	35,055	-0.1	109,353	10.3
Ratio of finished imports to apparent supply *(percent)*	24.1	[2]1.9	22.9	[2]1.0

[1] Based on unrounded numbers.
[2] Percentage point change.
Note.–Because of rounding, figures may not add to the totals shown.

Source: American Iron and Steel Institute.

STEEL

Table A-2
Continued declining shipments and new record levels of inventory for service centers

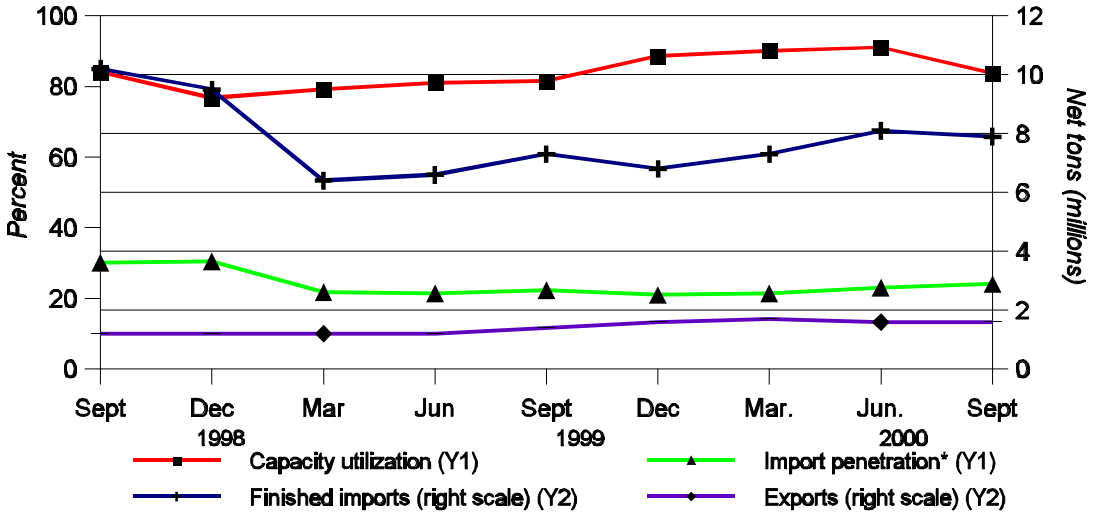
Item	June 2000	Sept. 2000	Percentage change, Sept. 2000 from Sept.1999[1]	Q3 1999	Q3 2000
Shipments *(1,000 net tons)*	2,613r	2,327	-11.0	7,465	7,167
Ending inventories *(1,000 net tons)*	8,898	8,954	0.6	8,013	8,954
Inventories on hand *(months)*	3.6	3.7	([2])	3.2	3.7

[1] Based on unrounded numbers.
[2] Not applicable.
Note.-Revised data indicated by "r".

Source: Steel Service Center Institute.

- The Steel Service Center Institute reported that shipments of finished steel products declined for a second consecutive quarter, with the third quarter 2000 volume 4 percent below that of the same period last year, as increases in stainless and alloy products did not offset declines in other product categories. Inventories at service centers grew for a 13th consecutive month, despite continued marketing efforts, to reach another record-setting level in September, as demand for current inventory was dampened by a slow-down in manufacturing activity.
- Import penetration of finished product markets rose in third quarter 2000, despite the 2.8-percent drop in finished-product imports compared to the previous quarter, reflecting reduced shipments and lower capacity utilization by domestic producers. However, finished-product imports through the first 9 months of 2000 were nearly 3.1 million short tons (15.2 percent) higher than over the same period a year ago.

Figure A-2
Steel mill products, all grades: Imports down but import penetration rises in September as lower capacity utilization reflects reduced domestic output



* Finished import share of apparent open market supply.

Source: American Iron and Steel Institute.

AUTOMOBILES

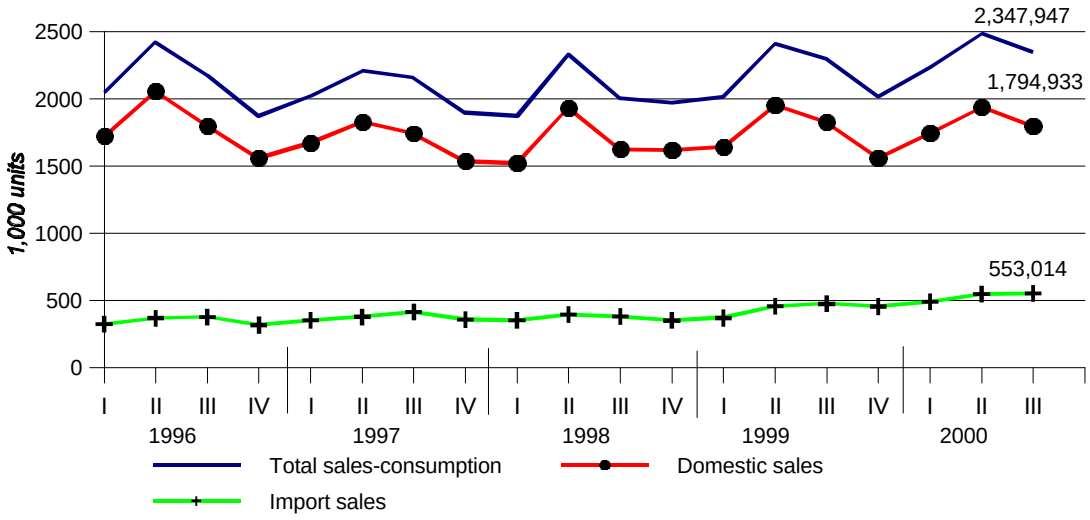
Table A-3
U.S. sales of new automobiles, domestic and imported, and share of U.S. market accounted for by sales of total imports and Japanese imports, by specified periods, January 1999-September 2000

Item	Jul.-Sep. 2000	Jan.-Sep. 2000	Percentage change: Jul.-Sep. 2000 from Apr.-Jun. 2000	Percentage change: Jan.-Sep. 2000 from Jan.-Sep. 1999
U.S. sales of domestic autos (*1,000 units*)[1]	1,795	5,481	-7.4	1.1
U.S. sales of imported autos (*1,000 units*)[2]	553	1,594	0.8	21.9
Total U.S. sales (*1,000 units*)[1, 2]	2,348	7,075	-5.6	5.1
Ratio of U.S. sales of imported autos to total U.S. sales (*percent*)[1, 2]	23.6	22.5	6.8	16.0
U.S. sales of Japanese imports as a share of the total U.S. market (*percent*)[1, 2]	10.9	10.2	11.9	10.5

[1] Domestic automobile sales include U.S.-, Canadian-, and Mexican-built automobiles sold in the United States.
[2] Imports do not include automobiles imported from Canada and Mexico.

Source: Compiled from data obtained from *Automotive News*.

Figure A-3
U.S. sales of new passenger automobiles decrease in third quarter 2000; sales of imports as a percentage of the U.S. market increase from previous quarter

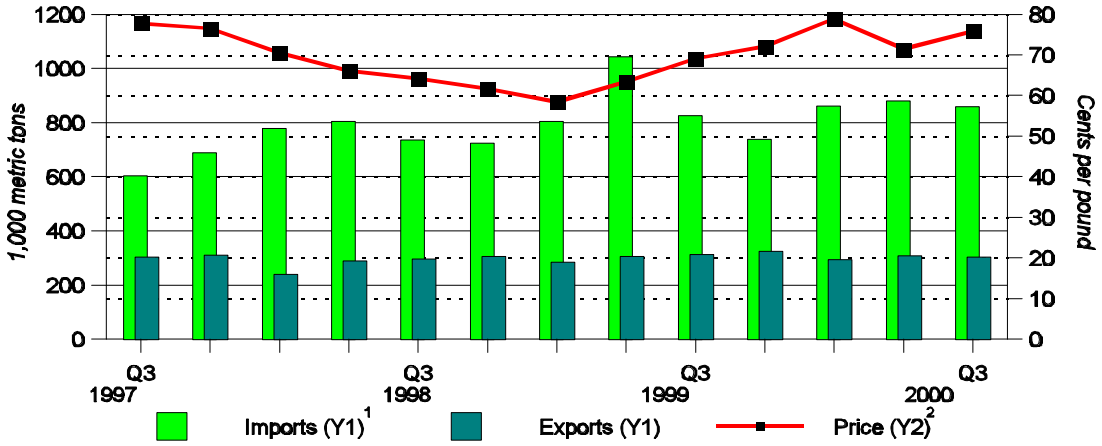


Note.–Domestic automobile sales include U.S.-, Canadian-, and Mexican-built automobiles sold in the United States; these same units are not included in import sales.

Source: *Automotive News*; prepared by the Office of Industries.

ALUMINUM

Figure A-4
Aluminum: Noticeably higher prices but lower U.S. aluminum imports during third quarter 2000



[1] Crude forms (metals and alloys) and mill products (e.g., plates, sheets, and bars) for consumption.
[2] Quarterly average of the monthly U.S. market price of primary aluminum ingots.

Source: U.S. Geological Survey.

- The average price of primary aluminum ingot increased 4.5 cents per pound in third quarter 2000 as supplies tightened from the sharp, year-long draw down of inventories and cut-backs in primary smelter output, despite seasonal lower demand. Cutbacks in both U.S. primary smelting and secondary recovery of aluminum reflected concerns over escalating costs because of rising electricity and natural-gas prices.
- Alcan (Canada) officially completed its acquisition of Algroup (Switzerland), through an exchange of shares, according to schedule, on October 17. Alcoa (United States) extended the divestiture of certain Reynold Metals (United States) smelting and refining assets, required as part of the merger-approval conditions, from the end of October to the end of the year. Despite failure of its proposed merger with Alcan and Algroup, Pechiney (France) announced "an aggressive policy of external growth" that will be in effect for the next few years. Acquisition of Kaiser Aluminum Corporation (United States) has been ruled out but certain Kaiser holdings remain of interest to Pechiney.

Table A-4
Higher import penetration despite lower import levels as U.S. aluminum production is scaled back during third quarter 2000

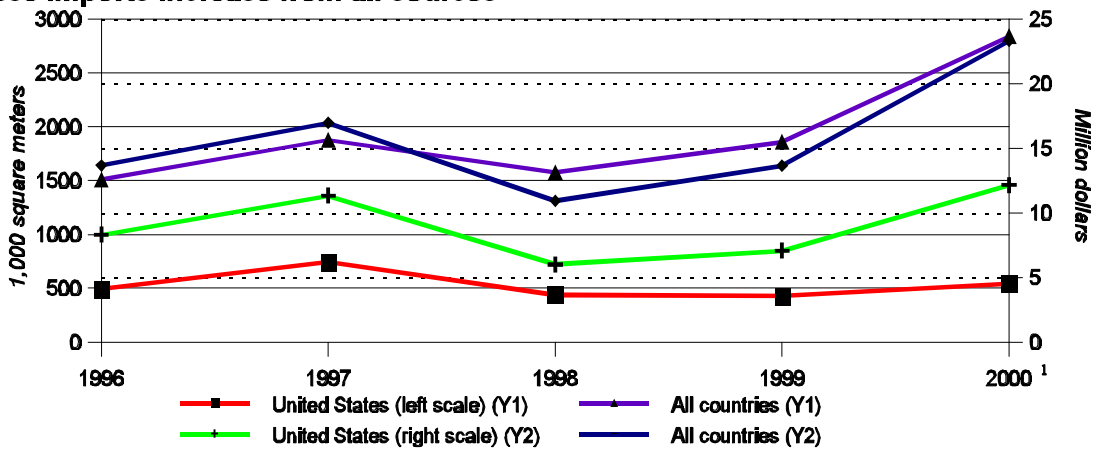
				Percentage change	
Item	Q3 1999	Q2 2000	Q3 2000	Q3 2000 from Q3 1999	Q3 2000 from Q2 2000
Primary production (*1,000 metric tons*)	953	942	883	-7.3	-6.3
Secondary recovery (*1,000 metric tons*)	889r	935r	903	1.6	-3.4
Imports (*1,000 metric tons*)	825	880	859	4.1	-2.4
Import penetration (*percent*)[1]	35.8	34.5r	36.1	[2]0.3	[2]1.6
Exports (*1,000 metric tons*)	312	307	303	-2.9	-1.3
Average nominal price (*¢/lb*)	69.1	71.4	75.9	9.8	6.3
LME inventory level (*1,000 metric tons*)	797	515	361	-54.7	-29.9

[1] Calculations based on unrounded data
[2] Percentage point change
Note: Revised data indicated by "r."

Sources: Compiled from data obtained from U.S. Geological Survey and World Bureau of Metal Statistics.

FLAT GLASS

Figure A-5
Japanese imports increase from all sources



[1]Data for 2000 include Jan.-Sept. (lastest available data).

Source: Average monthly Japanese imports of flat glass compiled from official statistics of the Ministry of Trade and Industry, Japan.

Background

- The U.S.-Japanese agreement on Japanese market access for imports of flat glass sought to increase access and sales of foreign flat glass in Japan through such means as increased adoption of nondiscriminatory standards and expanded promotion of safety and insulating glass. The agreement covered the 1995-99 period and expired on December 31, 1999.[1] Although Japanese demand for imported glass improved in 1999, the U.S. share of the Japanese market declined as the quantity of imports from the United States fell by 2 percent.

Current

- Japanese demand for imported glass has continued to improve during 2000. The average monthly quantity of Japanese imports from all countries increased by 53 percent during 2000 to 2.8 million square meters, and the average monthly value of such imports increased by 71 percent to $23.3 million. However, while Japanese imports from the United States increased by 27 percent to 546,000 square meters and by 72 percent to $12.2 million, respectively, the U.S. share of the Japanese market has declined; imports from the United States lost market share to less expensive imports from Thailand, Korea, China, and Malaysia.
- The U.S. Government cited the glass sector in it's annual submission to the Government of Japan under the U.S.-Japan Enhanced Initiative on Deregulation and Competition Policy that seeks to eliminate bottlenecks that inhibit Japanese structural change and economic adjustment.[2] The U.S. Government stated that Japanese flat glass manufacturers and the glass distribution system should be monitored to ensure compliance with Japan's Antimonopoly Act and to promote competition in the glass sector.[3]

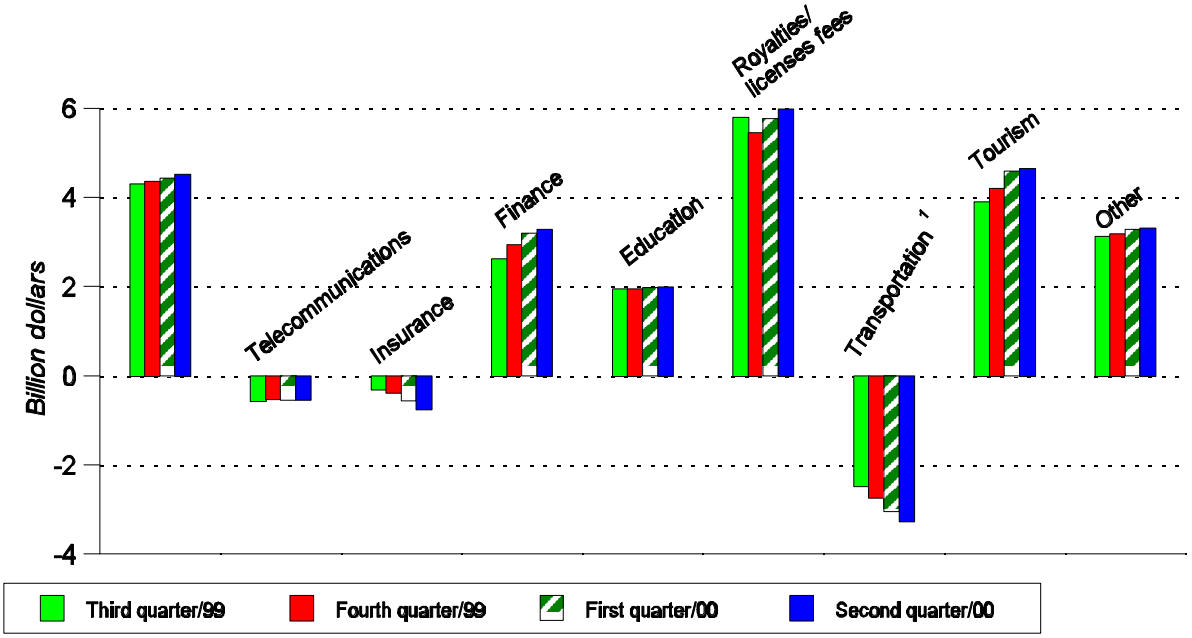
[1] Office of the U.S. Trade Representative (USTR), "The President's 1999 Annual Report on the Trade Agreements Program," p. 227, downloaded from *http://www.ustr.gov/reports/tpa/2000/index.html* on Mar. 3, 2000.

[2] USTR, "Barshefsky Hails Significant Achievements Under Enhanced Deregulation Initiative," downloaded from *http://www.ustr.gov/releases/2000/07/00-56.pdf* on Dec 12, 2000.

[3] USTR, "Annual Submission by the Government of the United States to the Government of Japan Under the U.S.-Japan Enhanced Initiative on Deregulation and Competition Policy," p. 32, downloaded from *http://www.ustr.gov/releases/2000/10/japanprop.html* on Nov. 15, 2000.

SERVICES

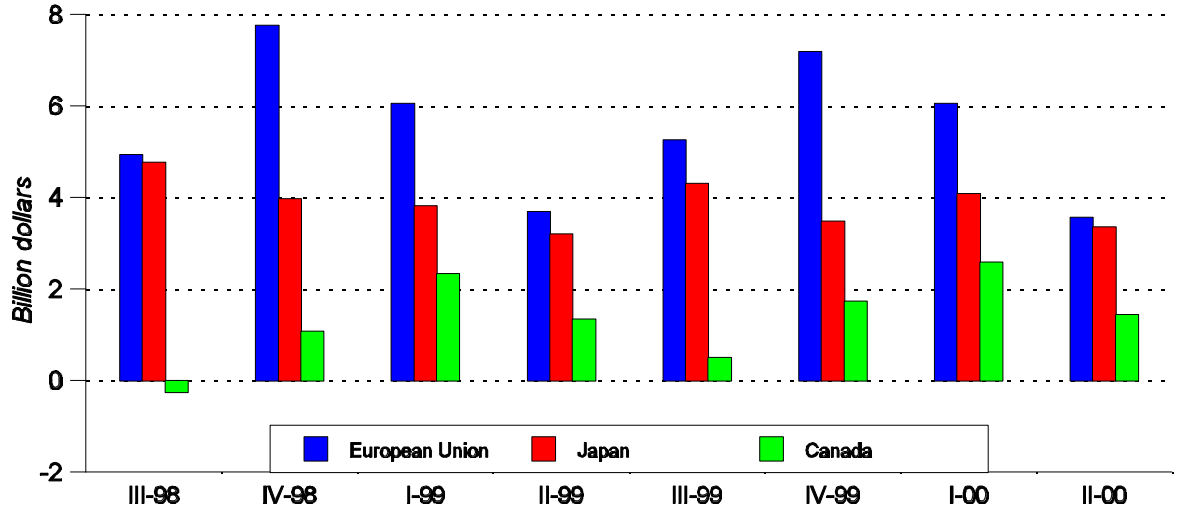
Figure A-6
Balance on U.S. service trade accounts, by quarter, 1999-2000



[1] Includes port fees.

Source: Bureau of Economic Analysis, *Survey of Current Business*, Oct. 2000, p. 105.

Figure A-7
Surpluses on cross-border U.S. services transactions with selected trading partners, by quarter, 1998-2000[1]



[1] Private-sector transactions only; military shipments and other public-sector transactions have been excluded.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business*, Oct. 1999, pp. 42-45; Jan. 2000, pp. 112-115; Apr. 2000, pp. 186-189; July 2000, pp. 116-119; and Oct. 2000, pp. 112-115.

North American Trade

U.S. trade with its North American partners, and the use of U.S.-made components in Mexican assembly plants based on imports under the production-sharing tariff provisions of HTS chapter 98, are highlighted in table A-5. The following is a summary of key developments during the first three quarters of 2000.

- *During January-September 2000, total U.S. trade with its NAFTA partners ($462 billion) increased by 18 percent ($71 billion) over the comparable period of 1999. The U.S. merchandise trade deficits with Canada (-$53 billion) and Mexico (-$26 billion) continued an upward trend which began in 1998, increasing by 41 percent and 18 percent, respectively, and principally reflect a 2.4 percent U.S. GDP annualized growth rate through the third quarter 2000.*

- *The pace of the expanding U.S. merchandise trade deficits with both Canada and Mexico could moderate in 2001 if slower growth in the U.S. economy eases demand for U.S. imports of automobiles, electronic products, petroleum, and natural gas. Nearly one-third of all U.S. trade is conducted with Canada and Mexico, which also rely on the United States as the principal market for more than 80 percent of their respective exports. The motor vehicles and parts sector is the largest item in bilateral trade between all North American trade partners.*

- *Two-way trade with Canada increased 14 percent ($35 billion) to $288 billion during January-September 2000, led by imports from Canada that reached $170 billion and increased 17 percent ($25 billion). Although about 35 percent of Canada's GDP is attributable to exports to the United States, the Canadian economy registered no growth during the third quarter of 2000. Despite higher interest rates in the third quarter that slowed both domestic and foreign demand for manufactured products, particularly autos and auto parts, trucks, wood products, chemicals, and electrical and electronic equipment, the Canadian economy is projected to grow by 4.1 percent in the year 2000, nearly twice the annualized growth in the U.S. economy.*

- *Mexico continued to consolidate its position as the second largest U.S. trading partner during January-September 2000, as total U.S. trade with Mexico reached $174 billion and increased by 27 percent ($37 billion) over the corresponding 1999 period. U.S. exports to Mexico continued to grow at a faster pace than imports from Mexico, increasing by 28 percent to $74 billion. A significant portion (76 percent) of total Mexican imports were intermediate goods used primarily by the Maquiladora or PITEX programs.*

- *U.S. imports from Mexico in the period rose by 25 percent ($20 billion) to $100 billion, led by strong demand for finished vehicles, auto parts, petroleum, electronic and electrical equipment, and apparel. Mexico surpassed the United States and Canada by posting a 7.5 percent growth rate through the third quarter 2000. Expansion in Mexico was also facilitated by trade liberalization, foreign investment, and fiscal and political reforms. U.S. exports to Mexico registered a $16 billion growth in the period compared with a $10 billion increase in U.S. exports to Canada.*

- *Although imports from Mexico reported under the production-sharing provisions (mostly from Mexico's maquiladora industry) decreased by 24 percent ($5 billion) through the third quarter 2000, U.S. imports entered duty free under NAFTA increased by 20 percent ($10.6 billion) to $63 billion, or 63 percent of total U.S. imports from Mexico.*

NORTH AMERICAN TRADE

Table A-5
North American trade, 1995-99, January-September 1999, and January-September 2000

Item	*1995*	*1996*	*1997*	*1998*	*1999*	*January-September 1999*	*January-September 2000*	*Percent change 1999/00*
	Value (million dollars)							
U.S.-Mexico trade:								
Total imports from Mexico	61,721	74,179	85,005	93,017	109,018	79,789	100,045	25
U.S. imports under production-sharing provisions (PSP) of HTS Chapter 98:[1]								
Total value	24,962	27,925	28,883	27,162	25,875	19,892	15,075	-24
Percent of total imports	40	38	34	29	24	25	15	-
U.S. components in HTS PSP imports:								
Total value	12,833	14,649	15,483	14,484	13,928	10,793	8,061	-25
Percent of HTS PSP imports	51	52	54	53	54	54	53	-
Percent of total imports	21	20	18	16	13	14	8	-
U.S. imports under NAFTA:[2]								
Total value	43,927	55,076	62,837	68,326	71,318	52,217	62,840	20
Percent of total imports	71	74	74	73	65	65	63	-
Total exports to Mexico	44,881	54,686	68,393	75,369	81,381	57,733	74,116	28
U.S. exports of components[3] to HTS Chapter 98 production-sharing operations as a percent of total U.S. exports	29	27	23	19	17	19	11	-
U.S. merchandise trade balance with Mexico[4]	-16,840	-19,493	-16,612	-17,648	-27,637	-22,056	-25,929	-18
U.S. -Canada trade:								
Total imports from Canada	144,882	156,299	167,881	174,685	198,242	145,151	170,137	17
Total exports to Canada	113,261	119,123	134,794	137,768	145,731	107,629	117,397	9
U.S. merchandise trade balance with Canada[5]	-31,621	-37,176	-33,087	-36,918	-52,511	-37,522	-52,740	-41

[1]The production-sharing provisions of HTS Chapter 98 are 9802.00.60, 9802.00.80, and 9802.00.90.

[2]Some import entries from Mexico declare eligibility for preferential tariff treatment under both NAFTA and the HTS production-sharing provisions (PSP); such entries are reported in the totals for both imports under HTS PSP (and U.S.-made components in HTS PSP imports) as well as imports under NAFTA.

[3]Represents the total value of U.S. components in HTS production-sharing provision imports.

[4]The hyphen (-) symbol indicates a loss or trade deficit, or not applicable. The $27.6 billion deficit in U.S. merchandise trade with Mexico in 1999 was partially offset by a $2.6 billion U.S. surplus in bilateral services trade.

[5]The $52.5 billion deficit in U.S. merchandise trade with Canada in 1999 was partially offset by a $5.8 billion U.S. surplus in bilateral services trade.

Source: Compiled by U.S. International Trade Commission staff from official statistics of the U.S. Department of Commerce. Statistics in footnote 4 on U.S. services trade with Mexico are based on preliminary data provided in U.S. Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business*, July 2000, vol. 80, No.7.