Office of Industries and Competitive Analysis
Working Paper ID-096

Trends in U.S. Merchandise Trade, 2022

Part 4

September 2023

Project Leader
Allison Utomi

Authors
Patrick Crotty, Nathan Lotze, Brennan Taylor

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Office of Industry and Competitiveness Analysis
U.S. International Trade Commission (USITC)
September 2023

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The authors would like to thank Robert Carr and Eric Forden for their helpful comments and suggestions and Gwenetta Duvall, David Lahrmer, and Justin Holbein for their production support.

Introduction

This working paper—the fourth in a series of four papers providing analysis on U.S. merchandise trade in 2022—discusses electronic products, machinery, and transportation equipment products, providing discussion and analysis on U.S. exports, imports, and trade balance by sector (e.g., electronic products), digest (e.g., telecommunications equipment), and leading U.S. trade partners. This series of working papers is intended to be read with the interactive data tables and figures that can be found on the USITC website at: https://www.usitc.gov/research_and_analysis/tradeshifts/2022/index.

Box 1.1 Background on the trade data used in this working paper

For the purposes of this paper, trade is divided into ten broad industry sectors (e.g., agriculture). The industry sectors are further divided into digests (e.g., poultry or oilseeds). Each USITC sector digest encompasses various 8-digit subheadings in the Harmonized Tariff Schedule of the United States (HTS). The USITC maintains and publishes the HTS which sets out the tariff rates and statistical categories for all merchandise imported into the United States. The U.S. Census Bureau (Census) collects and compiles export statistics of approximately 8,000 commodity classifications (10-digit classification codes) in Schedule B: Statistical Classification of Domestic and Foreign Commodities Exported from the United States. Schedule B classification codes are concorded to HTS 10-digit statistical reporting numbers based on USITC estimates; therefore, the classification codes for exports are presented using HTS 8-digit subheadings for imports.[a]

The trade data presented in this working paper principally rely on three broad categories of trade: "total exports," "domestic exports," and "general imports." Unless otherwise noted, the export data used in tables are for domestic exports; some tables also include data on re-exports.[b] The import data used in the tables are for general imports.

Definitions of the five broad categories of trade data gathered by the U.S. Census:

General imports are total physical arrivals of merchandise from foreign countries into the United States, whether such merchandise enters consumption channels immediately or is entered into bonded warehouses or Foreign Trade Zones (FTZs) under Customs custody.

Imports for consumption (sometimes called "special imports") are merchandise that have physically cleared through Customs, either entering consumption channels immediately or entering for consumption after withdrawal from bonded warehouses or FTZs under Customs custody.

Domestic exports are (1) exported goods that were grown, produced, or manufactured in the United States, and (2) exported commodities of foreign origin that have been changed in the United States (including changes made in a U.S. FTZ) from the form in which they were imported, or that have been enhanced in value or improved in condition by further processing or manufacturing in the United States.

Re-exports (sometimes called foreign exports) are calculated as total exports minus domestic exports of goods of foreign origin that (1) have previously entered the U.S. customs territory, a Customs bonded warehouse, or a U.S. FTZ, and (2) at the time of exportation, have not undergone any substantial change in form or condition or any enhancement in value by further manufacturing in the U.S. customs territory or U.S. FTZs.

Total exports are U.S. domestic exports plus re-exports. This includes all exports of physical merchandise from the United States.[c]

[a] For a complete list of HTS subheadings classified in a particular sector or digest, see https://www.usitc.gov/system/files/research_and_analysis/tradeshifts/files/sectors_digest_table_2022.html.
[b] For more information on trade terminology, please refer to USITC, "Special Topic: Trade Metrics https://www.usitc.gov/research_and_analysis/trade_shifts_2014/trade_metrics.htm, Shifts in U.S. Merchandise Trade, 2014.
[c] USDOC, Census webpage, "Trade Definitions," https://www.census.gov/foreign-trade/reference/definitions/ USITC, "A Note on U.S. Trade Statistics," August 22, 2014, http://www.usitc.gov/publications/research/tradestatsnote.pdf. Census also notes the following definition for foreign exports: "Exports of foreign merchandise (re-exports) consist of commodities of foreign origin which have entered the United States for consumption, or into Customs bonded warehouses or U.S. Foreign Trade Zones, and which, at the time of exportation, are in substantially the same condition as when imported." USDOC, Census webpage, "Guide to Foreign Trade Statistics," http://www.census.gov/foreign-trade/guide/sec2.html (accessed September 15, 2018).

Electronic Products

Changes in 2022 from 2021:

- **U.S. total exports increased by $16.7 billion (5.8 percent) to $302.8 billion**
  - **U.S. domestic exports increased by $5.4 billion (3.2 percent) to $167.2 billion**
  - **U.S. re-exports increased by $11.3 billion (9.1 percent) to $135.7 billion**
- **U.S. general imports increased by $58.4 billion (10.2 percent) to $629.9 billion**

The value of U.S. domestic exports of electronic products[1] rose by $5.4 billion (3.3 percent) to $167.2 billion in 2022, after rising by 9.0 percent in 2021 (table EL.1).[2] The largest increase in exports was for medical goods (up $2.6 billion); measuring, testing, and controlling instruments (up $1.8 billion); computers, peripherals, and parts (up $739 million); and circuit apparatuses not exceeding 1000V (up $690 million). By contrast, exports of semiconductors and integrated circuits declined significantly in 2022, down $3.5 billion (10.9 percent) to $29.1 billion.[3] Exports of electronic products increased by the largest amount to Mexico, rising $1.9 billion (up 10.6 percent) to $19.7 billion; the Netherlands, rising $1.3 billion (up 14.5 percent) to $10.6 billion; and Canada, rising $981 million (6.4 percent) to $10.6 billion. By contrast, exports decreased by the largest amount to China, falling $3.5 billion (16.1 percent) to $18.3 billion.

The value of U.S. general imports of electronic products rose by $58.4 billion (10.2 percent) to $629.9 billion in 2022 (table EL.2).[4] The largest increase in imports was for telecommunications equipment (up $15.5 billion); computers, peripherals, and parts (up $10.8 billion); semiconductors and integrated circuits (up $6.7 billion); medical goods (up $6.0 billion); and miscellaneous electrical equipment (up $5.4 billion). Imports of electronic products increased by the largest amount to Mexico, rising $15.4 billion (up 16.9 percent) to $106.5 billion; Vietnam, rising $10.8 billion (up 27.7 percent) to $49.8 billion; and Taiwan, rising $8.7 billion (21.4 percent) to $49.2 billion. By contrast, imports decreased by the largest amount from China, falling $1.9 billion (down 1.0 percent) to $182.9 billion.

In 2022, international trade in electronic products was driven by a variety of factors, including the ongoing adoption of cloud computing, the rollout of fifth-generation (5G) telecommunications, and the so-called Internet of Things (IoT), which, in turn, have led to increased trade in equipment like routers, modems, and computers (and computer peripherals) as well as component parts like data processing

[1] The Electronic Products sector consists of 25 product digests. Each USITC sector digest encompasses various 8-digit subheadings in the *Harmonized Tariff Schedule of the United States* (HTS). For a complete list of HTS subheadings classified in a particular sector or digest, see this data table.
[2] Unless otherwise noted, the export data used in this section are for domestic exports. For more information on trade terminology, please refer to USITC, "Special Topic: Trade Metrics," *Shifts in U.S. Merchandise Trade, 2014*, June 2015; USITC DataWeb/Census, digests EL001–25, accessed February 9, 2023.
[3] USITC DataWeb/Census, digest EL015, accessed February 9, 2023.
[4] USITC DataWeb/Census, digests EL001–25, accessed February 9, 2023.

units.[5] Aging populations and advancements in healthcare technology have also increased international trade in medical and surgical devices and measuring, testing, and controlling equipment.[6]

U.S. Domestic Exports

U.S. exports of medical goods increased by $2.6 billion (7.3 percent) to $38.3 billion in 2022 (table EL.1).[7] Within this digest, exports increased by the largest amount for surgical instruments and appliances, up $624 million (11.5 percent); electro-diagnostic patient monitoring systems, up $622 million (65.9 percent); and electro-surgical instruments and appliances, up $420 million (20.1 percent).[8] The increase in exports in this digest is attributable to pent-up demand for medical and surgical goods and devices used for elective surgery as global COVID-19 restrictions were relaxed. Surgeries postponed or canceled during the COVID-19 pandemic, advancements in early diagnosis and treatment of illness and injury, and increased demand for healthcare from a rapidly aging global population all contributed to this phenomenon.[9]

[5] Ann, "Data Processing Units: What are DPUs and Why Do You Want Them?," May 1, 2023; [5] Fisher, "Where is 5G Available in the US?," May 2, 2023; Finley, Pearlstein, Hill, "The WIRED Guide to 5G," December 31, 2022.
[6] Fortune Business Insights, "Medical Devices Market Size, Share & Growth," June 2022; United Nations, "Global Issues: Ageing," accessed April 26, 2023; *OR Today Magazine*, "Surgical Equipment Market Rebounds from COVID-19," March 31, 2023; MarketsandMarkets, "Test and Measurement Equipment Market Size, Share, Industry Trends, Companies, Growth Analysis 2026," April 2021.
[7] USITC DataWeb/Census, digest EL022, accessed February 9, 2023.
[8] USITC DataWeb/Census, HTS subheading 9018.90.80, accessed February 9, 2023; USITC DataWeb/Census, HTS subheading 9018.19.55, accessed February 9, 2023; USITC DataWeb/Census, HTS subheading 9018.90.60, accessed February 9, 2023.
[9] USITC, "Electronic Products," *Shifts in U.S. Merchandise Trade, 2021*, June 2022; Tucker, "Hospitals Likely to End 2022 in the Red," October 3, 2022; *OR Today Magazine*, "Surgical Equipment Market Rebounds from COVID-19," March 31, 2023; Fortune Business Insights, "Medical Devices Market Size, Share & Growth," June 2022; United Nations, "Global Issues: Ageing," accessed April 26, 2023; *OR Today Magazine*, "Surgical Equipment Market Rebounds from COVID-19," March 31, 2023.

Table EL.1 Leading changes in U.S. domestic exports, 2018–22
In millions of dollars and percentages

Product group (digest)	2018 (million $)	2019 (million $)	2020 (million $)	2021 (million $)	2022 (million $)	Absolute change, 2021–22 (million $)	Percentage change 2021–22 (%)
Medical goods	34,375	35,358	32,726	35,739	38,348	2,608	7.3
Semiconductors and integrated circuits	26,245	29,259	29,383	32,655	29,111	-3,544	-10.9
Measuring, testing, and controlling instruments	24,878	24,803	22,360	23,849	25,655	1,806	7.6
Computers, peripherals, and parts	18,045	16,360	15,246	17,331	18,071	739	4.3
Telecommunications equipment	14,994	13,333	11,349	11,997	12,465	469	3.9
Circuit apparatus not exceeding 1000V	7,078	6,802	5,928	6,622	7,312	690	10.4
Optical goods, including ophthalmic goods	6,694	6,397	5,830	6,475	6,822	347	5.4
Circuit apparatus assemblies	4,119	4,048	3,441	3,626	4,202	576	15.9
Parts of circuit apparatus	3,213	2,997	2,709	3,272	3,656	383	11.7
Consumer electronics	3,718	3,395	3,005	3,293	3,459	166	5.0
All other sources	19,463	19,378	16,500	16,908	18,066	1,157	6.8
Total	162,822	162,129	148,478	161,767	167,166	5,399	3.3

Source: USITC DataWeb/Census, accessed February 16, 2023.
Notes: Export values are based on free along ship value, U.S. port of export. Calculations based on unrounded data.

The largest increases in U.S. medical goods exports were to the Netherlands (up $882 million or 15.7 percent) and to Mexico (up $333million or 14.4 percent). Increased exports to the Netherlands can be explained by substantial re-exports and growth in the Dutch government's spending on elder care, whereas growth to Mexico is likely attributable to an increase in healthcare spending in 2022.[10]

U.S. exports of measuring, testing, and controlling instruments increased by $1.8 billion (7.6 percent) to $25.7 billion in 2022.[11] Within this digest, the largest change occurred in instruments and apparatuses for chemical and physical analysis, such as polarimeters, refractometers, and spectrometers, which rose 7.5 percent to $7.9 billion, followed by regulating or controlling instruments and apparatuses, which increased 15.0 percent to $4.3 billion.[12] The healthcare industry's growth has driven demand for measuring, testing, and controlling instruments, particularly as devices such as diagnostic imaging and monitors, implantable devices, and IoT healthcare devices become more widespread and as production of medicines and medical equipment rises following COVID-19.[13] The manufacturing of electronic devices like telecommunications equipment, IoT devices, and semiconductors also drove demand for

[10] Statistics Netherlands, "Medical Imports 8 Percent up in Q1 2020," May 2, 2020; Export.gov, "Netherlands - Healthcare Products and Services," August 16, 2019; USITA, "Country Commercial Guides - Mexico - Healthcare Products & Services," September 23, 2022.
[11] USITC DataWeb/Census, digest EL025, accessed February 9, 2023.
[12] USITC DataWeb/Census HTS heading 9032, accessed February 9, 2023. HTS heading 9032 covers automatic regulating or controlling instruments and apparatuses; parts and accessories thereof. Note that HTS 4-digit headings are used in this section as a result of reclassification of HTS codes between 2021 and 2022.
[13] These devices must undergo rigorous testing to meet regulatory and performance standards, further driving growth in this digest. Source: MarketsandMarkets, "Test and Measurement Equipment Market Size, Share, Industry Trends, Companies, Growth Analysis 2026," April 2021.

products in this digest, because such electronic devices must meet rigorous performance standards.[14] The leading destination markets for U.S. exports of measuring, testing, and controlling instruments were Mexico, which increased $330 million (17.0 percent) and Canada, which increased $301 million (13.1 percent).

U.S. exports of computers, peripherals, and parts grew by $739 million (4.3 percent) to $18.1 billion in 2022.[15] Growth in this digest was driven by data processing units (DPUs). A DPU is a processor capable of large-scale data processing tasks and is increasingly used in data centers[16] for a variety of tasks, including data transfer, compression, encryption, security, reduction, and analytics.[17] Because of their ability to improve the performance and efficiency of data centers, demand for DPUs has grown in step with the growing adoption of services hosted in data centers, including cloud computing, artificial intelligence (AI), 5G telecommunications services, edge computing, and the IoT.[18] The five largest export increases among HTS 8-digit subheadings within this digest were all DPUs and accounted for a combined $1.1 billion increase in 2022.[19]

In 2022, U.S. exports of computers, peripherals, and parts grew by the largest amount to the Netherlands (up $266 million or 27.9 percent) and to Singapore (up $238.7 million or 41.8 percent).[20] Both countries serve as regional data center hubs: Amsterdam is the largest data center market in Europe, Middle East, and Africa, and Singapore is the third-largest data center market in the world.[21]

In 2022, U.S. exports of circuit apparatuses not exceeding 1,000 volts increased by $690 million (up 10.4 percent) to $7.3 billion.[22] Within this digest, the largest increase in exports was for electrical apparatuses for switching, protecting, or connecting circuits not exceeding 1,000 volts (up $461 million or 18.9 percent).[23] These products are used in industrial, commercial, and residential equipment and are important inputs in a range of growing industries, including automobile manufacturing, IoT devices, and

[14] MarketsandMarkets, "Test and Measurement Equipment Market Size, Share, Industry Trends, Companies, Growth Analysis 2026," April 2021.
[15] USITC DataWeb/Census, digest EL017, accessed February 9, 2023.
[16] A data center is a facility—typically a building or a group of buildings—that houses computer and networking equipment. USITC, *Recent Trends in U.S. Services Trade: 2022 Annual Report*, May 9, 2022.
[17] Ann, "Data Processing Units: What are DPUs and Why Do You Want Them?," May 1, 2023.
[18] Ann, "Data Processing Units: What are DPUs and Why Do You Want Them?," May 1, 2023.
[19] USITC DataWeb/Census, HTS subheadings 8471.50.01, 8471.70.50, 8471.70.90, 8471.49.00, and 8471.70.60, accessed February 9, 2023.
[20] U.S. exports of products covered under HTS subheading 8471.50 constitute the largest share of the increase of computers, peripherals, and parts exports to the Netherlands. U.S. exports of products covered under HTS subheading 8471.70 constitute the largest share of the increase of computers, peripherals, and parts exports to Singapore. Source: USITC DataWeb/Census, HTS subheading 8471.50, accessed April 25, 2023.
[21] Mordor Intelligence, "Netherlands Data Center Market Size & Share Analysis," accessed April 25, 2023; Cushman & Wakefield, *Global Data Center Market Comparison*, 2023.
[22] USITC DataWeb/Census, digest EL011, accessed February 9, 2023.
[23] USITC DataWeb/Census, HTS subheading 8536.90, accessed April 25, 2023. HTS subheading 8536.90 covers electrical apparatuses for switching, protecting, or making connections to or in electrical circuits, for a voltage not exceeding 1,000 V, n.e.s.o.i.. The HTS 6-digit subheading is used because of HTS reclassifications between 2021 and 2022.

energy infrastructure development projects.[24] Exports within this digest grew by the largest amount to Mexico, rising $470 million (21.9 percent) to $2.6 billion.

One digest that experienced a decline in exports in 2022 was semiconductors, which fell by 10.9 percent ($3.5 billion) to $29.1 billion.[25] In particular, U.S. exports to China fell by 31.4 percent ($3.3 billion), accounting for nearly all the decline in U.S. exports in this digest.[26] Overall, the decline in U.S. exports of semiconductors to China stems from cooling global demand for consumer electronics, which, in turn, resulted in fewer purchases by manufacturers of such products in China.[27] [28] U.S. exports of semiconductors may also have been at least partially affected by a new U.S. Department of Commerce rule—implemented in October 2022—that imposes export controls on China related to certain advanced computing semiconductor chips. The new rule also imposed new controls on certain semiconductor manufacturing items and on transactions for certain integrated circuit end uses, like supercomputers.[29]

U.S. General Imports

U.S. imports of telecommunications equipment rose by $15.6 billion (up 14.0 percent) to $126.7 billion in 2022 (table EL.2).[30] Within this digest, imports of machines for the reception, conversion, and transmission of data grew by the largest amount, rising $8.4 billion (19.8 percent) to $50.6 billion.[31] Rising imports in this digest likely stem from the increase in demand for 5G networking equipment by U.S. telecommunications carriers as they continue to expand their 5G networks across the United States.[32]

[24] MarketsandMarkets, "Circuit Protection Market Size, Growth, Trend and Forecast to 2022," January 2017; ResearchandMarkets, "Global Circuit Protection Market 2022 to 2030," October 21, 2022; Markets and Markets, "Circuit Protection Market Size, Growth, Trend and Forecast to 2022," January 2017.
[25] USITC DataWeb/Census, digest EL015, accessed February 9, 2023.
[26] USITC DataWeb/Census, digest EL015, accessed February 9, 2023.
[27] Consumer electronics, including computers and communication devices, accounted for nearly 76 percent of semiconductor demand by end use in 2020. SIA, *2021 State of the U.S. Semiconductor Industry*, September 2021, 12.
[28] SIA, "Global Semiconductor Sales Increase 3.3% in 2022 Despite Second-Half Slowdown," February 3, 2023; Casanova, "Chip Sales Rise in 2022, Especially to Auto, Industrial, Consumer Markets," March 27, 2023; Growth from Knowledge, "Challenging Times for the Global Consumer Electronics Market," August 30, 2022; Kaur, "China Chip Sales Continues Its Steep Declines," January 13, 2023.
[29] USDOC, BIS, "Commerce Implements New Export Controls on Advanced Computing and Semiconductor Manufacturing Items to the People's Republic of China," news release, October 7, 2022.
[30] USITC DataWeb/Census, digest EL002, accessed February 9, 2023.
[31] USITC DataWeb/Census, HTS subheading 8517.62.00, accessed February 9, 2023. This includes certain routers and modems.
[32] Fisher, "Where is 5G Available in the US?," May 2, 2023; Finley, Pearlstein, Hill, "The WIRED Guide to 5G," December 31, 2022.

Imports of smartphones grew by the second-largest amount in 2022, rising $4.4 billion (7.3 percent) to $62.6 billion.[33] Increased imports of smartphones in 2022 is likely due to an ongoing rebound in 2021 following the end of the COVID-19 public health emergency, which dampened consumer spending and caused supply chain disruptions in 2020.[34] Despite increasing imports, U.S. smartphone sales stagnated in 2022 because of inflation, general concerns about the U.S. economy, and market saturation, leading to a buildup in smartphone inventories.[35]

Table EL.2 Leading changes in U.S. general imports, 2018–22
In millions of dollars and percentages

Product group (digest)	2018 (million $)	2019 (million $)	2020 (million $)	2021 (million $)	2022 (million $)	Absolute change, 2021–22 (million $)	Percentage change 2021–22 (%)
Computers, peripherals, and parts	137,650	126,131	141,254	163,329	174,168	10,839	6.6
Telecommunications equipment	111,883	101,559	94,724	111,228	126,748	15,520	14.0
Medical goods	47,128	50,818	48,456	56,922	62,976	6,053	10.6
Semiconductors and integrated circuits	43,527	43,669	44,700	54,405	61,130	6,726	12.4
Consumer electronics	42,831	42,814	42,362	52,085	52,620	535	1.0
Measuring, testing, and controlling instruments	28,594	28,403	26,082	29,327	31,854	2,527	8.6
Miscellaneous electrical equipment	11,994	10,908	10,003	13,311	18,751	5,440	0.9
Blank and prerecorded media	11,316	10,935	14,516	16,176	17,442	1,266	7.8
Circuit apparatus assemblies	12,278	12,941	12,146	13,873	16,040	2,167	15.6
Optical goods, including ophthalmic goods	12,521	12,302	10,906	14,114	14,919	806	5.7
All other sources	45,073	42,951	37,513	46,683	53,223	6,540	14.0
Total	504,795	483,429	482,662	571,453	629,871	58,417	10.2

Source: USITC DataWeb/Census, accessed February 16, 2023.
Notes: Import values are based on U.S. customs value. Calculations are based on unrounded data.

The largest source countries for U.S. telecommunications equipment imports were Vietnam (up 39.8 percent to $24.3 billion) and China (up 4.8 percent to $63.6 billion).[36] In recent years, Vietnam has emerged as a manufacturing and assembly location for telecommunications equipment, mainly smartphones. Samsung, which achieved a 30 percent share of the U.S. smartphone market in 2022,

[33] USITC DataWeb/Census, HTS subheading 8517.13.00, accessed February 9, 2023. HTS subheading 8517.13.00 covers smartphones for cellular networks or for other wireless of networks. This subheading includes reclassified goods from HTS subheading 8517.12.00, which covered telephones for cellular networks or for other wireless networks until the end of 2021. Goods formerly covered under HTS subheading 8517.12.00 can be reclassified under HTS subheading 8517.13.00 or HTS subheading 8517.14.00, which cover smartphones and cellular telephones other than smartphones, respectively. Because of reclassification, these data should be interpreted as an approximation.
[34] Ghosh, "Global Smartphone Sales Declined 12.5% in 2020," February 2021; IndexBox, "American Mobile Phone Imports Accelerate," November 2021.
[35] Warren, "Smartphone Sales are So Bad Even the Holidays Couldn't Help, January 26, 2023.
[36] USITC DataWeb/Census, digest EL002, accessed February 9, 2022.

manufactures most of its smartphones in—and exports from—Vietnam.[37] Despite Vietnam's growth as a smartphone exporter, more than 57 percent of smartphones sold in the United States were manufactured in China in 2022.[38]

U.S. imports of computers, peripherals, and parts rose by $10.8 billion (6.6 percent) to $174.2 billion in 2022.[39] Within this digest, DPUs accounted for the largest increase in imports, increasing by $9.9 billion (30.5 percent) to $42.5 billion.[40] As discussed in the export section above, as a result of their ability to improve the performance and efficiency of data centers, demand for DPUs has grown in step with the growing adoption of services hosted in data centers, including cloud computing, AI, 5G telecommunications services, edge computing, and IoT devices.[41] Imports in this digest grew by the largest amount from Mexico (up $8.4 billion or 33.2 percent). Imports of DPUs account for most of this increase.[42] DPUs are produced in Mexico in a number of locations, including Chihuahua, Nuevo León, Jalisco, Mexico City, and Tamaulipas.[43]

U.S. imports of semiconductors increased by $6.7 billion (12.4 percent) to $61.1 billion in 2022.[44] Within this digest, imports of electronic integrated circuits (excluding processors, controllers, memories, and amplifiers) grew by the largest amount, rising $4.6 billion (44.2 percent) to $15.0 billion.[45] Import growth in this digest is derived from demand in the manufacturing sector, particularly the automotive sector, with such demand surging in 2021 and 2022 following pandemic-induced shortages.[46] U.S. imports of semiconductors increased by the largest amount from its two leading suppliers, Taiwan (up 48.8 percent to $8.9 billion) and Thailand (up 42.1 percent to $3.9 billion).[47] Although Taiwan is the leading manufacturer of high-end semiconductor chips, it is also a significant producer of so-called legacy

[37] Oberlo, "U.S. Smartphone Market Share," April 2023; Birney, "Where are Samsung Phones Designed and Made?," May 5, 2023.
[38] Thorbecke, "Apple Made China the Backbone of its iPhone Assembly," December 12, 2022; Oberlo, "U.S. Smartphone Market Share," April 2023.
[39] USITC DataWeb/Census, digest EL017, accessed February 9, 2023. This digest covers finished computers (*e.g.*, laptop computers and desktop computers), computer peripherals (*e.g.,* automatic data processors, printers, and keyboards), and some computer parts (*e.g.*, printed circuit assemblies).
[40] USITC DataWeb/Census, HTS Subheading 8471.50.01, accessed February 9, 2023. HTS Subheading 8471.50.01 covers processing units other than those of subheading 8471.41 and 8471.49, n.e.s.o.i. Data processing units refer to servers that complete network, storage, and data management functions for central processing units (CPUs). This frees the CPU server to execute different functions, such as running the computer's operating system. DPUs are used with CPUs to process large data workloads for data center servers. Source: Kerravala, "Understanding the Power Benefits of Data Processing Units," November 8, 2022.
[41] Ann, "Data Processing Units: What are DPUs and Why Do You Want Them?," May 1, 2023.
[42] USITC DataWeb/Census, HTS subheading 8471.50.01, accessed April 25, 2023. HTS Subheading 8471.50.01 covers processing units other than those of subheadings 8471.41 and 8471.49, n.e.s.o.i.
[43] Mexico Cross Border Freight, "Electronics Manufacturing In Mexico," August 15, 2019; Data México, "Computer and Electronic Product Manufacturing," accessed April 26, 2023.
[44] USITC DataWeb/Census, digest EL015, accessed February 9, 2023.
[45] USITC DataWeb/Census, HTS subheading 8542.39.00, accessed February 9, 2023. HTS subheading 8542.39.00 covers other electronic integrated circuits.
[46] Collier, "Is the Chip Shortage Over?," November 23, 2022; Shivakumar, Wessner, and Howell, "The Strategic Importance of Legacy Chips," March 3, 2023; Casanova, "Chip Sales Rise in 2022, Especially to Auto, Industrial, Consumer Markets," March 27, 2023.
[47] USITC DataWeb/Census, digest EL015, accessed February 9, 2023.

chips.[48] Thailand is the 10th-largest exporter of semiconductor devices, with the United States as its largest market.[49]

U.S. imports of medical goods rose by $6.1 billion (10.6 percent) to $63 billion in 2022.[50] The largest increases were in surgical instruments and appliances, up $967 million (11.5 percent) to $9.4 billion; artificial body parts other than joints, up $803 million (22.8 percent) to $4.3 billion; and surgical devices like catheters, up $621 million (9.4 percent) to $7.2 billion.[51] Mirroring the trend in U.S. exports, imports of medical goods increased as a result of a rise in elective surgeries postponed or cancelled during the COVID-19 pandemic, advancements in early diagnostics and treatment boosting diagnostic and surgical procedures, and an aging population.[52] Imports of medical goods from Mexico (up $1.2 billion or 10.6 percent) and Ireland (up $1.1 billion or 15.4 percent) grew the largest amount.

[48] Kleinhans et al., "Running on Ice," April 4, 2023.
[49] Statista, "Semiconductors - Thailand," December 2022; The Observatory of Economic Complexity, "Semiconductor Devices in Thailand," 2021.
[50] USITC DataWeb/Census, digest EL022, accessed February 9, 2023.
[51] USITC DataWeb/Census, HTS subheading 9018.90.80, accessed February 9, 2023; USITC DataWeb/Census, HTS subheading 9021.39.00, accessed February 9, 2023; USITC DataWeb/Census, HTS subheading 9018.39.00, accessed February 9, 2023.
[52] USITC, "Electronic Products," *Shifts in U.S. Merchandise Trade, 2021*, June 2022; Fortune Business Insights, "Medical Devices Market Size, Share & Growth," June 2022; *OR Today Magazine*, "Surgical Equipment Market Rebounds from COVID-19," March 31, 2023.

Machinery

Changes in 2022 from 2021:

- **U.S. total exports of machinery products increased by $15.7 billion (10.6 percent) to $163.5 billion**
  - **U.S. domestic exports of machinery products increased by $11.3 billion (9.2 percent) to $134.6 billion**
  - **U.S. re-exports of machinery products increased by $4.4 billion (17.8 percent) to $28.9 billion**
- **U.S. general imports of machinery products increased by $33.1 billion (13.3 percent) to $280.9 billion**

The value of U.S. domestic exports of machinery products[53] rose by $11.3 billion (9.2 percent) to $134.6 billion in 2022 (table MT.1), after increasing by 15.4 percent in 2021.[54] Nearly every digest within this sector experienced export growth, with the largest increases occurring in farm and garden machinery and equipment (up $2.5 billion or 25.3 percent); centrifuges and filtering and purifying equipment (up $1.3 billion or 15.2 percent); nonautomotive insulated electrical wire and related products (up $982 million or 17.6 percent); taps, cocks, valves, and similar devices (up $941 million or 10.1 percent); and household appliances, including commercial applications (up $821 million or 11.6 percent). Machinery exports to Canada increased by $3.1 billion (13.2 percent) to $26.1 billion, and U.S. exports to Mexico grew by $3.0 billion (18.0 percent) to $19.7 billion. By contrast, U.S. machinery exports to China exhibited the largest decline, falling by $1.7 billion (12.5 percent) to $12.2 billion and exports to South Korea declined by $915 million (9.6 percent) to $8.6 billion.[55]

The value of U.S. general imports of machinery products grew by $33.1 billion (13.3 percent) during the same period to $280.9 billion (table MT.2). The majority of sector digests experienced import growth, with the largest increases occurring in mineral processing machinery (up $4.7 billion or 314.4 percent); air-conditioning equipment and parts (up $4.1 billion or 16.7 percent); electrical transformers, static

[53] The Machinery Products sector consists of 31 product digests. Each USITC sector digest encompasses various 8-digit subheadings in the Harmonized Tariff Schedule of the United States (HTS). For a complete list of HTS subheadings classified in a particular sector or digest, see this data table.

[54] Unless otherwise noted, the export data used in this section are for domestic exports. For more information on trade terminology, please refer to Lundquist,, "Special Topic: Trade Metrics," June 2015. USITC DataWeb/Census, digests MT001-031, accessed December 21, 2022.

[55] The decrease in machinery exports to China and South Korea is almost entirely due to declining exports of semiconductor manufacturing equipment (SME) and robotics. Although overall U.S. exports of SME and robotics experienced relatively modest growth in 2022, up $561 million, exports to China declined by $1.4 billion and exports to South Korea by $949 million. Factors contributing to the decline in SME exports to these countries include falling demand for certain semiconductor-containing products such as consumer electronics, reduced Chinese manufacturing activities from COVID-19 outbreaks and strict lockdown policies, and the imposition of new controls on semiconductor and SME exports to China by the Department of Commerce's Bureau of Industry and Security. For more information see: Ho, "Demand for Electronics Is Falling," October 7, 2022; Mearian, "PC Sales Fall off a Cliff," October 11, 2022; Kim, "Korea Exports Post Double-Digit Drop," November 30, 2022; NPR, "Chinese Manufacturing Weakens Amid COVID-19 Outbreak," December 31, 2022; USDOC, BIS, "Commerce Implements New Export Controls," October 7, 2022.

converters, and inductors (up $4.0 billion or 24.8 percent); farm and garden machinery and equipment (up $4.0 billion or 31.5 percent); and miscellaneous machinery (up $2.8 billion or 15.0 percent). Machinery imports grew by the largest amount from Mexico, up $7.2 billion (17.5 percent) to $48.2 billion, and Japan, up $3.0 billion (14.5 percent) to $23.9 billion.

The growth in both U.S. machinery exports and imports were driven by similar factors. First, the manufacturing sector saw strong demand for machinery—at both the domestic and global levels—as economies around the world recovered from the pandemic-induced downturn of 2020 and 2021. Second, farmers around the world increased purchases of farm and garden machinery in response to high agricultural prices. Last, higher global commodity prices increased the cost of machinery inputs, which were passed on to retail consumers in the form of higher prices for machinery.

U.S. Domestic Exports

U.S. exports of farm and garden machinery and equipment increased by $2.5 billion (25.3 percent) to $12.3 billion in 2022 (table MT.1). The largest increase in exports within this digest occurred in harvesting and threshing machinery[56] (up $341 million or 306.1 percent) and combine harvester-threshers[57] (up $320 million or 37.8 percent). Demand for these products was likely driven by farmers' purchases of machinery in response to the rise in global agricultural commodity prices, which were caused by strong post-pandemic demand from China as well as production and shipping disruptions resulting from Russia's invasion of Ukraine.[58] World wheat prices, for reference, rose 36.0 percent in 2022, and corn prices increased by 22.8 percent.[59] Exports of U.S. farm and garden machinery equipment grew by the largest amount to Canada (up $794 million or 26.3 percent), Australia (up $421 million or 41.8 percent), and Mexico (up by $407 million or 25.0 percent). In 2022, Canada and Australia were among the 10-largest wheat-producing countries in the world and Canada and Mexico were among the 10-largest corn producing countries.[60]

[56] HTS 8433.59.00.
[57] HTS 8433.51.00.
[58] Ukraine was the seventh-largest wheat producer in the world in 2021 and dropped to ninth in 2022. USDA, FAS, "Wheat Explorer 2021," April 2023; USDA, FAS, "Wheat Explorer 2022," February 23, 2023; Sundaram, *Food, Beverages & Tobacco: November 2022*, November 2022, 4. For more information on trends in agriculture, please see the Agricultural Products section.
[59] Prices are in nominal terms. Source refers to corn as "Maize." Two types of wheat are listed: soft red winter wheat (SRW) and hard red winter wheat (HRW). HRW is used predominantly for making bread flour; SRW is used in cakes, cookies, and crackers. SRW prices increased 35.6 percent from 2021 to 2022; HRW increased 36.4 percent. World Bank, "Commodity Markets: Annual Prices," April 4, 2023; USDA, ERS, "Wheat Sector at a Glance," October 26, 2022.
[60] USDA, FAS, "Wheat Explorer 2022," February 23, 2023; USDA, FAS, "Corn Explorer 2022," February 23, 2023.

Table MT.1: Leading changes in U.S. domestic exports, by product group, 2018–22
In millions of dollars and percentages.

Product group (digest)	2018 (million $)	2019 (million $)	2020 (million $)	2021 (million $)	2022 (million $)	Absolute change, 2021–22 (million $)	Percentage change 2021–22 (%)
Semiconductor manufacturing equipment and robotics	22,656	19,697	23,045	29,701	30,262	561	1.9
Farm and garden machinery and equipment	10,226	9,527	7,960	9,853	12,346	2,493	25.3
Taps, cocks, valves, and similar devices	10,250	9,955	8,768	9,344	10,285	941	10.1
Centrifuges and filtering and purifying equipment	8,052	8,130	7,667	8,740	10,072	1,332	15.2
Household appliances, including commercial applications	7,717	7,549	6,424	7,068	7,889	821	11.6
Air-conditioning equipment and parts	7,974	7,581	6,681	6,966	7,745	779	11.2
Nonautomotive insulated electrical wire and related products	5,478	5,380	4,738	5,577	6,559	982	17.6
Pumps for liquids	6,052	5,891	5,009	5,368	5,997	629	11.7
Industrial thermal-processing equipment and furnaces	3,808	3,984	3,449	3,561	4,061	501	14.1
Electrical transformers, static converters, and inductors	3,414	3,276	3,031	3,221	3,712	491	15.2
All other product groups	35,259	34,921	30,023	33,865	35,684	1,819	5.4
Total	120,885	115,890	106,796	123,265	134,612	11,347	9.2

Source: USITC DataWeb/Census, accessed February 16, 2023.
Notes: Export values are based on free along ship value, U.S. port of export. Calculations are based on unrounded data.

U.S. exports of centrifuges and filtering and purifying equipment grew by $1.3 billion (15.2 percent) to $10.1 billion in 2022. Exports of products in this digest are used in wastewater management and other industries associated with environmental services and benefited from increased demand from the residential and commercial construction industry, especially in developing countries.[61] Exports in this digest were also driven by the construction of wastewater treatment facilities in several countries.[62] Exports of centrifuges and filtering and purifying equipment to Mexico experienced the largest growth in 2022, rising by $428 million (32.9 percent) to $1.7 billion. Exports of this equipment are likely attributable to the ongoing construction of four large municipal water infrastructure projects in Mexico, two of which began in 2022.[63] The second-largest increase in exports of equipment in this digest occurred to China, which grew by $171 million (17.7 percent) to $1.1 billion. The construction of water infrastructure projects in China—following several years of heatwaves and droughts—is likely a factor driving U.S. exports in this digest, particularly water storage facilities.[64]

[61] GlobeNewswire, "Centrifugal Pump Market Economy Size Expected a Growth of USD 49.7," September 9, 2022.
[62] MarketWatch, "Global Centrifugal Pump Market To Grow At A CAGR Of 5.8% By 2027," December 27, 2022.
[63] Mares, "Four Water Projects To Be Delivered in 2023," August 25, 2022.
[64] Stanway, "After Long Drought, China Plots Ambitious Water Infrastructure Push," September 1, 2022.

U.S. exports of nonautomotive insulated electrical wire and related products grew by $982 million (17.6 percent) to $6.6 billion in 2022. An important factor driving exports of products in this digest—which are widely used in construction projects—was the end of pandemic-era restrictions and associated construction delays,[65] which in turn led to the resumption of construction activity. In addition, unit values for such products also rose as higher prices for steel and aluminum—important inputs in electrical wire—were passed on to customers.[66] Exports of nonautomotive electrical wire grew by the largest amount to Mexico, up $454 million (23.7 percent), and Canada, up $271 million (22.8 percent).

U.S. exports of taps, cocks, valves, and similar devices increased by $941 million (10.1 percent) in 2022 to $10.3 billion. Demand created by the resumption of both commercial and residential construction as well as water infrastructure projects in the aftermath of the pandemic likely stimulated exports in this category.[67] Surging oil and gas prices in 2022 may also have played a role as strong demand for specialized valves in the oil and gas extraction industry likely provided an impetus to U.S. exports.[68] Additionally, higher prices for steel, aluminum, and copper—important raw material inputs—resulted in higher units cost for many of the products in this digest, causing the value of exports to increase.[69] In 2022, the largest increases in exports of taps, cocks, valves, and similar devices were to Canada (up $254 million or 14.1 percent) and Mexico (up by $218 million or 15.0 percent).

U.S. exports of household appliances, including those for commercial applications, increased by $821 million (11.6 percent) to $7.9 billion in 2022. The primary driver of U.S. exports of appliances is the recovery of the global construction industry downturn caused by COVID-19 pandemic, largely because appliances are considered necessary equipment for new residential (and many commercial) construction projects. The ongoing replacement of older appliances with newer energy-efficient appliances is also an important driver of U.S. exports in this digest.[70] Exports of refrigerating or freezing equipment increased by the largest amount, up $171 million (14.4 percent) to $1.4 billion. Exports of household appliances increased by the largest amount in Mexico (up $341 million or 34.1 percent) and Canada (up $146 million or 6.3 percent).

[65] Lee, *Wire & Cable Manufacturing in the US*, July 2022.
[66] Lee, *Wire & Cable Manufacturing in the US*, July 2022, 10; Report Linker, "Wires And Cables Global Market Report 2022," March 25, 2022. For more information on trends in steel and aluminum, please see the Minerals and Metals section.
[67] Business Wire, "Global Industrial Valves Market 2021–2030," October 24, 2022.
[68] Petridis, *Valve Manufacturing in the US*, August 2022.
[69] Wolfe, *Building Products: July 2022*, July 2022. For more information, see the Minerals and Metals sections of this report.
[70] PR Newswire, "Home Appliance Market Will Reach USD 282150 Million By 2028," July 13, 2022.

U.S. General Imports[71]

U.S. imports of air-conditioning equipment and parts increased by $4.1 billion (16.7 percent) in 2022 to $28.4 billion (table MT.2). The primary driver of U.S. imports in this digest is the ongoing recovery of the construction industry following the end of the COVID-19 pandemic because such equipment is considered essential for new construction projects in both the residential and non-residential segments.[72] Additionally, the increasing incidence of heat waves and extended summers, as well as growing demand for energy-efficient HVAC systems and devices, such as smart thermostats, likely fueled demand for these products, which in turn led to increased U.S. imports of air-conditioning equipment.[73] Imports from Mexico increased by the largest amount in 2022, up $1.7 billion (23.2 percent), followed by Thailand, up $579 million (41.1 percent).

[71] Mineral processing machinery (MT008) exhibited the largest import increase of any digest: $4.2 billion of its $4.7 increase can be attributed to HTS 8479.89.9599 "other machines and mechanical appliances having individual functions, not specified or included elsewhere in chapter 84," which contained no imports in prior years. This is because, in 2022, HTS 8479.89.9499 was renumbered to 8479.89.9599 and its scope was modified. HTS 8479.89.9499 was previously included in MT019 semiconductor manufacturing equipment and robotics. The compositions of both MT008 and MT019 changed from 2021 to 2022 and are not directly comparable across the two years. Therefore, detailed explanations of the shift in mineral processing machinery imports and semiconductor manufacturing equipment and robotics are excluded from the body of this paper.

[72] In 2022, the residential construction sector grew by 5 percent and non-residential construction grew by 12 percent. Nasseff, *Building Products*, January 2023, 5.

[73] Cielo, "HVAC Industry Trends to Watch Out for in 2023," January 5, 2023.

Table MT.2: Leading changes in U.S. general imports, 2018–22
In millions of dollars and percentages.

Product group (digest)	2018 (million $)	2019 (million $)	2020 (million $)	2021 (million $)	2022 (million $)	Absolute change, 2021–22 (million $)	Percentage change 2021–22 (%)
Mineral processing machinery	1,428	1,400	1,259	1,494	6,194	4,699	314.4
Air-conditioning equipment and parts	20,620	20,554	19,501	24,322	28,377	4,055	16.7
Electrical transformers, static converters, and inductors	12,469	12,613	13,548	16,089	20,087	3,997	24.8
Farm and garden machinery and equipment	9,201	9,461	9,350	12,675	16,664	3,989	31.5
Miscellaneous machinery	15,897	15,552	15,514	18,718	21,518	2,800	15.0
Electric motors, generators, and related equipment	15,556	15,127	14,750	17,347	20,063	2,717	15.7
Taps, cocks, valves, and similar devices	16,144	15,045	12,751	15,101	17,473	2,372	15.7
Nonautomotive insulated electrical wire and related products	9,669	9,087	9,082	11,611	13,879	2,269	19.5
Household appliances, including commercial applications	29,465	29,086	31,298	39,201	40,467	1,266	3.2
Pumps for liquids	8,578	8,286	7,158	8,391	9,646	1,255	15.0
All other product groups	74,677	75,772	69,959	82,841	86,483	3,642	4.4
Total	213,704	211,982	204,170	247,791	280,851	33,060	13.3

Source: USITC DataWeb/Census, accessed February 16, 2023.
Notes: Import values are based on U.S. customs value. Calculations are based on unrounded data.

U.S. imports of electrical transformers, static converters, and inductors increased by $4.0 billion (24.8 percent) to $20.1 billion in 2022. A broad rise in industrial and nonresidential construction in the aftermath of the pandemic led to increased imports for products in this category, because such equipment is considered essential for many nonresidential applications. Rising aluminum prices, a key input of many products in this sector, also led to increasing unit values.[74] Imports from Mexico increased by the largest amount in 2022, up $1.3 billion (41.7 percent), and imports from Thailand grew by $417 million (57.7 percent).

U.S. imports of farm and garden machinery and equipment grew by $4.0 billion (31.5 percent) to $16.7 billion in 2022. The primary driver of import growth in this digest is likely purchases of new farm equipment by U.S. farmers in response to high prices for many agricultural commodities. In 2022, the already high prices of some agricultural commodities surged in response to supply disruptions stemming from Russia's invasion of Ukraine and India's ban on wheat exports. Higher agricultural commodity prices are beneficial to the farming machinery industry because they increase farmers' profits, providing

[74] Brocker, *Electrical Equipment Manufacturing in the US*, July 2022, 11, 29.

additional funds for equipment upgrades.[75] Also, a lack of available agricultural laborers increased demand for farming machinery[76] U.S. imports of farm and garden machinery grew by the largest amount from Germany (up $676 million or 29.8 percent), Canada (up $532 million or 31.8 percent), and Mexico (up $393 million or 41.2 percent).

In 2022, U.S. imports of miscellaneous machinery increased by $2.8 billion (15.0 percent) to $21.5 billion. Imports of machinery for lifting, handling, loading, or unloading[77] grew by the largest amount, rising by $663 million because of strong demand in the public storage and warehousing industry. Demand in this sector stems from growing e-commerce sales, because many online retailers require third-party warehousing services.[78] Imports of miscellaneous machinery from Canada grew by the largest amount in 2022, up $644 million (28.0 percent) to $2.9 billion.

[75] Villaruel, *Tractors & Agricultural Machinery Manufacturing in the US*, January 2023, 9–11.
[76] Research and Markets, "United States Agricultural Equipment Industry," April 14, 2023.
[77] Before January 1, 2022, data for products in this HTS 8-digit code were reported under HTS 8 8428.90.02.
[78] Perdomo, *Public Storage & Warehousing in the US*, October 2022.

Transportation Equipment Products

Changes in 2022 from 2021:

- **U.S. total exports of transportation equipment products increased by $33.8 billion (12.4 percent) to $307.2 billion**
    - **U.S. domestic exports of transportation equipment products increased by $27.9 billion (11.5 percent) to $270.3 billion**
    - **U.S. re-exports of transportation equipment products increased by $6 billion (19.3 percent) to $36.9 billion**
- **U.S. general imports of transportation equipment products increased by $72.4 billion (17.0 percent) to $499.0 billion**

The value of U.S. domestic exports of transportation equipment products[79] rose by $27.9 billion (11.5 percent) to $270.3 billion in 2022 (table TE.1), after growing by 11.5 percent in 2021.[80] This increase was driven mostly by increases in U.S. domestic exports of aircraft, spacecraft, and related equipment; motor vehicles; certain motor vehicle parts; internal combustion engines; and trailers, semitrailers, and parts. U.S. domestic exports of all digests covered under transportation equipment increased from 2021 to 2022 except for powersport vehicles which slightly declined from $2.5 billion in 2021 to $2.4 billion in 2022. Canada (up $10.3 billion or 16.9 percent) saw the largest increase in U.S. exports in 2022, followed by Mexico (up $5.8 billion or 17.4 percent) and United Arab Emirates (up $2 billion or 44.2 percent).

The value of U.S. general imports of transportation equipment products grew by $72.4 billion (17.0 percent) to $499.0 billion during the same period, after growing by 12.0 percent in 2021 (table TE.2). The transportation digests that contributed most to the rise in U.S. imports in 2022 were motor vehicles, certain motor vehicle parts, primary cells and batteries and electric storage batteries, construction and mining equipment, and aircraft engines and gas turbines. As with exports, U.S. general imports of all digests covered under transportation equipment increased in 2022. Mexico (up $21.8 billion or 17.2 percent) remained the top U.S. supplier of general import value in 2022, accounting for $148.6 billion in imports. China (up $10.1 billion or 33.4 percent) and Canada (up $8.3 billion or 15.5 percent) were the sources of the next two largest increases in import value in 2022.

In general, the changes in imports and exports of transportation equipment were driven by higher prices for both inputs and finished products, the recovery from the COVID-19 pandemic, and increased demand for certain goods. Prices of automobiles are at an all-time high as a result of manufacturers' inability to meet demand and supply chain issues continuing from the pandemic. With the automobile manufacturing supply chain recovering in certain countries from the employment and sourcing restrictions related to the pandemic, manufacturers increased production, which fueled the demand for

[79] The Transportation Equipment Products sector consists of 15 product digests. Each USITC sector digest encompasses various 8-digit subheadings in the Harmonized Tariff Schedule of the United States (HTS). For a complete list of HTS subheadings classified in a particular sector or digest, see this data table).
[80] Unless otherwise noted, the export data used in this section are for domestic exports. For more information on trade terminology, please refer to Lundquist, "Special Topic: Trade Metrics," June 2015.

vehicle parts. Rising demand for clean-energy equipment caused the rise in imports of lithium batteries as well as of construction equipment to extract necessary raw materials.

U.S. Domestic Exports

U.S. domestic exports of aircraft, spacecraft, and related equipment increased by $11.3 billion (14.8 percent) to $87 billion in 2022 (table TE.1).[81] This increase in exports—stemming largely from an increase in the number of Boeing aircraft deliveries—continues a trend established in 2021. In 2022, Boeing delivered 480 aircraft to foreign customers, up 140 deliveries (40 percent) compared to the previous year.[82] In total, Boeing delivered 737 MAXs (374), 747s (5), 767s (33), and 787 Dreamliners (31).[83] In particular, the resumption of 787 Dreamliner deliveries, which had been suspended in late 2020, boosted U.S. exports in 2022.[84] The majority of these deliveries were from built-up aircraft inventory from the global 737 MAX grounding from March 2019 to December 2020 and the 787 Dreamliner production-quality crisis that halted deliveries from October 2020 through July 2022.[85] The top three export destinations for aircraft, spacecraft, and related equipment in 2022 were the United Kingdom with $6.6 billion in domestic exports (up $1.8 billion or 37.8 percent), France at $7.5 billion (up $1.4 billion or 23.2 percent), and Canada at $7 billion (up $1.4 billion or 24.5 percent)

[81] USITC DataWeb/Census, digest TE013, accessed January 11, 2023.
[82] Gates, "Year-end Surge Boosts Boeing, but Airbus Still No. 1 in 2022," January 10, 2023.
[83] Boeing, "Boeing Reports Commercial Orders and Deliveries for 2022," January 10, 2023.
[84] Chokshi, "Boeing Gets F.A.A Go-Ahead for Plan to Resume Deliveries of 787 Dreamliner," July 30, 2022.
[85] Broderick, "Boeing Closes 2022 With Delivery Surge For 737 MAX, 787 programs," January 10, 2023.

Table TE.1: Leading changes in U.S. domestic exports, 2018–22
In millions of dollars and percentages.

Product group (digest)	2018 (million $)	2019 (million $)	2020 (million $)	2021 (million $)	2022 (million $)	Absolute change, 2021–22 (million $)	Percentage change 2021–22 (%)
Aircraft, spacecraft, and related equipment	123,985	118,258	69,587	75,735	87,007	11,271	14.9
Motor vehicles	67,238	74,314	60,648	70,704	75,285	4,582	6.5
Certain motor vehicle parts	40,802	38,236	29,586	31,729	35,468	3,739	11.8
Internal combustion piston engines, other than for aircraft	21,076	20,675	17,371	18,858	20,786	1,928	10.2
Trailers, semitrailers, and parts	3,665	3,241	2,353	3,711	4,909	1,198	32.3
Construction and mining equipment	13,735	14,241	10,683	11,878	12,984	1,106	9.3
Aircraft engines and gas turbines	8,496	8,785	7,735	8,308	9,340	1,033	12.4
Primary cells and batteries and electric storage batteries	4,570	4,678	4,137	4,180	4,918	738	17.7
Rail locomotive and rolling stock	3,132	2,859	2,453	2,398	3,113	715	29.8
Motors and engines, except internal combustion, aircraft, or electric	2,465	2,419	1,907	2,369	2,815	446	18.8
All other product groups	14,654	14,069	10,799	12,601	13,714	1,113	8.8
Total	303,818	301,775	217,258	242,472	270,339	27,868	11.5

Source: USITC DataWeb/Census, accessed February 16, 2023.
Notes: Export values are based on free alongside ship value, U.S. port of export. Calculations are based on unrounded data.

U.S. domestic exports of motor vehicles increased by $4.6 billion (6.4 percent) to $75.3 billion in 2022[86] despite global automobile sales totaling 66.1 million units in 2022, down from 66.7 million units in 2021.[87] U.S. production of motor vehicles increased by 10.2 percent in 2022, totaling 10 million units, which allowed for more units to be exported while the U.S. market contracted.[88] In addition, the value of domestic exports increased because of higher average prices.[89] New car prices increased by 4.2 percent in 2022 because of higher production costs. The average cost of a used car increased by 30 percent compared to pre-pandemic levels.[90] Canada, which accounted for more than 40 percent of export value, remained the top destination for U.S. automobile exports, growing by $3.9 billion (14.3 percent) to $31.5 billion.

U.S. domestic exports of certain motor vehicle parts increased by $3.7 billion (11.8 percent) to $35.5 billion in 2022, following increased automobile production as original equipment manufacturers (OEMs) try to answer consumer demand for automobiles. Mexico, North America's second-largest vehicle producer, manufactured 3.3 million (up 9.8 percent) light vehicles in 2022, with Canada manufacturing 1.2 million (up 10.2 percent). Both countries rely heavily on U.S. producers to provide parts for their automobile production.[91] The top two markets for U.S. exports of certain motor parts, Canada ($11.8

[86] USITC DataWeb/Census, digest TE009, accessed March 8, 2023.
[87] Clemens, "Can Tesla Build 20 Million Cars Per Year By 2030?" April 23, 2023.
[88] Opportimes, "U.S. car and truck production up 10.2% in 2022" January 24, 2023.
[89] Opportimes, "U.S. car and truck production up 10.2% in 2022" January 24, 2023.
[90] J. P. Morgan, "Inflation and the Auto Industry: When Will Car Prices Drop?," February 22, 2023.
[91] Ward's Intelligence, "North America Vehicle Production by State and Plant, 2018–2022," April 11, 2023.

billion, up $1.9 billion or 19.6 percent) and Mexico ($13.8 billion, up $1.6 billion or 12.7 percent) accounted for 72.3 percent of total U.S. export value in 2022.

U.S. domestic exports of internal combustion engines increased by $1.9 billion (10.2 percent) to $20.8 billion in 2022. As discussed in the paragraph above, increased Mexican and Canadian production of automobiles drove their demand for engines. As with certain motor vehicle parts, exports to Mexico (up $909 million or 11.9 percent) and Canada (up $459.4 million or 8.8 percent) accounted for the majority of U.S. internal combustion engine exports, making up 68.4 percent of export value in 2022.

U.S. domestic exports of trailers, semitrailers, and parts increased by $1.2 billion (32.3 percent) to $4.9 billion in 2022, up from $3.7 billion in 2021.[92] Trailers for housing or camping and semitrailers and trailers for the transport of goods made up most of the growth in this digest, accounting for $780.3 million or 68 percent of the increase in domestic exports.[93] The strong demand for recreational travel experienced during the COVID-19 pandemic held strong during the beginning of the year after setting a shipment record of 64,454 recreational vehicle (RV) units in March 2022 but has been slowly declining ever since.[94] Despite slowing sales in the fourth quarter of 2022, the Canadian RV market saw an annual gain of 11.1 percent in sales revenue as a result of pent-up demand for tourism.[95] Demand for new and used semitrailers in Canada remained strong following 2021 even as chip shortages continued to suppress supply of new semitrailers.[96] Canada ($3.5 billion, up $789 million or 29.1 percent) and Mexico ($880.3 million, up $313.7 million or 55.3 percent) accounted for 91.6 percent of all growth within this digest.

U.S. General Imports

U.S. imports of motor vehicles increased by $26.1 billion (14.4 percent) to $207.2 billion in 2022 (table TE.2). As discussed in the motor vehicles export section above, this increase was mostly driven by higher average vehicle prices. The number of automobiles sold in the U.S. market in 2022 fell by 8 percent; rising prices due to supply chain issues from the COVID-19 pandemic led American consumers to pay 20 percent more for cars than they did in 2019.[97] Imports from Mexico accounted for the largest increase in import value, growing by $10 billion (16 percent) to $73 billion in 2022. Germany (up $4.4 billion or 28.3 percent) and Canada (up $3.4 billion or 12.6 percent) were the next two largest sources of general imports of motor vehicles. These three countries together made-up 59.5 percent of the total import value of motor vehicles in 2022.

[92] USITC DataWeb/Census, digest TE012, accessed January 11, 2023.
[93] USITC DataWeb/Census, digest TE012, accessed January 11, 2023.
[94] Singhi, "The Party is Over for the Pandemic-Winning RV Industry," December 28, 2022.
[95] RV News, "RVDA of Canada Reports Decreased Sales, Revenue Gains", March 21, 2023.
[96] Cantruck, "Truck Demand Roars to Start 2022: ACT," January 21, 2022.
[97] Goodkind, "Auto sales are falling — but profits are surging," January 12, 2023.

Table TE.2: Leading changes in U.S. general imports, 2018–22
In millions of dollars and percentages.

Product group (digest)	2018 (million $)	2019 (million $)	2020 (million $)	2021 (million $)	2022 (million $)	Absolute change, 2021–22 (million $)	Percentage change 2021–22 (%)
Motor vehicles	210,899	216,884	172,804	181,116	207,225	26,109	14.4
Certain motor vehicle parts	90,294	88,575	75,518	92,014	105,710	13,696	14.9
Primary cells and batteries and electric storage batteries	9,046	9,122	10,420	15,963	24,667	8,704	54.5
Construction and mining equipment	18,180	19,344	13,891	18,080	24,007	5,927	32.8
Aircraft engines and gas turbines	26,314	30,913	19,928	19,813	23,884	4,071	20.5
Internal combustion piston engines, other than for aircraft	31,432	30,311	24,995	30,285	33,365	3,080	10.2
Powersport vehicles	6,068	5,977	6,195	8,135	10,365	2,230	27.4
Trailers, semitrailers, and parts	4,207	4,037	3,368	4,796	6,539	1,743	36.3
Forklift trucks and similar industrial vehicles	4,675	4,555	3,246	4,737	6,391	1,654	34.9
Aircraft, spacecraft, and related equipment	32,501	35,944	28,367	25,510	27,098	1,588	6.2
All other product groups	24,734	25,021	21,995	26,078	29,753	3,675	14.1
Total	458,350	470,684	380,728	426,527	499,005	72,477	17.0

Source: USITC DataWeb/Census, accessed February 16, 2023.
Notes: Import values are based on U.S. customs value. Calculations are based on unrounded data.

U.S. general imports of certain motor vehicle parts increased by $13.7 billion (14.9 percent) to $105.7 billion in 2022. This growth in import value was driven by the increased production of automobiles by OEMs operating in the United States in 2022. Total U.S. production of light vehicles totaled 14.2 million units in 2022, up 9.8 percent from 2021 and the highest since 2019.[98] [99] Mexico (up $6.8 billion or 17.1 percent), Canada (up $1.7 billion or 16.6 percent), and China (up $1.2 billion or 11.2 percent) accounted for 70.8 percent of the increase in U.S. import value for certain motor vehicle parts in 2022.

The value of U.S. general imports of primary cells and batteries and electric storage batteries rose by $8.7 billion (54.5 percent) to $24.7 billion in 2022. Lithium-ion batteries accounted for $5.6 billion (68.8 percent) of this increase.[100] This increase in imports of lithium-ion batteries was driven by rising demand for electric vehicles (EVs)[101] resulting from consumer concerns over environmental impacts, more EV models available, improved battery capacity, and cost savings.[102] More than 800,000 fully electric vehicles were sold in the United States in 2022, which accounted for 5.8 percent of vehicle sales, up

[98] Stoddard, "North America Production Up 9.8% in 2022," January 19, 2023.
[99] "Light vehicles" is a term used to describe passenger vehicles under subheadings 8703.21–8703.90 and light trucks under subheadings 8704.21 or 8704.31. Examples of passenger vehicles include cars/sport utility vehicles; examples of light trucks include pickup trucks and work vans. This definition does not include heavy trucks, under subheadings 8701.20, 8704.22, 8704.23, 8704.32, 8704.90, or heading 8706, such as tractor trailers, cab and chassis trucks, or electric and hybrid trucks.
[100] USITC DataWeb/Census, digest TE006, accessed January 11, 2023.
[101] Kane, "All-Electric Car Sales Surged," March 18, 2023.
[102] Colato, "Charging into the Future: The Transition to Electric Vehicles," February 2023.

from 3.2 percent in 2021.[103] Increased import values were also driven by higher average prices for automotive batteries, which at least partially reflected higher lithium prices, a key component of EV batteries.[104] China, the world's largest producer of lithium-ion batteries for use in EVs, accounted for $11.1 billion, or 44.9 percent, of all U.S. imports within this digest, up $5.4 billion (96.1 percent) from 2021.[105]

U.S. imports of construction and mining equipment increased by $5.9 billion (32.8 percent) to $24 billion in 2022.[106] Growth in imports was driven mainly by the construction of onshore energy projects. For example, as of January 2022, the U.S. government had approved 18 onshore projects and 54 priority projects expected to grow the U.S. solar energy capacity by 21 gigawatts in 2022.[107] The rising demand for lithium, graphene, cobalt, nickel, and other inputs into EV batteries, electric vehicles, and other clean technologies is also driving the growth in the demand for equipment for mining operations in the United States.[108] Japan was the largest supplier of general imports of construction and mining equipment in 2022, supplying $7.0 billion worth of imports, a rise of $1.8 billion from 2021. Imports from China grew by $648.7 million (33.4 percent) to $2.6 billion in 2022; imports from Germany grew by $579 million (25.5 percent) to $2.9 billion.

U.S. general imports of aircraft engines and gas turbines increased by $4.1 billion (21 percent) to $23.9 billion in 2022. As discussed in the aircraft, spacecraft, and related equipment export section above, U.S production of aircraft rose significantly in 2022, which drove demand for aircraft engines, including imports. France (up $1.3 billion or 35.2 percent) and Canada (up $1.3 billion or 37.2 percent) supplied the largest increases in import value in 2022, followed by United Kingdom (up $618 million or 27.8 percent). These three countries accounted for more than 50 percent of the value of U.S. imports of aircraft engines and gas turbines in 2022.[109]

[103] Colias, "U.S. EV Sales Jolted Higher in 2022 as Newcomers Target Tesla," January 6, 2023.
[104] BloombergNEF, "Lithium-ion Battery Pack Prices Rise for First Time," December 6, 2022. Barrera; "Lithium Market 2022 Year-End Review," December 19, 2022.
[105] USITC DataWeb/Census, digest TE006, accessed January 11, 2023.
[106] USITC DataWeb/Census, digest TE004, accessed January 11, 2023
[107] Lewis, "The Biden Administration is Set to Beat its 25 GW by 2025 Onshore Clean Energy Goal", April 21, 2022.
[108] Perry, "High Demand for New, Used Construction Equipment Continues Despite Challenges," September 8, 2022.
[109] USITC DataWeb/Census, digest TE001, accessed March 8, 2023.

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