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U.S. Manufacturing Trends, Performance, and Competitiveness

Annual Report on the Manufacturing Economy, 2026



Douglas Thomas

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Applied Economics Office
Engineering Laboratory

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November 2026



U.S. Department of Commerce
Howard Lutnick, Secretary

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Abstract

This report provides a statistical review of the U.S. manufacturing industry. There are three aspects of U.S. manufacturing that are considered: (1) how the U.S. industry compares to other countries, (2) the trends in the domestic industry, and (3) the industry trends compared to those in other countries. The report discusses forecasts for U.S. manufacturing and provides means for advancing national manufacturing competitiveness. Eight primary means for advancing U.S. competitiveness are identified. They organize into four pillars: Target, Accelerate, Learn, and Protect. The eight methods provide a systematic approach to advancing manufacturing competitiveness by focusing resources where they can generate the greatest returns.

Keywords

manufacturing; economy; supply chain; value added; statistics; competitiveness

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Preface

This study was conducted by the Applied Economics Office (AEO) in the Engineering Laboratory (EL) at the National Institute of Standards and Technology (NIST). The study provides aggregate manufacturing industry data and industry subsector data to develop a quantitative depiction of the U.S. manufacturing industry.

Acronyms

AM: Additive Manufacturing
ASM: Annual Survey of Manufactures
ATP: Advanced Technology Program
BEA: Bureau of Economic Analysis
BLS: Bureau of Labor Statistics
CAG: Compound Annual Growth
CEO: Chief Executive Officer
DARPA: Defense Advanced Research Projects Agency
GDP: Gross Domestic Product
ISIC: International Standard Industrial Classification
NAICS: North American Industry Classification System
NIST: National Institute of Standards and Technology
OECD: Organization for Economic Cooperation and Development
PPP: Purchasing Power Parity
R&D: Research and Development
SBIR: Small Business Innovation Research Program
SIC: Standard Industrial Classification
STEP: Standard for the Exchange of Product Model Data
USGS: United States Geological Survey
VA: Value Added

Executive Summary

Context and Background: Assessing U.S. manufacturing competitiveness is directly relevant to NIST's mission to promote U.S. innovation and industrial competitiveness through advances in measurement science, standards, and technology. Achieving this mission requires not only advancing individual technologies but also understanding how U.S. manufacturing performs, where competitive gaps exist, and which structural factors influence productivity and industrial capacity. A rigorous, data-driven assessment of manufacturing competitiveness provides a foundation for connecting technological progress to industrial outcomes and for identifying areas where further research, technological development, or investment may have the greatest potential impact. NIST is uniquely positioned to conduct this assessment, as it can combine its expertise in measurement science, industrial technology, and data-driven economic analyses to provide an objective and rigorous evidence base to inform investments in competitiveness.

This report assesses U.S. manufacturing competitiveness through three lenses: the position of U.S. manufacturing relative to other countries, trends in domestic manufacturing, and changes in those trends relative to other countries. Rather than presenting a broad inventory of economic indicators, the report prioritizes diagnostic measures, including manufacturing scale and productivity, that directly inform assessments of competitive position and performance. By combining contextual data with structured international comparisons, the report establishes an evidence base to help NIST and other stakeholders identify competitive gaps, assess risks, and inform strategic priorities. This approach aligns with the economic decision-making framework outlined in NIST AMS 100-80 (Thomas, 2026) and supports more targeted consideration of research, technology development, and investment opportunities.

Current State of Competitiveness: The United States remains a major manufacturing nation and performs strongly on several measures of productivity, innovation, and manufacturing scale. However, relatively slow growth, recent productivity trends, supply-chain dependencies, and uneven performance across industries indicate opportunities to improve competitiveness. These findings suggest that the central challenge is directing limited resources toward interventions with the greatest potential returns.

Table 0.1 provides a series of rankings for national branding (collective national reputation), multi-factor indices, R&D, and output along with the magnitude of high-tech production. Lower rankings equate to better performance while the red, yellow, green colors highlight the relative level/ranking compared to the other countries shown. In the table, the other countries shown represent those that might be seen as having high-quality (e.g., Germany), high-tech (e.g., Japan or South Korea), or high-volume (e.g., China) production. As seen in the table, the U.S. ranks well in multi-factor indices and R&D metrics; however, it is not ranked at the top for any of them and some are in the double digits; thus, there is room for improvement. According to the Ipsos National Brands Index, the U.S. as a brand slipped from 7th to 14th. The U.S. is a major manufacturing

country, as it is the second largest in terms of value added; however, its 5-year compound annual growth rate is ranked lower (i.e., 129th), which is common for advanced economies as they frequently must advance the productivity frontier in order to grow. Out of the six high tech manufacturing industries shown, the U.S. is the largest for only "basic pharmaceutical products and pharmaceutical preparations" and is significantly smaller than that of China for machinery/equipment and electrical equipment.

Table 0.2 focuses on details of domestic production, particularly high-tech manufacturing. It provides estimates for past and predicted growth in production, net stock, and labor while also estimating the proportion of intermediate goods/services that are imported. The domestic details in the table further confirm the trends regarding "machinery and equipment" manufacturing from the country comparison in Table 0.1.

Table 0.1: International Comparison Quick Reference

	Metric	U.S.	Germany	Japan	South Korea	China
Branding	Ipsos National Brands Index (see Table 5.2)	14	2	1	-	-
Multi-factor Indices (Rankings)	Competitive Industrial Performance Index (see Section 5.2)	6	1	7	3	2
	Global Innovation Index (see Section 5.2)	3	11	12	4	10
	IMD Competitiveness Index (see Section 5.2)	10	23	30	21	12
R&D metrics (Rankings)	Patent applications per million people	2	5	3	4	1
	R&D Expenditures as % of GDP	5	11	6	3	21
	Researchers per million people	21	11	13	1	51
	Journal articles	20	32	35	41	14
	Journal articles per capita	28	24	43	22	49
Output and Growth (Rankings)	Goods Exports* (see Figure 5.6)	20	24	28	29	17
	Manufacturing value added (see Figure 2.3)	2	4	3	5	1
	5-year compound annual growth in manufacturing value added (see Figure 2.12)	129	175	135	89	40
	Manufacturing value added per capita (see Figure 2.5)	15	9	10	8	38
High Tech. Production (Percent of Global Value Added)	Chemicals and chemical products	23.0%	4.0%	3.8%	3.5%	28.1%
	Computer, electronic and optical products	22.8%	3.4%	4.5%	8.6%	24.9%
	Machinery and equipment n.e.c.	14.6%	9.0%	10.1%	3.3%	33.4%
	Electrical Equipment	11.3%	7.3%	8.1%	6.2%	38.4%
	Motor vehicles and other transport equip.	20.4%	11.7%	7.2%	3.4%	22.3%
	Basic pharmaceutical products and pharmaceutical preparations	28.5%	3.5%	3.1%	1.7%	17.3%

Note: Indicated above are the sections, tables, or figures where the relevant data is discussed. The metrics presented here are those that are useful for brevity while those discussed in other sections might present slightly different aspects of the data (e.g., the nominal values rather than rankings). Each data value may not be presented elsewhere but rather illustrated or only discussed for the U.S.
Note: The color shading is a visual aid. Better values are shown in green while worse values are red.

Table 0.2: Domestic Manufacturing Quick Reference

NAICS		Total Manuf. 31-33	Chemicals (incl. pharma.) 325	Machinery 333	Computers 334	Elect. Equip., Appliance, and components 335	Transportation Equip. 336
Production	Value Added as a percent of total manufacturing (see Figure 2.10)	$2397 (Billion)*	20.80%	5.90%	12.40%	2.20%	17.10%
	Value Added Growth: CAG5 (see Figure 2.12)	2.30%	5.00%	0.30%	1.30%	-0.20%	7.30%
	Growth in Manufacturing Output: CAG 2025 to 2035 (see Table 6.1)	1.50%	2.20%	1.30%	1.90%	1.60%	1.10%
Net Stock	Growth in Equipment: CAG5 (see Figure 2.13)	-0.50%	0.10%	-0.40%	-1.80%	0.60%	-1.90%
	Growth in Structures: CAG5 (see Figure 2.14)	3.10%	4.30%	3.80%	2.00%	2.50%	4.70%
	Growth in Intellectual Property: CAG5 (see Figure 2.15)	2.70%	4.20%	1.50%	1.30%	1.40%	1.90%
Labor	Manufacturing Employment, Thousands (see Table 4.1)	12 194	884	1065	808	370	1696
	Manufacturing Employment: CAG 2025 to 2035 (see Table 6.1)	0.10%	0.40%	-0.10%	0.40%	1.10%	0.10%

CAG: Compound annual growth
CAG5: 5-year compound annual growth
* Chained 2017 Dollars
Note: Indicated above are the sections, tables, or figures where the relevant data is discussed. The aspects presented here are those that are useful for brevity while those discussed in other sections might present slightly different aspects of the data (e.g., the nominal values rather than rankings). Each data value may not be presented elsewhere but rather illustrated or only discussed for the U.S.
Note: The color shading is a visual aid. Better values are shown in green while worse values are red.

Machinery and electrical equipment (NAICS 333) account for lower levels of the manufacturing industry value added, have lower growth, and lower forecasted growth compared to the other industries shown. Even further, their growth in net stock for equipment, structures, and property are lower than that of the other industries shown.

As seen in Table 0.3, the top supply chain (i.e., intermediate) good/service cost for discrete manufacturing is primary metals, which accounts for 6.6 % of the total of direct and indirect value added, which captures goods and services purchased from other industries. Wholesale trade is the second largest and is in the top two costs for all four manufacturing categories shown (i.e., discrete, discrete tech, process, and food manufacturing). The costs of wholesale trade (e.g., sourcing, distribution, and logistics) are substantial. The magnitude of these intermediate costs highlights activities where productivity improvements could have broad effects on manufacturing competitiveness. As seen in Table 0.4, the U.S. manufacturing industry imports 12.9 % of its intermediate goods and services with food, process, discrete, and discrete technology manufacturing imports ranging from 7.7 % to 14.7 %. The rates are lower when excluding services and focusing on supply chain goods.

Table 0.3: Supply Chains: Top Intermediate Goods/Services and their Percent of Total Output (Direct and Indirect) by Discrete, Discrete Tech, Process, and Food Manufacturing (based on

Table 3.8)

Rank	Discrete (NAICS 321, 327, 332, 337, 339, 313-323)	Discrete Tech (NAICS 333-336)	Process (NAICS 324-326)	Food (NAICS 311)
1	Primary metals (6.6 %)	Wholesale trade (6.9 %)	Oil and gas extraction (12.1 %)	Farms (14.6 %)
2	Wholesale trade (5.4 %)	Primary metals (6.4 %)	Wholesale trade (5 %)	Wholesale trade (6.8 %)
3	Chemical products (3.5 %)	Fabricated metal products (3.5 %)	Management of companies and enterprises (2 %)	Chemical products (2.8 %)
4	Miscellaneous professional, scientific, and technical services (2 %)	Chemical products (1.8 %)	Fabricated metal products (1.7 %)	Truck transportation (2.2 %)
5	Other real estate (1.8 %)	Management of companies and enterprises (1.7 %)	Miscellaneous professional, scientific, and technical services (1.5 %)	Management of companies and enterprises (1.9 %)

Table 0.4: Percent of Foreign Value Added Embedded in U.S. Manufacturing

	All U.S. Manufacturing	Food	Discrete	Process	Discrete Tech
Percent of all intermediate goods/services imported for U.S. manufacturing	12.9%	10.8%	14.8%	7.7%	14.7%
Percent of intermediate manufacturing imported for U.S. manufacturing	7.9%	6.8%	6.6%	3.7%	10.3%

Data Source: OECD. (2026). Inter-Country Input-Output Tables. https://www.oecd.org/en/data/datasets/inter-country-input-output-tables.html

Advancing Competitiveness: This report identifies eight primary means for advancing U.S. competitiveness that organize into four pillars: Target, Accelerate, Learn, and Protect. The eight methods provide a systematic approach to advancing manufacturing competitiveness by focusing resources where they can generate the greatest returns. The approach begins with targeting strategically important industries, as measured by costs, losses, and quality; supply-chain risks; ecosystem constraints; and information gaps that limit competitive performance. The approach turns to accelerating the adoption and diffusion of high-return technologies and then learning through a system of continuous improvement for manufacturing competitiveness investments. Finally, the approach discusses protecting the value signals that allow quality, performance, and other product attributes to be distinguished.

1. **Target**
    - *Industries*: Focus limited resources on industries where investments can generate the greatest economic, strategic, or national-security returns.
    - *Manufacturing Costs, Losses, and Quality*: Direct investments toward the manufacturing costs, losses, and quality/performance aspects that have the greatest potential to increase productivity and competitiveness.
    - *Supply Chain Risks*: Identify and mitigate supply-chain vulnerabilities where the expected costs of disruption justify investments in resilience.
    - *Ecosystem Constraints*: Improve the workforce, infrastructure, R&D capabilities, and other conditions that enable individual manufacturers and supply chains to compete effectively.
    - *Information Gaps*: Develop standards and measurement methods that enable customers to recognize and value differences in product quality, performance, durability, and other attributes.
2. **Accelerate**

- *Adoption and Diffusion of High-Return Technologies and Practices*: Accelerate the adoption and diffusion of high-impact innovations by reducing information, cost, and implementation barriers so that proven technologies and practices generate broader and faster competitiveness gains.

3. **Learn**
    - *Continuous Improvement for Investments in Competitiveness*: Use forecasting, measurement, and feedback loops to improve the selection and design of investments and increase their returns over time, as discussed in NIST AMS 100-80 (Thomas 2026).
4. **Protect**
    - *Competitive Advantages:* Protect and strengthen the sources of U.S. competitive advantage by safeguarding the value of U.S. manufacturing, maintaining the credibility of U.S. origin and quality claims, and strengthening the capabilities and attributes that affect cost and differentiation of U.S.-made products.

Together, these methods shift competitiveness investments from broadly supporting manufacturing toward identifying specific opportunities and constraints, directing resources toward high-return interventions, accelerating their effects, learning from their results, and preserving the value they create. These strategies are identified as those that are likely to facilitate creating increasingly greater advancements in U.S. manufacturing competitiveness per unit of investment.

1. Introduction

1.1. Background

Public entities have a significant role in the U.S. innovation process (Block and Keller 2016). The federal government has had a substantial impact in developing, supporting, and nurturing numerous innovations and industries, including the internet, telecommunications, aerospace, semiconductors, computers, pharmaceuticals, and nuclear power among others, many of which may not have come to fruition without public support (Wessner and Wolff 2012). Although the Defense Advanced Research Projects Agency (DARPA), Small Business Innovation Research Program (SBIR), and Advanced Technology Program (ATP) have received attention in the scholarly community, evidence suggests there is likely limited or diminished public awareness of the government's role in U.S. innovation (Block and Keller, 2016).

One objective of public innovation is to enhance economic security and improve our quality of life (National Institute of Standards and Technology 2018), which is achieved in part by advancing efficiency and productivity in which resources are consumed or impacted by production. This includes decreasing inputs, which amount to costs, and negative externalities (e.g., environmental impacts) while increasing output, (i.e., the products produced), and the function of the product (e.g., the usefulness or quality of the product), as seen in Figure 1.1. Figure 2.7 from NIST AMS 100-80 (Thomas 2026) describes this as preserving or freeing up resources/wellness. For instance, by reducing inputs, resources are freed up or preserved. Reducing negative externalities can either preserve resources such as those for future generations or it can preserve wellness by reducing exposure to hazards. In pursuit of this goal, the National Institute of Standards and Technology (NIST) has a number of projects in manufacturing, such as support for the development of the International Standard for the Exchange of Product Model Data (STEP) (Robert D. Niehaus, Inc 2014), which reduces the need for duplicative efforts such as re-entering design data; digital twins for virtual models; or standards for additive manufacturing.

1.2. Purpose of this Report

The purpose of this report is to characterize U.S. innovation and industrial competitiveness in manufacturing, as it relates to the objectives illustrated in Figure 1.1. It includes tracking domestic manufacturing activity and its supply chain in order todevelop a quantitative depiction of U.S. manufacturing in the context of the domestic economy and global industry. There are five aspects that encapsulate the information discussed in this report:

- **Growth and Size**: The size of the U.S. manufacturing industry and its growth rate as compared to other countries reveals the relative competitiveness of the industry.
    - ***Metrics***: Value added, value added per capita, assets, and compound annual growth

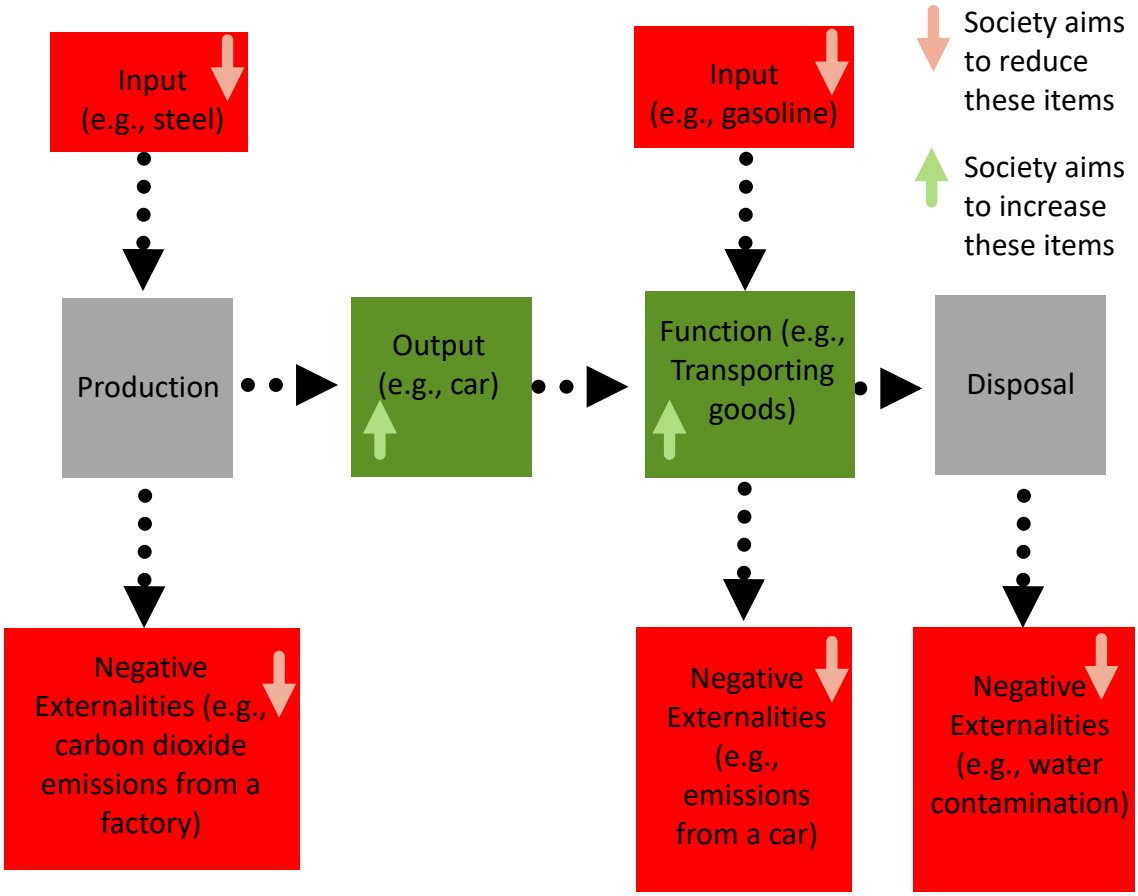


Figure 1.1: Illustration of Objectives – Drive Inputs and Negative Externalities Down while Increasing Production Output and Product Function

- **Productivity**: It is necessary to use resources efficiently to have a competitive manufacturing industry. Productivity is a major driver of the growth and size of the industry.
    - ***Metrics***: Labor productivity index, total factor productivity index, output per hour

- **Economic Environment**: A number of factors, including research, policies, and societal trends, can affect the productivity and size of the industry.
    - ***Metrics***: Research and development expenditures as a percent of GDP, journal articles per capita, researchers per capita, competitiveness indices, inflation, patents

- **Stakeholder Impact**: Owners, employees, and other stakeholders invest their resources into manufacturing with the purpose of receiving some benefit. The costs and return that they receive can drive industry productivity and growth. However, data is limited on this topic area.

- ***Metrics***: Number of employees, compensation, safety incidents, profits, exports, hours worked

- **Areas for Advancement**: It is important to identify areas of investment that have the potential to have a high return, which can facilitate productivity and growth in manufacturing.
  - ***Metrics***: High-cost supply chain components, country comparison indices

Currently, this annual report discusses items related to inputs for production and outputs from production. It does not discuss negative externalities, the inputs that are used in the function of a product (e.g., gasoline for an automobile), or the function of the product; however, these items might be included in future reports.

Manufacturing metrics can be categorized by stakeholder, scale, and metric type (see Figure 1.2). Stakeholders include the individuals that have an interest in manufacturing. Each metric in this report relates directly or indirectly to one or more stakeholders, such as a cost or benefit. The benefits for some stakeholders are costs for other stakeholders. For instance, the price of a product is a cost to the consumer but represents compensation and profit for the producers. The scale indicates whether the metric is nominal (e.g., the total U.S. manufacturing revenue) or is adjusted to a notionally common scale (e.g., revenue per capita). The metric type distinguishes whether the metric measures manufacturing activities directly (e.g., total employment) or measures those things that affect manufacturing (e.g., research and development). These metrics are then compared over time and/or between industries to provide context to U.S. manufacturing activities.

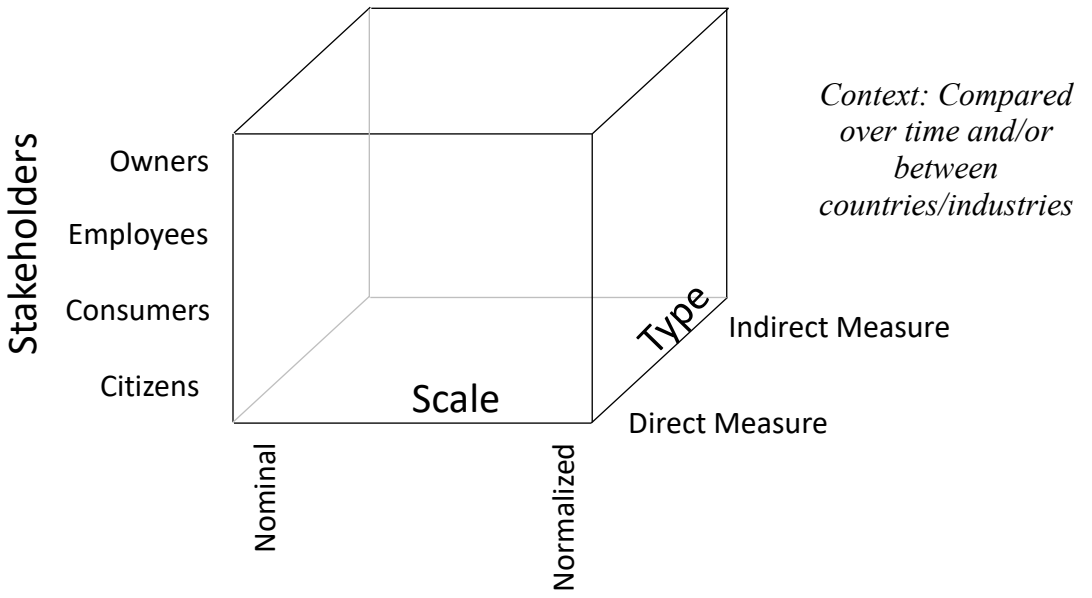


Figure 1.2: Data Categorization for Examining the Economics of Manufacturing

1.3. Scope and Approach

There are numerous aspects one could examine in manufacturing. This report discusses a subset of stakeholders and focuses on U.S. manufacturing. Among the many datasets available, it utilizes those that are prominent and are consistent with economic standards. These criteria are further discussed below.

Stakeholders: This report focuses on the employees and the owners/investors, as the data available facilitates examining these entities. Future work may move toward examining other stakeholders in manufacturing, such as the consumers and general public.

Geographic Scope: Many change agents such as public research organizations, universities, and trade organizations are concerned with a certain group of people or organizations. Since NIST is concerned with "U.S. innovation and competitiveness," this report focuses on activities within national borders. In a world of globalization, this effort is challenging, as some of the parts and materials being used in U.S.-based manufacturing activities are imported. NIST, however, promotes U.S. innovation and industrial competitiveness; therefore, consideration of these imported goods and services are outside of the scope of this report.

Standard Data Categorization: Domestic data in the U.S. tends to be organized using NAICS codes, which are the standard used by federal statistical agencies classifying business establishments in the United States. NAICS was jointly developed by the U.S. Economic Classification Policy Committee, Statistics Canada, and Mexico's Instituto Nacional de Estadística y Geografía, and was adopted in 1997. NAICS has several major categories each with subcategories. Historic data and some organizations continue to use the predecessor of NAICS, which is the Standard Industrial Classification system (SIC). NAICS codes are categorized at varying levels of detail. The broadest level of detail is the two-digit NAICS code, which has 20 categories. More detailed data is reported as the number of digits increase; thus, three-digit NAICS provide more detail than the two-digit and the four-digit provides more detail than the three-digit. The maximum is six digits. Sometimes a two, three, four, or five-digit code is followed by zeros, which do not represent categories. They are null or place holders. For example, the code 336000 represents NAICS 336. International data tends to be in the International Standard Industrial Classification (ISIC) version 3.1, a revised United Nations system for classifying economic data. Manufacturing is broken into 23 major categories (ISIC 15 through 37), with additional subcategorization. This data categorization works similar to NAICS in that additional digits represent additional detail.

Data Sources: Thomas (2012) explores a number of data sources for examining U.S. manufacturing activity. This report selects from sources that are the most prominent and reveal the most information about the U.S. manufacturing industry. These data include the United Nations Statistics Division's National Accounts Main Aggregates Database and the U.S. Census Bureau's Annual Survey of Manufactures, among others. Because the data sources are scattered across several resources, there are differences in what yearly data is available for a particular category or topic. In each case, the most-up-to-date and available information is provided for the relevant category.

Data Limitations: Like all collections of information, the data on manufacturing has limitations. In general, there are 3 aspects to economic data of this type: 1) breadth of the data, 2) depth of the data, and 3) the timeliness of the data. The breadth of the data refers to the span of items covered, such as the number of countries and years. The depth of the data refers to the number of detailed breakouts, such as value added, expenditures, and industries. In general, breadth and depth are such that when the number of items in each are multiplied together it equals the number of observations in the dataset for a particular time period. For instance, if you have value added data on 5 industries for 20 countries for a single year, then you would have 100 observations (i.e., 5 x 20 = 100). The timeliness of the data refers to how recently the data was released. For instance, is the data 1 year old or 5 years old at release. In general, data can perform well in 2 of these 3 criteria, but it is less common to perform well on all 3 due to feasibility of data collection (see Figure 1.3). Moreover, in this report there is data that is very recent (timeliness) and spans numerous subsectors (depth), but it only represents the United States. On the other hand, there is data that spans multiple countries (breadth) and subsectors of manufacturing (depth); however, this data is from several years ago. Fortunately, industry level trends change slowly; thus, the data may not be from the most recent years, but it is still representative.

Official statistics are typically presented as descriptive point estimates. For many international comparisons, the dominant source of uncertainty is embedded in structural differences from variations in definitions and how data is collected rather than sampling error. As a result, conventional error bars or measures of statistical uncertainty may imply statistical properties that are not credible. This report provides a wide array of complex

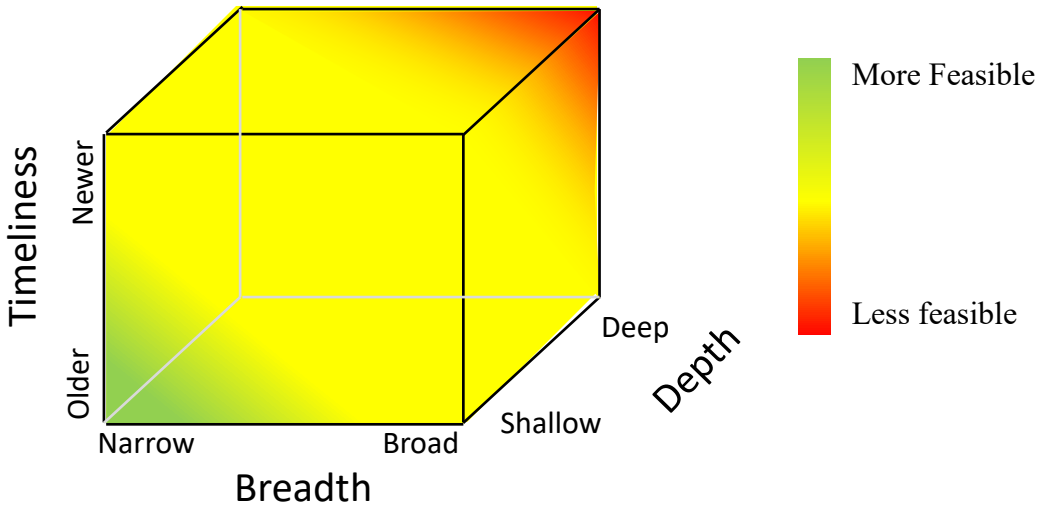


Figure 1.3: Illustration of the Feasibility of Data Collection and Availability

comparisons for a primarily non-technical audience. A focus on statistical precision can obscure the broader cross-country patterns and trends that are central to the analysis. For these reasons, this report presents point estimates without formal uncertainty measures, as is consistent with source agencies and peer publications. Nevertheless, it is important to recognize that the data and statistics are subject to measurement error and limitations; thus, small differences and variations should be interpreted with caution. Greater weight should be placed on persistent differences, broader trends, and order of magnitude differences.

2. Value Added and Capital Stock

Value added is the primary metric used to measure economic activity. It is defined as the increase in the value of output at a given stage of production; that is, it is the value of output minus the cost of inputs from other establishments (Dornbusch 2000). The primary elements that remain after subtracting inputs are taxes, compensation to employees, and gross operating surplus; thus, the sum of these also equal value added. Gross operating surplus is used to calculate profit, which is gross operating surplus less the depreciation of capital such as buildings and machinery. The sum of all value added for a country is that nation's Gross Domestic Product (GDP).

2.1. International Comparison of Industry Size, Growth, and Subsectors

There are a number of sources of international estimates of value added for manufacturing. The United Nations Statistics Division National Accounts Main Aggregates Database has a wide-ranging dataset that covers a large number of countries over a significant period of time. In 2024, there was $15.7 trillion of value added (i.e., GDP) in global manufacturing in constant 2020 dollars, which is 16.3 % of the value added by all industries ($96.3 trillion), according to the United Nations Statistics Division. Since 1970, manufacturing ranged between 13.5 % and 16.7 % of global GDP. The top 10 manufacturing countries accounted for $11.1 trillion or 71.1 % of global manufacturing value added: China (30.2 %), United States (15.2 %), Japan (7.2 %), Germany (5.0 %), South Korea (3.3 %), India (3.1 %), United Kingdom (1.7 %), Italy (2.1 %), Mexico (1.7 %), and France (1.7 %) (United Nations Statistics Division 2024). China's share is up 2.7 % from the previous year, while the U.S. share is up 0.6 %.

As seen in Figure 2.1, U.S. compound real (i.e., controlling for inflation) annual growth between 1999 and 2024 was 1.5 %, which places the U.S. below the 50th percentile. This growth exceeded that of France, Japan, and Australia; however, it is slower than that for the world (3.6 %) and many emerging economies. It is important to note that emerging economies can employ idle or underutilized resources and adopt technologies that are already proven in other nations to achieve high growth rates. Developed countries are already utilizing resources and are employing advanced technologies; thus, comparing U.S. growth to the high growth rates in China or India has limited meaning concerning the ability of the U.S. to increase manufacturing. As seen in Figure 2.2, the compound annual growth for the U.S. between 2019 and 2024 was 0.2 %. This puts the U.S. just below the 50th percentile above France and Germany among others but still below the world growth of 0.5 %.

As seen in Figure 2.3, among the 10 largest manufacturing nations, U.S. manufacturing value added, as measured in constant 2020 dollars, is the second largest. In current

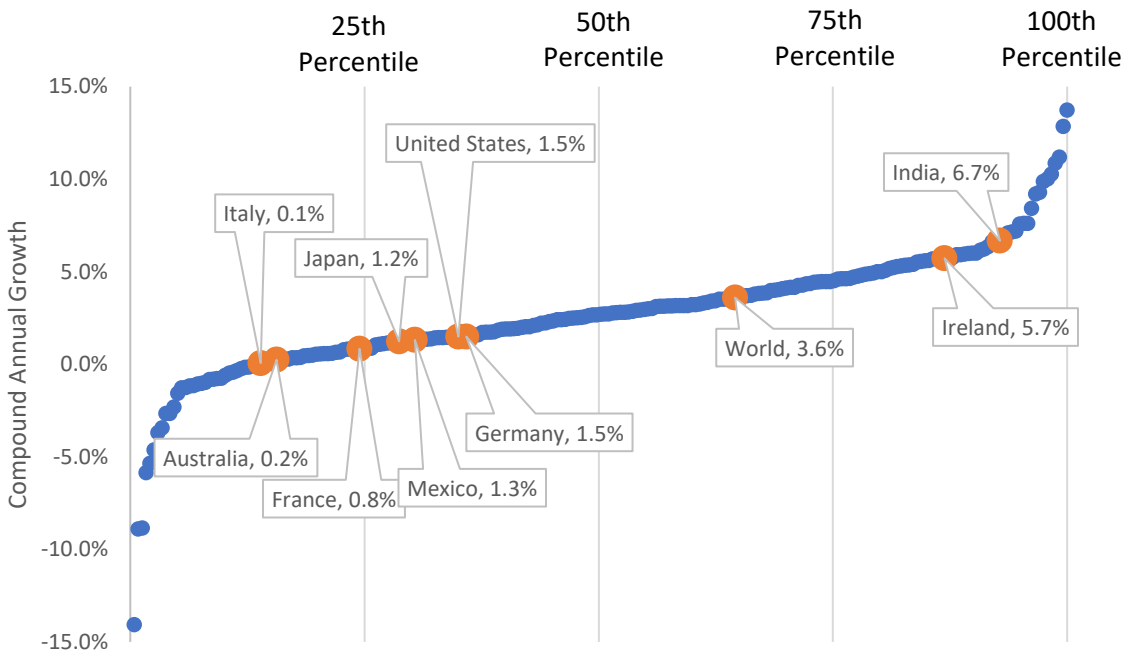


Figure 2.1: National 25-Year Compound Annual Growth, by Country (1999 to 2024): Higher is Better

Data Source: United Nations Statistics Division. (2026). "National Accounts Main Aggregates Database." https://unstats.un.org/unsd/snaama/

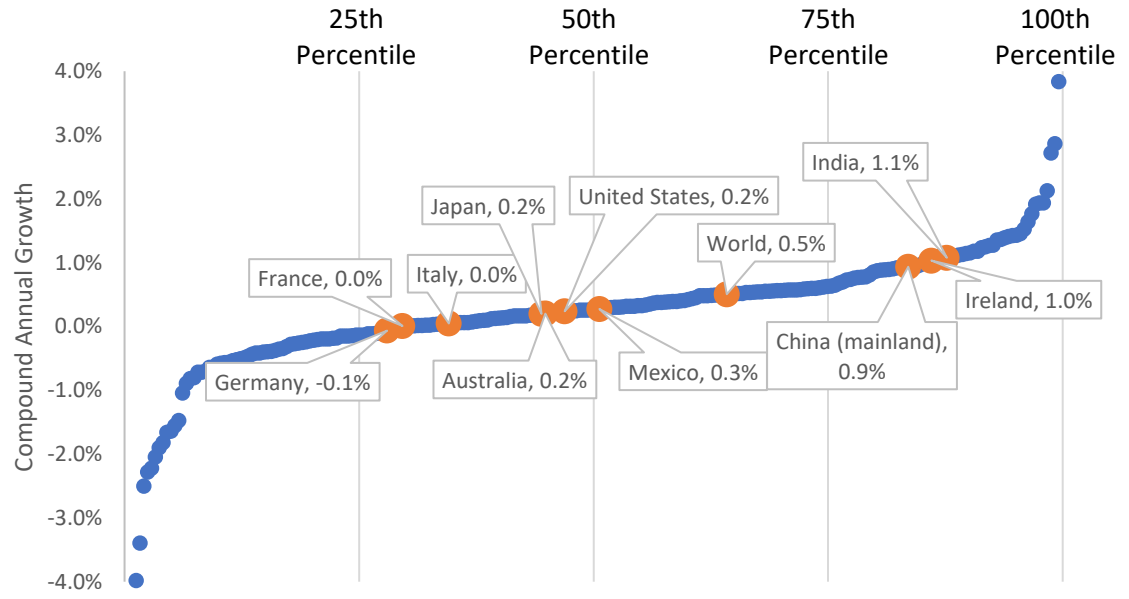
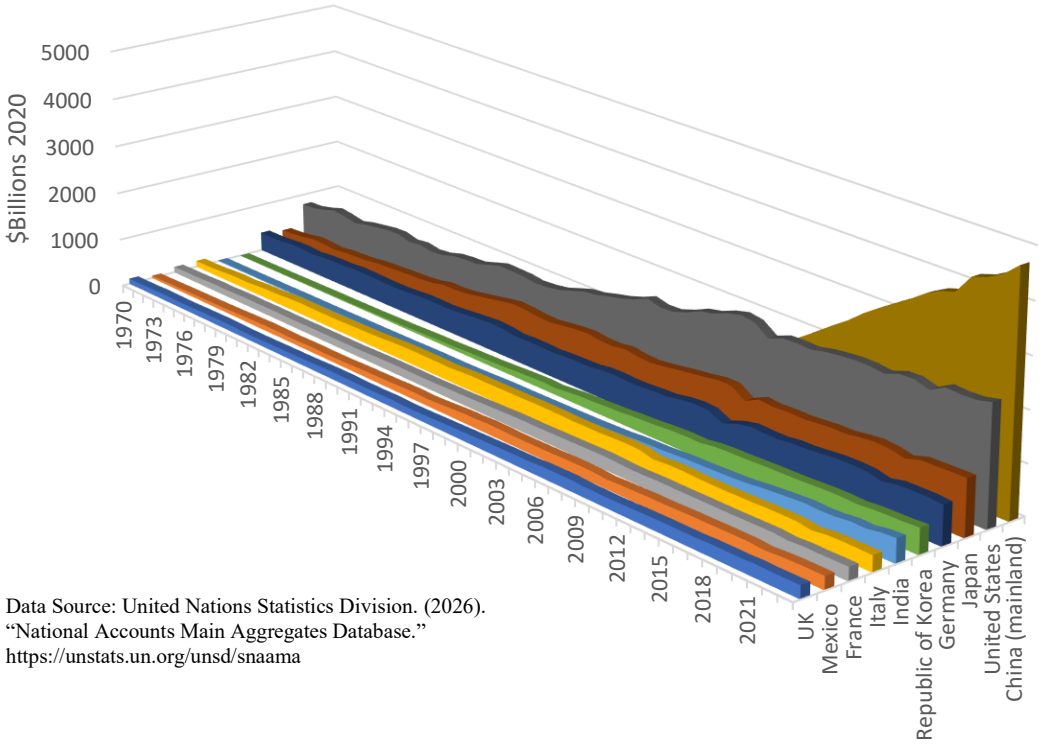


Figure 2.2: National 5-Year Compound Annual Growth, by Country (2019 to 2024): Higher is Better

Data Source: United Nations Statistics Division. (2026). "National Accounts Main Aggregates Database." https://unstats.un.org/unsd/snaama/



Data Source: United Nations Statistics Division. (2026). "National Accounts Main Aggregates Database." https://unstats.un.org/unsd/snaama

Figure 2.3: Manufacturing Value Added, Top 10 Manufacturing Countries (1970 to 2024)

dollars, the U.S. produced $2.9 trillion in manufacturing valued added while China produced $4.7 trillion in 2024. As illustrated in Figure 2.4, U.S. manufacturing value added was 9.7 % of national GDP in 2024. In comparison, Germany's manufacturing industry was 21.6 %, China was 25.5 %, and Japan was 21.0 % with the world average being 16.3 %. Although the U.S. is below average, this can be somewhat deceiving, as 2024 U.S. GDP per capita is significantly higher than both Japan and Germany along with most other countries, which makes the denominator disproportionally larger when calculating the proportion of the economy that manufacturing represents. A more meaningful measure might be manufacturing GDP (i.e., value added) per capita. Among the ten largest manufacturing countries, the U.S. has the 4th largest manufacturing value added per capita, as seen in Figure 2.5. Out of all countries the U.S. ranks 15th, as seen in Figure 2.6. Since 1970, the U.S. ranking has ranged between 12th and 20th. It is important to note that there are varying means for adjusting data that can change the rankings slightly. The UNSD data uses market exchange rates while others might use purchasing power parity (PPP) exchange rates. PPP is the rate that a currency in one country would have to be converted to purchase the same goods and services in another country. The drawback of

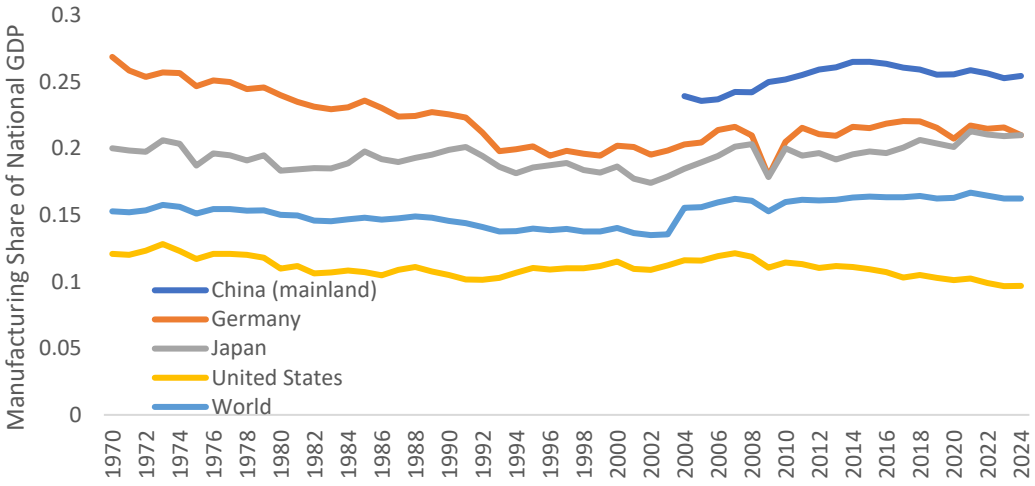
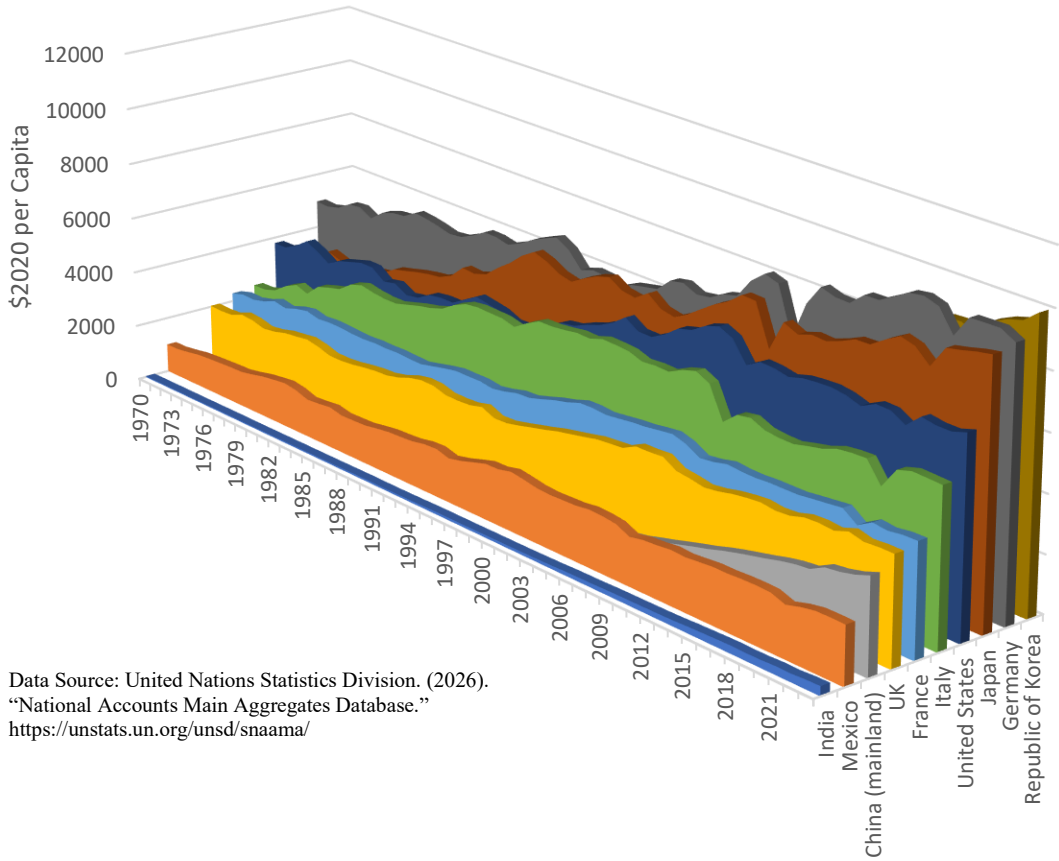


Figure 2.4: Manufacturing's Share of National GDP (Constant 2015 Dollars)

Data Source: United Nations Statistics Division. (2026). "National Accounts Main Aggregates Database." https://unstats.un.org/unsd/snaama/



Data Source: United Nations Statistics Division. (2026). "National Accounts Main Aggregates Database." https://unstats.un.org/unsd/snaama/

Figure 2.5: Manufacturing Value Added Per Capita, Top 10 Largest Manufacturing Countries (1970 to 2024): Higher is Better

PPP is that it is difficult to measure and methodological questions have been raised about some surveys that collect data for these calculations (Callen 2007). Market based rates tend to be relevant for internationally traded goods (Callen 2007); therefore, this report often utilizes these rates. As illustrated in Figure 2.7, manufacturing's share of GDP can vary based on whether the data is adjusted due to changes in prices. This tendency applies to other countries, as is illustrated for Germany in Figure 2.7.

In terms of subsectors of manufacturing, China produces more than the U.S. in 11 of the 14 subsectors shown in Figure 2.8. When aggregated together, U.S. and European manufacturing value added exceeds that of Eastern and South-eastern Asia (excluding Japan) for 7 of the 14 subsectors. Computer, electronic, and optical products is among those that Asia produces more value added.

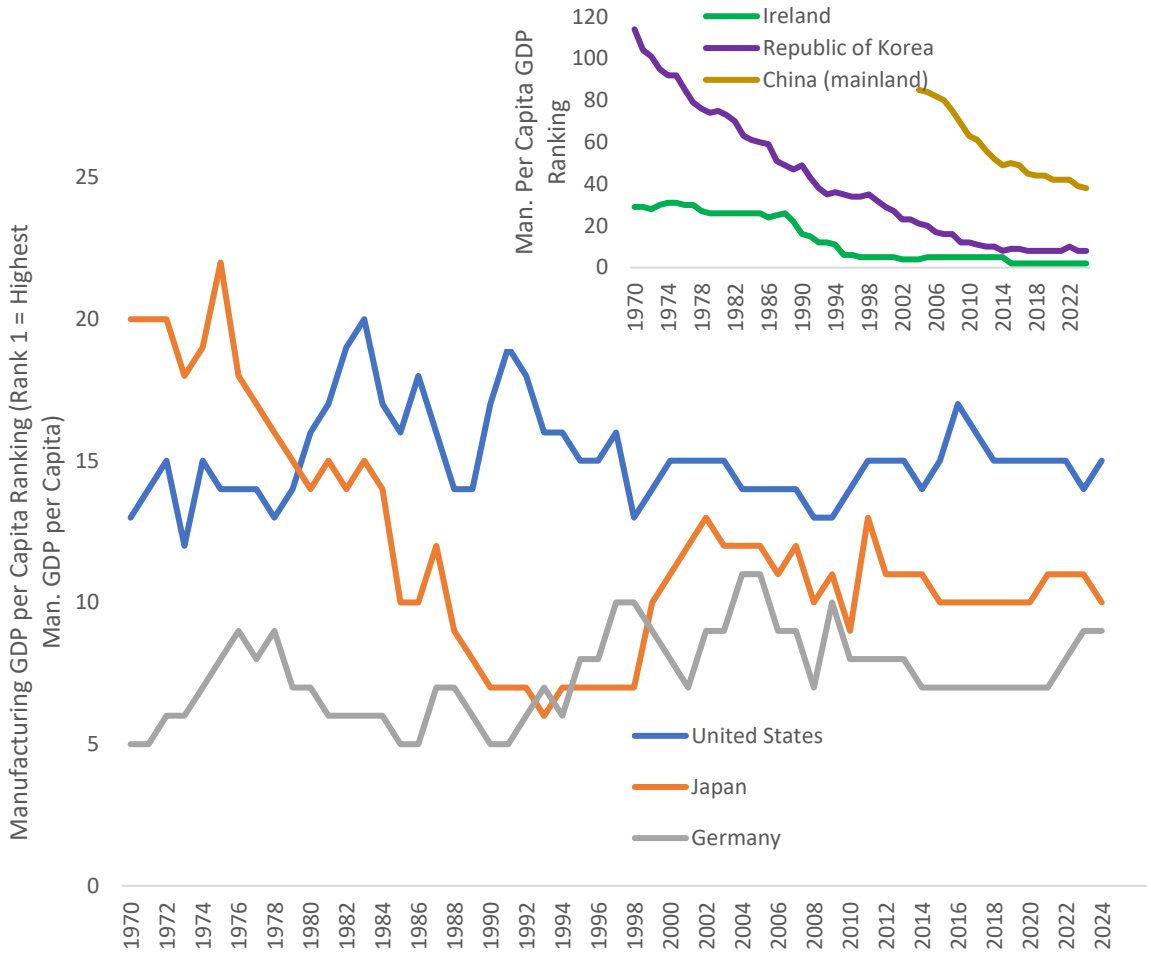


Figure 2.6: Manufacturing Per Capita Ranking, 1970 to 2024: Lower is Better

Data Source: United Nations Statistics Division. (2026). "National Accounts Main Aggregates Database." https://unstats.un.org/unsd/snaama/

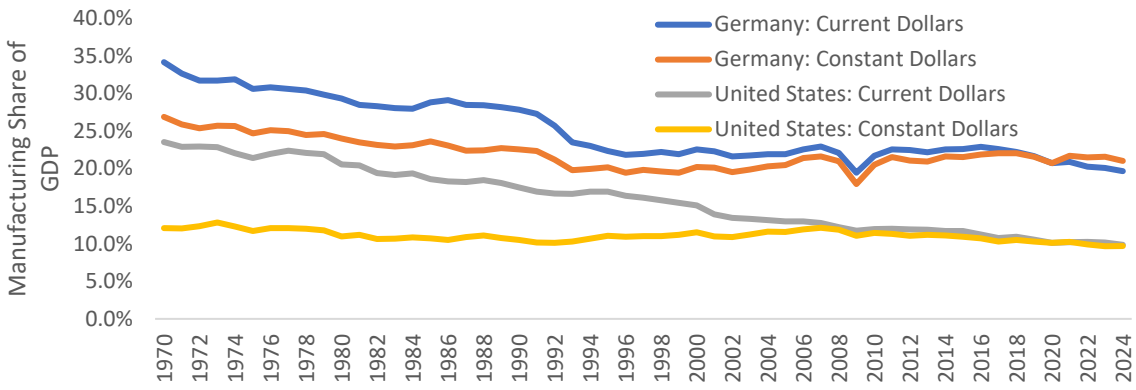


Figure 2.7: Manufacturing Share of GDP, Constant vs. Current Dollars

Data Source: United Nations Statistics Division. (2026). "National Accounts Main Aggregates Database." https://unstats.un.org/unsd/snaama/

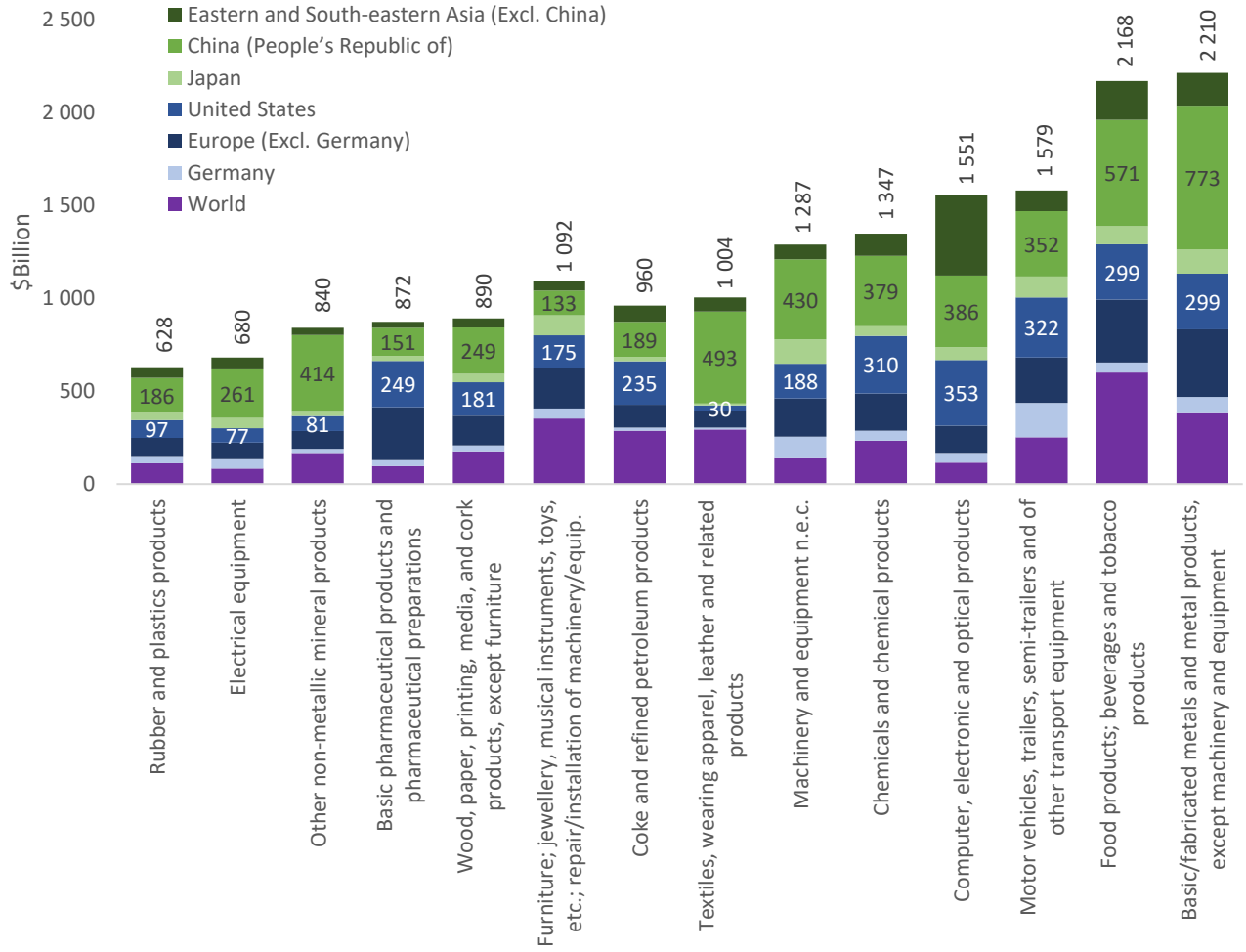


Figure 2.8: Global Manufacturing Value Added by Industry, by Country/Region ($Billion), 2022

Data Source: OECD. (2025b) . Trade in Value Added (TiVA). https://www.oecd.org/en/tiva.html

2.2. Growth and Subsectors (Domestic Data)

There are two primary methods for adjusting value added for inflation. The first is using chained dollars, which uses a changing selection of goods to adjust for inflation. The second uses an unchanging selection of goods to adjust for inflation (Dornbusch 2000). There has been some dispute about the accuracy of each for some goods. The values in this section uses chained dollars. Previous versions of this report included both; however, the differences are often minor.

Figure 2.9 shows the cumulative change in manufacturing, durable goods, and nondurable goods manufacturing from 2005 forward. As seen in the figure, U.S. manufacturing value added dips during the financial crisis in the late 2000's and during the recent COVID-19 health crisis. During the 2005 to 2026 period, durable goods, which was 51.5 % higher than its 2005 value, has had more robust growth than nondurables, which is 11.6 % above its 2005 value.

Manufacturing value added in the U.S. in 2024 was $2.4 trillion in chained 2017 dollars or 10.0 % of GDP (Bureau of Economic Analysis 2026a). Using chained dollars from the BEA shows that manufacturing increased by 1.5 % between 2024 and 2025. Figure 2.10 and Figure 2.11 provide more detailed data on durable and nondurable goods within the manufacturing industry. As seen in Figure 2.10, computer and electronic products along with motor vehicles, bodies and trailers, and parts has grown 28.0 % and 52.5 %, respectively between 2015 and 2025. Primary metals also saw significant growth (57.1 %) as did chemical products (46.4%). Four of the eleven durable goods subsectors decreased in size between 2015 and 2025. As seen in Figure 2.11, in 2025 four of eight non-durable sectors also decreased in value. The largest manufacturing subsector in the U.S. is chemical products followed by computer and electronic products, as seen in Figure 2.12. Food, beverage, and tobacco products is third. Note that this is based on chained dollars. Adjustments using other methods or the nominal value can have slightly different results.

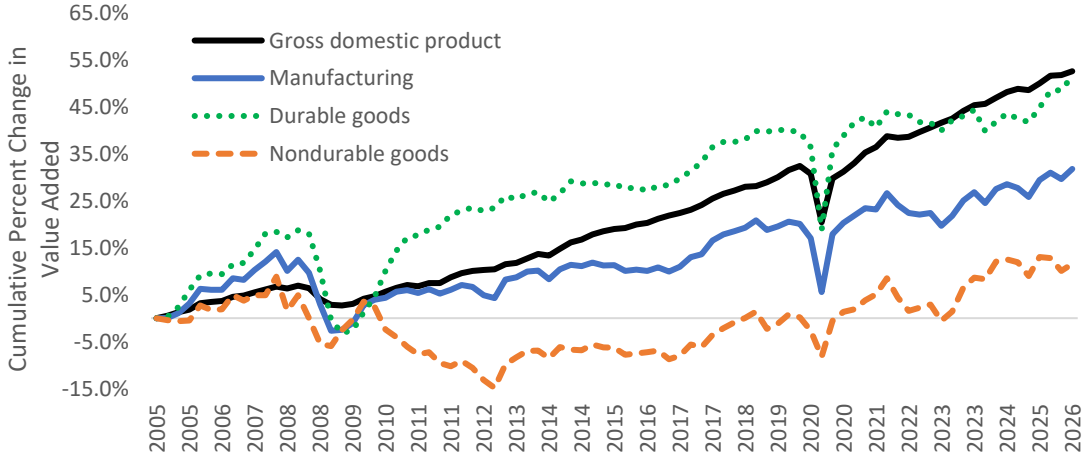
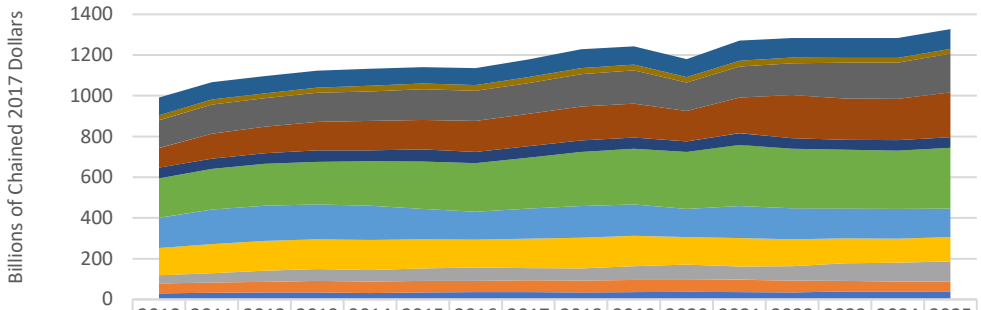
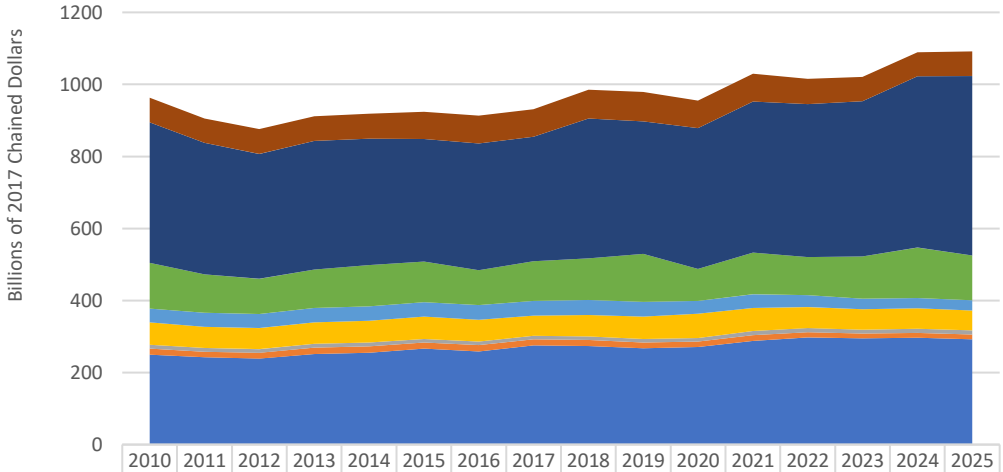


Figure 2.9: Cumulative Percent Change in Value Added (2017 Chained Dollars)
Data Source: Bureau of Economic Analysis. (2025a). "Industry Economic Accounts Data."
http://www.bea.gov/iTable/index_industry_gdpIndy.cfm



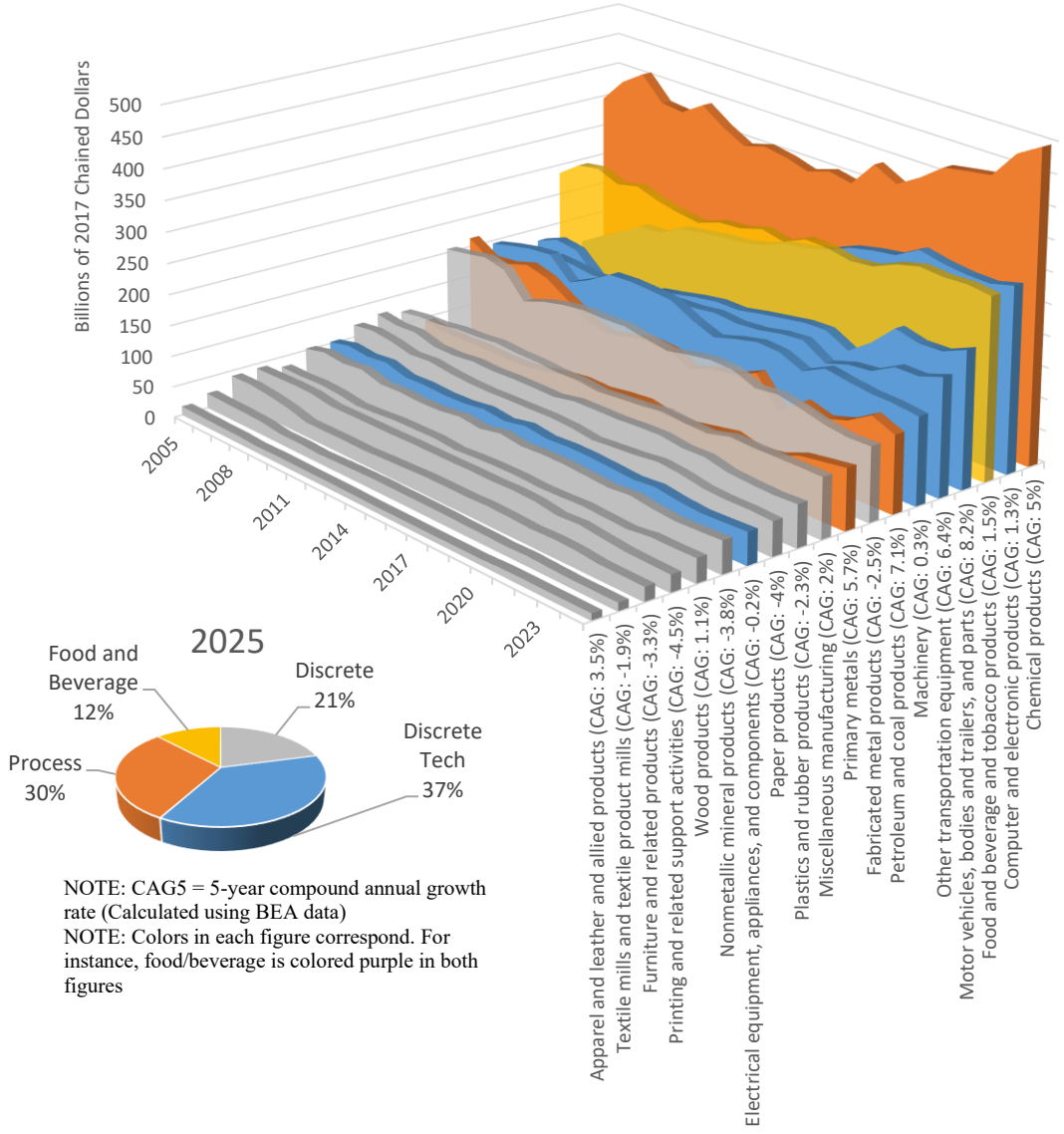
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Miscellaneous manufacturing	88	85	85	82	83	80	84	87	92	89	88	98	97	97	97	97
Furniture and related products	24	24	24	26	27	29	29	29	30	29	27	29	28	24	24	23
Other transportation equipment	137	142	140	144	146	151	148	151	159	162	140	152	156	177	177	190
Motor vehicles/bodies/trailers/parts	97	123	130	139	145	145	153	159	166	167	148	176	212	203	204	221
Elect. Equipment/appliances/components	53	51	52	57	53	60	55	58	58	55	53	57	52	49	51	53
Computer and electronic products	193	200	205	209	218	232	238	249	265	273	279	300	293	288	287	297
Machinery	149	171	173	172	168	150	136	148	156	154	139	157	151	147	146	141
Fabricated metal products	134	142	147	147	148	142	137	145	151	149	135	140	132	123	118	119
Primary metals	41	45	54	58	57	63	67	60	60	67	75	66	71	87	93	99
Nonmetallic mineral products	48	51	53	56	57	57	55	59	58	61	59	61	59	52	50	49
Wood products	30	33	34	34	31	34	35	36	34	35	37	35	34	39	38	39

Figure 2.10: Value Added for Durable Goods by Type (billions of chained dollars), 2010 to 2025
Data Source: Bureau of Economic Analysis. (2026a) "Industry Economic Accounts Data."
http://www.bea.gov/iTable/index_industry_gdpIndy.cfm



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Plastics and rubber products	68	67	69	69	69	76	77	77	80	82	77	78	70	68	66	69
Chemical products	390	366	346	357	351	340	352	345	388	369	391	419	425	431	476	498
Petroleum and coal products	127	107	98	107	115	113	97	111	116	133	88	116	105	117	140	125
Printing and related support activities	38	39	39	40	40	40	41	41	42	41	35	38	33	30	29	28
Paper products	61	59	59	60	61	62	61	56	60	63	68	64	58	56	57	55
Apparel and leather	11	11	11	11	10	10	10	9	9	10	10	11	12	11	12	12
Textile mills and textile product mills	16	15	16	17	18	18	18	17	16	16	15	16	15	13	13	14
Food and beverage and tobacco	250	243	239	252	255	266	259	275	274	267	271	288	298	295	297	292

Figure 2.11: Value Added for Nondurable Goods by Type (billions of chained dollars), 2010-2025
Data Source: Bureau of Economic Analysis. (2026a) "Industry Economic Accounts Data."
http://www.bea.gov/iTable/index_industry_gdpIndy.cfm



NOTE: CAG5 = 5-year compound annual growth rate (Calculated using BEA data)
NOTE: Colors in each figure correspond. For instance, food/beverage is colored purple in both figures

Figure 2.12: Manufacturing Value Added by Subsector (billions of chained dollars), 2005 to 2025

Data Source: Bureau of Economic Analysis. (2026a) "Industry Economic Accounts Data." http://www.bea.gov/iTable/index_industry_gdpIndy.cfm

2.3. Equipment, Structures, and Intellectual Property

In addition to examining manufacturing value added, it is useful to examine the capital stock in manufacturing, as it reflects the investment in machinery, buildings, and intellectual property in the industry (see Figure 2.13, Figure 2.14, Figure 2.15, and Figure 2.16). Discrete technology manufacturing (i.e., computer manufacturing, transportation equipment manufacturing, machinery manufacturing, and electronics manufacturing) accounts for 29 % of all manufacturing equipment and 33 % of structures. The 5-year compound annual growth in computer and electronic manufacturing equipment is -1.8 % while structures is growing at a rate of 2.0 %. Recall that computer and electronic product

manufacturing is the largest durable goods manufacturing sector in the U.S., as shown in Figure 2.10. Note that for many subsectors, structures are growing at a five-year compound with the highest 5-year compound annual growth rate being 4.7 %, as seen in Figure 2.14. In terms of intellectual property, chemical products have the highest value, as seen in Figure 2.15. As of 2025, manufacturing net stock is split between intellectual property (35.4 %), structures (33.0 %), and equipment (31.5 %) somewhat evenly.

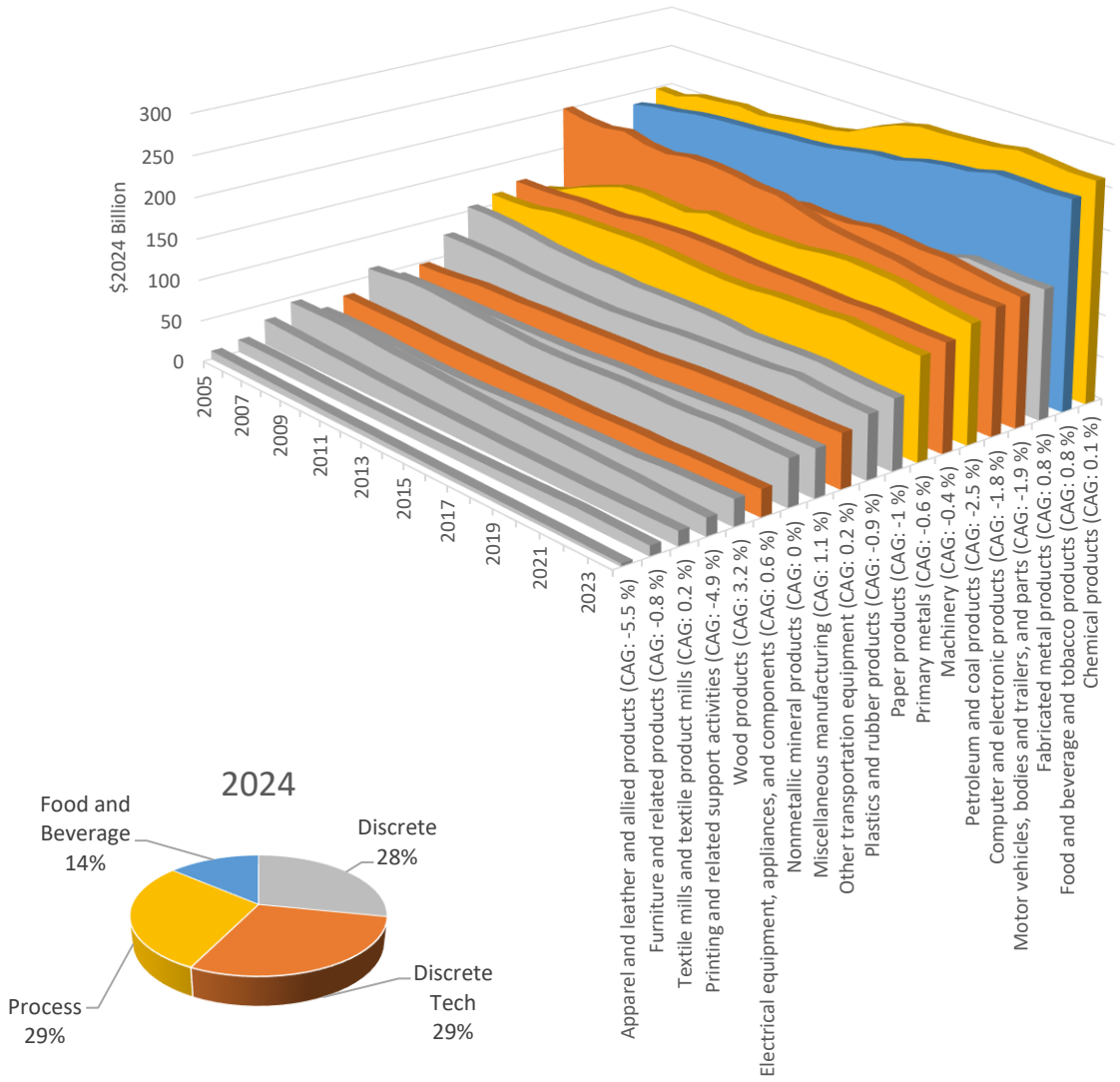


Figure 2.13: Current-Cost Net Stock: Private Equipment, Manufacturing (2005 to 2024)

NOTE: CAG5 = 5-year compound annual growth rate (Calculated using BEA data)
NOTE: Colors in each figure correspond. For instance, food/beverage is colored purple in both figures
Adjusted using the Consumer Price Index from the Bureau of Labor Statistics
Data Source: Bureau of Economic Analysis. (2026b) "Fixed Assets Accounts Tables." Table 3.1E. Current-Cost Net Stock of Private Equipment by Industry. https://apps.bea.gov/iTable/iTable.cfm?ReqID=10&step=2

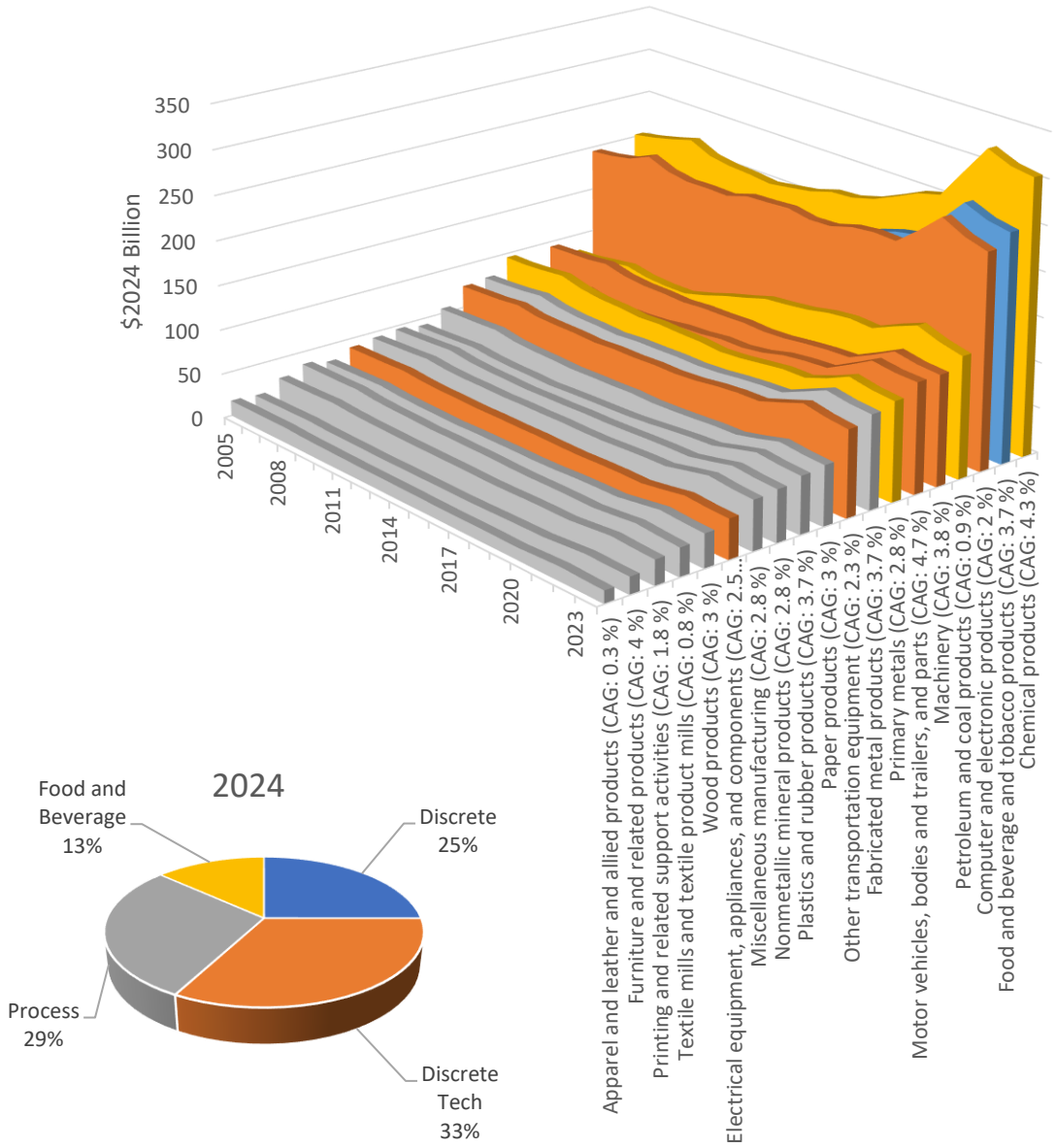


Figure 2.14: Current-Cost Net Stock: Private Structures, Manufacturing (2005 to 2024)

NOTE: CAG5 = 5-year compound annual growth rate (Calculated using BEA data)
NOTE: Colors in each figure correspond. For instance, food/beverage is colored purple in both figures
Adjusted using the Consumer Price Index from the Bureau of Labor Statistics
Data Source: Bureau of Economic Analysis. (2026b) "Fixed Assets Accounts Tables."
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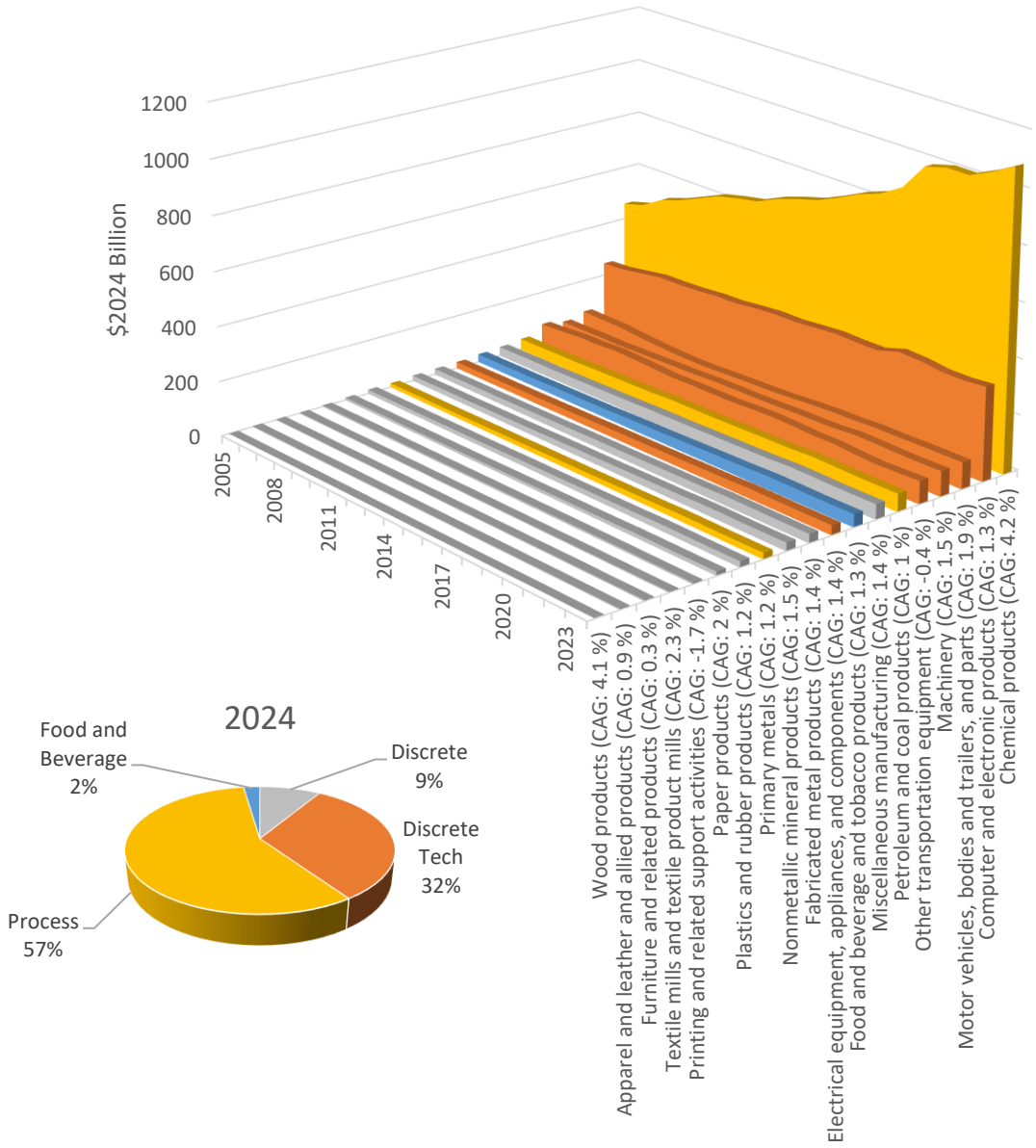


Figure 2.15: Current-Cost Net Stock: Intellectual Property Products, Manufacturing (2005 to 2024)

NOTE: CAG5 = 5-year compound annual growth rate (Calculated using BEA data)
NOTE: Colors in each figure correspond. For instance, food/beverage is colored blue in both figures
Adjusted using the Consumer Price Index from the Bureau of Labor Statistics
Data Source: Bureau of Economic Analysis. (2026b) "Fixed Assets Accounts Tables." Table 3.1I. Current-Cost Net Stock of Intellectual Property Products by Industry. https://apps.bea.gov/iTable/iTable.cfm?ReqID=10&step=2

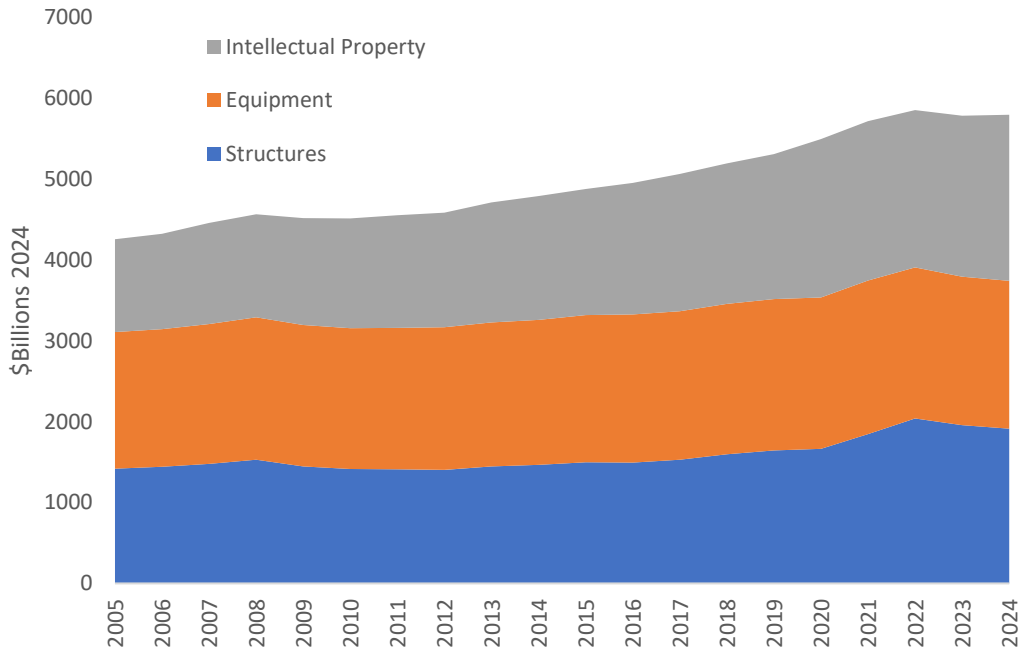


Figure 2.16: Current-Cost Net Stock in Manufacturing, by Type (2005 to 2024)

Adjusted using the Consumer Price Index from the Bureau of Labor Statistics
Data Source: Bureau of Economic Analysis. (2026b) "Fixed Assets Accounts Tables."
https://apps.bea.gov/iTable/iTable.cfm?ReqID=10&step=2

3. Expenditures and Supply Chains

There are many suppliers of goods and services that have a stake in manufacturing; these include resellers, providers of transportation and warehousing, raw material suppliers, suppliers of intermediate goods, and suppliers of professional services.

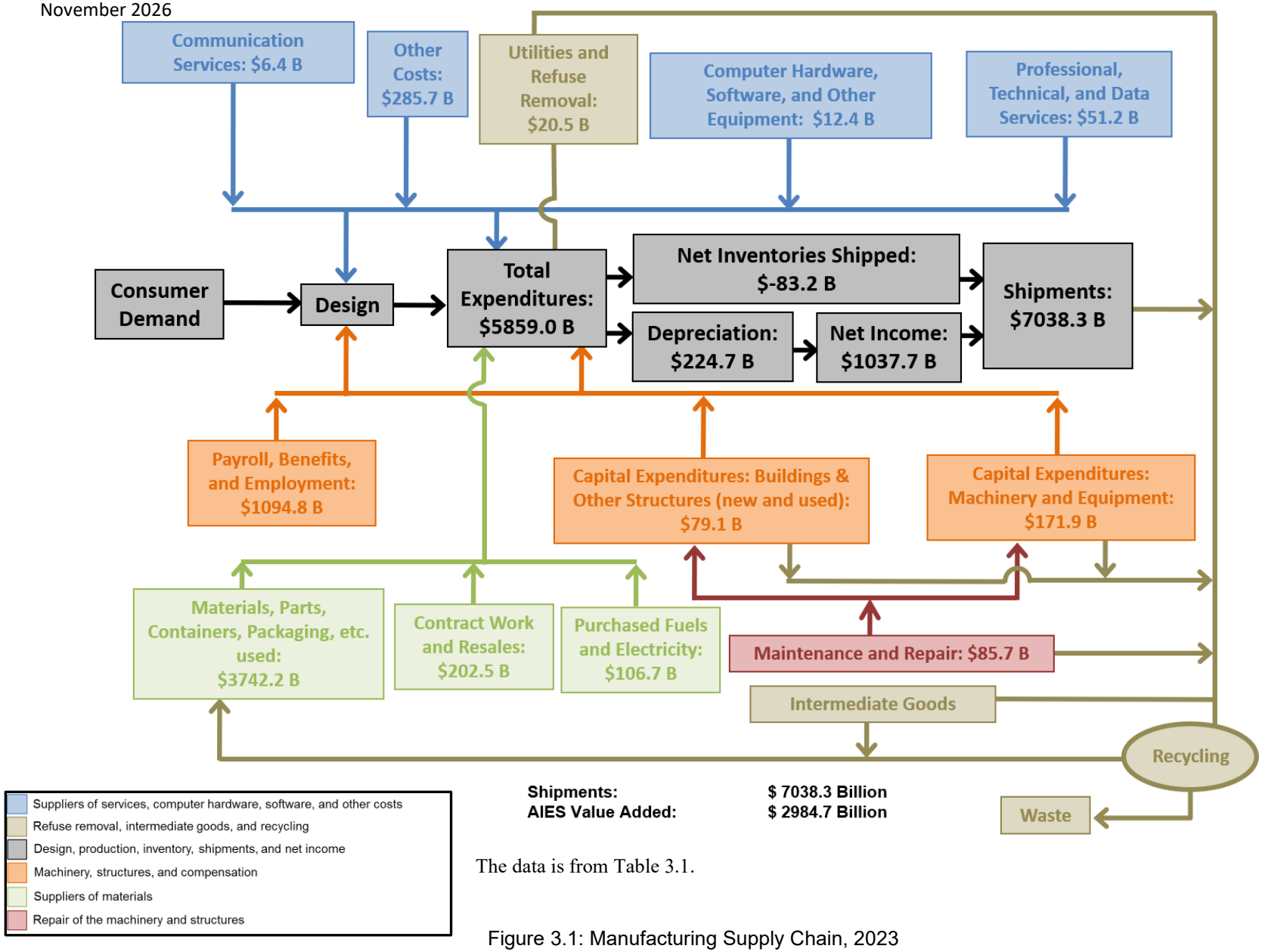
3.1. Expenditures, Depreciation, Replacements, and Losses

Using data from the Annual Survey of Manufactures (U.S. Census Bureau 2023), Table 3.1 presents and Figure 3.1 maps the purchases that the manufacturing industry made for production, which is disaggregated into five categories: suppliers of services,

Table 3.1: Supply Chain Entities and Contributions, Annual Survey of Manufactures, 2023

	($Billions 2023)
I. Services, Computer Hardware, Software, and Other Expenditures	
a. Communication Services*	6.4
b. Computer Hardware, Software, and Other Equipment*	12.4
c. Professional, Technical, and Data Services	51.2
d. Other Expenditures	285.7
e. TOTAL	**355.7**
II. Water, Sewer, Refuse Removal, and Other Utilities	**20.5**
III. Machinery, Structures, and Compensation Expenditures	
a. Payroll, Benefits, and Employment	1094.8
b. Capital Expenditures: Structures (including rental)*	79.1
c. Capital Expenditures: Machinery/Equipment (including rental)*	171.9
d. TOTAL	**1345.8**
IV. Suppliers of Materials Expenditures	
a. Materials, Parts, Containers, Packaging, etc… Used	3742.2
b. Contract Work and Resales	202.5
c. Purchased Fuels and Electricity	106.7
d. TOTAL	**4051.3**
V. Maintenance and Repair Expenditures	**85.7**
VI. Shipments	
a. Expenditures	5859.0
b. Net Inventories Shipped*	-83.2
c. Depreciation**	224.7
d. Net Income	1037.7
E. TOTAL	**7038.3**
VII. Value Added estimates	
a. Value added calculated VI.E-VI.b-VI.A+III.a	2357.3
b. AIES Value added	2984.7
c. BEA value added	2816.5

* Approximated using ratios from the Annual Survey of Manufacturers (2023)
** Approximated using the depreciation ratio from the 2012 Economic Census
Note: Colors correspond with those in Figure 3.1
Source: U.S. Census Bureau. (2026). “Annual Integrated Economic Survey.” https://www.census.gov/programs-surveys/aies.html



The data is from Table 3.1.

Figure 3.1: Manufacturing Supply Chain, 2023

computer hardware, software, and other costs (blue); refuse removal (gold); machinery, structures, and compensation (orange); repair of the machinery and structures (red); and suppliers of materials (green). These items all feed into the design and production of manufactured goods which are inventoried and/or shipped (gray). The depreciation of capital and net income is also included in Figure 3.1, which affects the market value of shipments. High-cost items might be seen as opportunities where productivity can have significant effects on competitiveness. In addition to the stakeholders, there are also public vested interests, the end users, and financial service providers to be considered.

Some of the costs of production are caused by losses due to waste or defects. Unfortunately, there is limited data and information on these losses. The research that does exist is often case studies within various industries and countries, which provide only limited insight to U.S. national trends. Tabikh estimates from survey data in Sweden that the percent of planned production time that is downtime amounts to 13.3 % (Tabikh 2014). According to NIST's Manufacturing Cost Guide, downtime amounts to 8.3 % of planned production time and amounts to $245 billion for discrete manufacturing (i.e., NAICS 321-339 excluding NAICS 324 and 325) (Thomas 2020). In addition to downtime, defects result in additional losses. IndustryWeek's best plants report estimates that among those considered as high performers, the plant defect rate was 25 934 parts per million or 2.6 % with a high of 357 964 or 35.8 % and a low of 8617 or 0.9 % (IndustryWeek 2024). The Manufacturing Cost Guide estimates that defects amount to between $32.0 billion and $58.6 billion for discrete manufacturing (i.e., NAICS 321-339 excluding NAICS 324 and 325), depending on the method used for estimation (Thomas 2020).

The USGS estimates that 15 % of steel mill products end up as scrap in the manufacturing process (Fenton 2001). Other sources cite that at least 25 % of liquid steel and 40 % of liquid aluminum does not make it into a finished product due primarily to metal quality (25 % of steel loss and 40 % of aluminum loss), the shape produced[1] (10 % to 15 % of loss), and defects in the manufacturing processes (5 % of loss) (Allwood 2012). Material losses mean there is the possibility of producing the same goods using less material, which could have rippling effects up and down the supply chain. There would be reductions in the burden of transportation, material handling, machinery, inventory costs, and energy use along with many other activities associated with handling and altering materials. Another source of losses can be found in cybercrime where criminals can disrupt production and/or steal intellectual property. The Manufacturing Cost Guide estimates that manufacturers lost between $8.9 billion and $38.6 billion due to cybercrime.

Manufacturing costs also accumulate in assets such as buildings, machinery, and inventory. In addition to the estimates provided in Figure 2.13, Figure 2.14, Figure 2.15, and Figure 2.16, data on assets is published periodically in the Economic Census. As seen in Table 3.2, total depreciable assets amount to $3.0 trillion with $2.2 trillion being machinery and equipment. The adoption of new technologies often requires new assets

[1] The steel and aluminum industry often produce standard shapes rather than customized shapes tailored to specific products. This results in needing to cut away some portion of material, which ends up as scrap.

Table 3.2: Depreciable Assets and the Rate of Change, 2022 ($Billion 2022)

NAICS Code	Meaning of NAICS code	Capital Expenditures		Retirements		Gross value of depreciable assets (acquisition costs)		Percent of assets that are new	
		Buildings and Structures	**Machinery and Equipment**	**Buildings and Structures**	**Machinery and Equipment**	**Buildings and Structures**	**Machinery and Equipment**	**Buildings and Structures**	**Machinery and Equipment**
311	Food	5.10	15.71	1.30	4.56	99.23	245.83	5.1%	6.4%
312	Beverage and Tobacco Product	1.38	3.42	0.47	1.14	32.46	52.20	4.2%	6.5%
313	Textile Mills	0.08	0.40	0.05	0.24	3.50	11.97	2.2%	3.4%
314	Textile Product Mills	0.05	0.28	0.04	0.15	1.65	4.39	2.8%	6.3%
315	Apparel	0.01	0.08	0.05	0.04	0.78	1.33	1.8%	5.6%
316	Leather and Allied Product	0.01	0.04	0.00	0.01	0.57	0.81	2.6%	5.5%
321	Wood Product	1.34	4.75	0.22	0.98	16.82	54.59	8.0%	8.7%
322	Paper	1.52	8.70	0.39	4.62	25.10	150.51	6.0%	5.8%
323	Printing and Related Support Activities	0.23	1.90	0.18	1.01	9.30	34.43	2.5%	5.5%
324	Petroleum and Coal Products	2.86	8.05	0.69	1.35	64.94	218.65	4.4%	3.7%
325	Chemical	7.43	24.04	2.66	9.75	130.28	414.39	5.7%	5.8%
326	Plastics and Rubber Products	1.56	10.65	0.32	2.45	40.50	128.74	3.8%	8.3%
327	Nonmetallic Mineral Product	1.48	6.14	0.58	2.38	22.64	82.25	6.5%	7.5%
331	Primary Metal	2.20	9.05	0.39	2.72	29.24	137.35	7.5%	6.6%
332	Fabricated Metal Product	2.39	10.13	0.86	3.61	43.14	146.47	5.5%	6.9%
333	Machinery	2.30	6.52	0.76	3.12	41.28	104.74	5.6%	6.2%
334	Computer and Electronic Product	4.66	11.14	0.77	3.27	49.91	108.85	9.3%	10.2%
335	Elect. Equip., Appliance, and Components	0.65	2.63	0.13	0.90	15.31	36.88	4.2%	7.1%
336	Transportation Equipment	6.60	20.31	1.01	4.79	91.43	255.77	7.2%	7.9%
337	Furniture and Related Product	0.49	1.39	0.19	0.50	7.36	14.29	6.7%	9.7%
339	Miscellaneous	0.90	2.32	0.36	1.00	17.81	39.01	5.1%	5.9%
31-33	Total Manufacturing	43.24	147.64	11.42	48.63	743.25	2,243.45	5.8%	6.6%

Data Source: U.S. Census Bureau. (2025). 2022 Economic Census. EC2231BASIC: Manufacturing Summary Statistics. https://www.census.gov/data/tables/2022/econ/economic-census/naics-sector-31-33.html

(e.g., machinery). By the end of the 2022 year, 6.6 % of manufacturing depreciable assets were new. This rate provides some insight into the rate of change for assets.

3.2. Supply Chains

Direct and Indirect Manufacturing: As previously mentioned, to achieve economy-wide efficiency improvements, researchers have suggested that "the supply chain must become the focus of policy management, in contrast to the traditional emphasis on single technologies/industries" (Tassey 2010). As seen in Table 3.3, there is an estimated $2639.9 billion in manufacturing value added with an additional $1864.0 billion in indirect value added from other industries for manufacturing, as calculated using input-output analysis.[2] Direct and indirect manufacturing accounts for 15.4 % of total GDP. In 2024, the U.S. manufacturing industry imported approximately 19.0 % of its intermediate goods, as seen in Table 3.4. As a proportion of output and imports (i.e., a proportion of the total inputs), intermediate imports represented 11.7 %. As can be seen in Table 3.4, these proportions change over the years but have a range within several percentage points.

Table 3.3: Direct and Indirect Manufacturing Value Added, 2024 ($Billion)

Industry and NAICS Code	Direct Value Added	Indirect Value Added	Total Direct and Indirect Value Added	Total as % of Total GDP
Total GDP			29 298.0	100%
31-33: Manufacturing	2 639.9	1 864.0	4 504.0	15.4%
Discrete	580.5	565.8	1 146.2	3.9%
Discrete Tech	859.5	637.6	1 497.1	5.1%
Process	843.9	848.4	1 692.3	5.8%
Food	354.3	671.8	1 026.1	3.5%

* The sum of the 3-digit NAICS does not equal total manufacturing due to overlap in supply chains.
Data Source: BEA. (2026c). Input-Output Accounts Data. https://www.bea.gov/industry/input-output-accounts-data
Note: These values are calculated by using the Excel solver to estimate final demand for each set of NAICS codes such that the total requirements table multiplied by the final demand estimate equals the industry output. All other industries are set to zero in the final demand.

The Federal Reserve estimates that 30 % of intermediate inputs are imported after accounting for indirect imports, such as imports into the service sector that serves manufacturing (De Michelis and Somale 2023). Note that Table 3.4 excludes indirect imports. Measuring imports can be complex and have different aspects. In the Federal Reserve note, De Michelis and Somale are discussing imports in the context of risk (e.g., national security) and measure it using the BEA input-output tables. When discussing indirect effects in terms of national manufacturing competitiveness, it is important to consider that U.S. products are embedded in U.S. imports. That is, the U.S. exports items that are integrated into products

[2] These values are calculated by using the Excel solver to estimate final demand for each set of NAICS codes such that the total requirements table multiplied by the final demand estimate equals the industry output. All other industries are set to zero in the final demand.

that are then imported into the United States. Given that the BEA input-output data is a national dataset and given the nature of input-output analysis, the BEA data likely does not fully account for the embedded U.S. products in U.S. imports. An assessment using the World Input-Output Data (WIOD) provides some insight, though. According to NIST Technical Note 1810, U.S. imports accounted for 15 % of the 2009 manufacturing supply chain and was among the lowest of the 40 nations examined (Thomas 2014). This analysis accounts for direct and indirect effects. Moreover, understanding the origin of the products produced in the U.S. is complex and caution is needed before acting based on such assessments. An economic input-output analysis using OECD inter-country input-output data, shown in Table 3.5, suggests the magnitude of estimates in Table 3.4 are reasonably representative. For all of U.S. manufacturing 12.9 % of its intermediate goods and services measured in value added are imported, as shown in the table. When focusing only on the manufactured goods imported, the U.S. manufacturing industry imports 7.9 % of its intermediate manufactured goods. For food, discrete, process, and discrete tech manufacturing, the imported portion of intermediate goods/services is 10.8%, 14.7%, 7.7%, and 14.7% respectively. As shown in Table 3.6, which shows the imported intermediates similar to that of Table 3.4 for each subsector of manufacturing, the variation by subsector can be significant.

Table 3.4: Imported Intermediate Manufacturing ($millions)

Year	Intermediate Manufacturing*	Intermediate Imports for Manufacturing**	Total Manufacturing Output	Intermediate Imports as a Percent of Intermediates	Intermediate imports as a Percent of Total Industry Output
2004	2,721,237	518,753	4,227,722	19.1%	12.3%
2009	2,776,626	540,688	4,327,389	19.5%	12.5%
2014	3,951,752	823,295	5,764,523	20.8%	14.3%
2019	3,631,406	699,677	5,710,349	19.3%	12.3%
2024	4,193,582	797,172	6,833,497	19.0%	11.7%

Source Data: Bureau of Economic Analysis. (2026c). Input-Output Accounts Data. https://www.bea.gov/industry/input-output-accounts-data
* Commodities used by industries
** From the import matrix

Table 3.5: Percent of Foreign Value Added Embedded in U.S. Manufacturing, 2022

	All U.S. Manufacturing	Food	Discrete	Process	Discrete Tech
Percent of all intermediate goods/services imported for U.S. manufacturing	12.9%	10.8%	14.8%	7.7%	14.7%
Percent of intermediate manufacturing imported for U.S. manufacturing	7.9%	6.8%	6.6%	3.7%	10.3%

Data Source: OECD. (2026). Inter-Country Input-Output Tables. https://www.oecd.org/en/data/datasets/inter-country-input-output-tables.html

A frequently invoked axiom suggests that roughly 80 % of a problem is due to 20 % of the cause, a phenomenon referred to as the Pareto principle (Hopp and Spearman 2008). That is, a small portion of the cause accounts for a large portion of the problem. Joseph Juran proposed that the Pareto principle could be applied to an organization's operations (Six Sigma Daily 2018). For instance, 80 % of defects would be the result of 20 % of the causes. Identifying that small portion of the cause (i.e., the 20 %) can facilitate making large efficiency improvements in operations. Manufacturing industry NAICS codes are categories of production activities. A larger industry (i.e., one in the top 20 %) suggests that there is more of a particular type of activity and/or the activities are more costly; thus, an increase in productivity in a larger industry would either reduce a costly activity or reduce an activity that occurs at high frequency. The result is a greater impact than might otherwise be achieved. Additionally, statistical evidence suggests that a dollar of research and development in a large cost supply chain entity has a higher return on investment than a small cost one (Thomas 2018). Table 3.7 presents the results of input-output analysis. It shows that wholesale trade is a major contributor to manufacturing, as is professional and business services. These costs present an opportunity where productivity increases might have significant impact. Table 3.8 presents an economic input-output analysis at a more detailed level, as it breaks up the industries being analyzed (i.e., discrete, discrete tech, process, and food) and provides more granularity as to what is being supplied. Items shown in red and/or orange might be considered high-cost items where there is opportunity for productivity to increase competitiveness. For instance, primary metals contributes $164.8 to producing discrete manufacturing.

Table 3.6: Imported Intermediate Manufacturing, by Subsector ($million), 2024

	Intermediate Manufacturing*	Intermediate Imports for Manufacturing**	Total Manufacturing Output	Intermediate Imports as a Percent of Intermediates	Intermediate imports as a Percent of Total Industry Output
321: Wood products	113 877	10 613	170 426	9.3%	6.2%
327: Nonmetallic mineral products	97 276	8 895	169 859	9.1%	5.2%
331: Primary metals	225 280	49 792	299 581	22.1%	16.6%
332: Fabricated metal products	268 562	35 775	446 678	13.3%	8.0%
333: Machinery	224 632	48 592	417 096	21.6%	11.7%
334: Computer and electronic products	87 394	23 748	335 997	27.2%	7.1%
335: Electrical equipment, appliances, and components	111 181	24 543	185 555	22.1%	13.2%
3361MV: Motor vehicles, bodies and trailers, and parts	577 560	134 415	749 746	23.3%	17.9%
3364OT: Other transportation equipment	174 560	51 149	346 431	29.3%	14.8%
337: Furniture and related products	49 890	8 506	82 104	17.0%	10.4%
339: Miscellaneous manufacturing	62 952	8 826	161 197	14.0%	5.5%
311FT: Food and beverage and tobacco products	899 047	74 748	1 253 389	8.3%	6.0%
313TT: Textile mills and textile product mills	30 331	4 720	46 040	15.6%	10.3%
315AL: Apparel and leather and allied products	10 214	1 281	22 957	12.5%	5.6%
322: Paper products	144 748	20 171	217 171	13.9%	9.3%
323: Printing and related support activities	45 970	5 641	89 528	12.3%	6.3%
324: Petroleum and coal products	453 623	169 436	639 248	37.4%	26.5%
325: Chemical products	420 572	87 368	906 832	20.8%	9.6%
326: Plastics and rubber products	195 913	28 927	293 662	14.8%	9.9%

Source Data: Bureau of Economic Analysis. (2026c). Input-Output Accounts Data. https://www.bea.gov/industry/input-output-accounts-data
* Commodities used by industries ** From the import matrix

Table 3.7: Domestic U.S. Manufacturing Supply Chain, 2024 Value Added.

	Description	$Billion	% of Total
31G	Manufacturing	2639.9	58.6%
42	Wholesale trade	345.8	7.7%
PROF	Professional and business services	342.1	7.6%
21	Mining	284.2	6.3%
FIRE	Finance, insurance, real estate, rental, and leasing	271.8	6.0%
11	Agriculture, forestry, fishing, and hunting	192.9	4.3%
48TW	Transportation and warehousing	161.5	3.6%
G	Government	59.9	1.3%
51	Information	59.9	1.3%
22	Utilities	59.0	1.3%
23	Construction	22.9	0.5%
81	Other services, except government	22.8	0.5%
7	Arts/entertainment, recreation, accommodation, food services	21.3	0.5%
44RT	Retail trade	19.0	0.4%
6	Educational services, health care, and social assistance	0.9	0.0%
		4504.0	100.0%

Data Source: Bureau of Economic Analysis. (2026c). Input-Output Accounts Data. https://www.bea.gov/industry/input-output-accounts-data
Note: Calculated using methods described in Table 3.2; however, the BEA industry-by-commodity after redefinitions input-output data with 15 total industries was used.

Table 3.8: Supply Chain Costs By Industry Grouping ($Billion), 2024

	Discrete[1]	Discrete Tech[2]	Process[3]	Food[4]
Farms	7.6	2.3	19.6	382.8
Forestry, fishing, and related activities	21.9	2.1	4.6	28.9
Oil and gas extraction	12.3	10.1	448.0	12.6
Mining, except oil and gas	24.0	12.8	26.8	5.0
Support activities for mining	1.7	1.0	26.4	0.9
Utilities	27.7	21.0	37.4	23.0
Construction	13.5	10.6	19.5	10.2
Wood products[1]	165.3	11.8	8.8	5.4
Nonmetallic mineral products[1]	169.9	15.6	13.2	5.9
Primary metals[3]	164.8	213.5	299.6	20.0
Fabricated metal products[1]	446.7	116.1	62.1	33.3
Machinery[2]	18.9	417.1	29.6	12.7
Computer and electronic products[2]	24.1	336.0	18.6	11.5
Electrical equipment, appliances, and components[2]	11.4	185.6	10.0	8.2
Motor vehicles, bodies and trailers, and parts[2]	19.2	749.7	14.1	13.5

Other transportation equipment[2]	1.1	346.4	1.4	0.8
Furniture and related products[1]	82.1	0.9	0.7	0.3
Miscellaneous manufacturing[1]	161.2	6.5	2.4	0.8
Food and beverage and tobacco products[4]	6.8	2.8	16.6	1 253.4
Textile mills and textile product mills[1]	46.0	5.8	7.7	1.8
Apparel and leather and allied products[1]	23.0	1.3	0.1	1.0
Paper products[1]	217.2	23.5	24.0	42.5
Printing and related support activities[1]	89.5	2.3	2.4	1.6
Petroleum and coal products[3]	14.3	11.7	639.2	15.3
Chemical products[3]	87.7	60.6	906.8	74.6
Plastics and rubber products[3]	31.4	49.4	293.7	33.3
Wholesale trade	136.8	229.9	183.4	179.1
Motor vehicle and parts dealers	2.9	7.6	2.0	2.5
Food and beverage stores	0.1	0.1	0.1	0.1
General merchandise stores	0.3	0.5	0.3	0.4
Other retail	5.0	4.1	5.2	4.3
Air transportation	3.9	3.5	3.4	3.1
Rail transportation	12.0	7.7	14.8	11.8
Water transportation	1.5	1.0	2.4	3.1
Truck transportation	34.5	33.4	38.8	57.4
Transit and ground passenger transportation	2.5	2.1	2.2	1.6
Pipeline transportation	1.8	1.4	25.3	1.8
Other transportation and support activities	14.8	14.0	15.1	15.6
Warehousing and storage	15.2	8.3	12.1	11.2
Publishing industries, except internet (includes software)	3.7	3.6	3.1	2.4
Motion picture and sound recording industries	1.0	1.0	1.0	0.8
Broadcasting and telecommunications	9.6	9.0	9.0	7.0
Data processing, internet publishing, and other information services	19.5	17.0	14.2	11.6
Federal Reserve banks, credit intermediation, and related activities	29.5	33.4	34.4	25.1
Securities, commodity contracts, and investments	13.0	15.7	13.5	6.3
Insurance carriers and related activities	26.7	34.2	34.0	31.6
Funds, trusts, and other financial vehicles	0.1	0.2	0.2	0.2
Housing	0.0	0.0	0.0	0.0
Other real estate	46.1	39.4	43.0	37.4
Rental and leasing services and lessors of intangible assets	23.7	28.5	29.1	21.9
Legal services	12.8	11.3	11.7	7.8
Computer systems design and related services	9.4	11.1	14.4	6.6
Miscellaneous professional, scientific, and technical services	51.3	50.5	53.8	44.6
Management of companies and enterprises	35.9	55.5	74.1	51.1
Administrative and support services	43.9	40.8	38.4	27.3
Waste management and remediation services	5.9	5.5	8.6	3.9
Educational services	0.2	0.2	0.2	0.2
Ambulatory health care services	0.1	0.1	0.1	0.1
Hospitals	0.0	0.0	0.0	0.0
Nursing and residential care facilities	0.1	0.1	0.1	0.1
Social assistance	0.0	0.0	0.0	0.0

Performing arts, spectator sports, museums, and related activities	2.6	2.7	2.8	2.3
Amusements, gambling, and recreation industries	0.8	0.8	0.9	0.7
Accommodation	3.3	2.9	2.9	2.1
Food services and drinking places	6.8	6.4	6.7	5.6
Other services, except government	13.3	12.1	13.3	9.8
Federal general government (defense)	0.0	0.0	0.0	0.0
Federal general government (nondefense)	6.5	10.9	9.6	6.0
Federal government enterprises	2.9	3.6	3.6	3.0
State and local general government	9.4	9.6	13.5	3.2
State and local government enterprises	12.8	10.2	16.2	11.1

Data Source: Bureau of Economic Analysis. (2026c). Input-Output Accounts Data. https://www.bea.gov/industry/input-output-accounts-data
Note: Calculated using methods described in Table 3.2; however, the BEA industry-by-commodity after redefinitions input-output data was used.
Note: The values are colored green through yellow and red to aid in identifying low/high values. Green is low while red is high.
[1] Discrete Manufacturing includes NAICS 321, 327, 332, 337, 339, 313-323
[2] Discrete Tech Manufacturing includes NAICS 333-336
[3] Process Manufacturing includes NAICS 324-326
[4] Food Manufacturing includes NAICS 311

4. Employment, Compensation, Profits, and Productivity

Section 2 focused on measuring the size of the manufacturing industry and comparing it internationally while Section 3 discussed supply chains and expenditures. This section shifts to examining benefits to stakeholders along with some of the non-financial costs that are born out to them.

4.1. Employment

The Annual Survey of Manufactures estimates that there were 12.2 million employees in the manufacturing industry in 2023, which is the most recent data available (see Table 4.1). The Current Population Survey estimates that there were 15.1 million manufacturing employees in 2024 and the Current Employment Statistics estimates 12.6 million employees in 2025, the most recent data available (see Table 4.2 and Table 4.3). According to data in Table 4.2, manufacturing accounted for 9.3 % of total employment. Approximately, 34.0 % of manufacturing employment was production workers with an additional 20.3 % being management, business, and financial operations occupations along with 17.0 % being professional and related occupations. As seen in Table 4.3, manufacturing employment has a 5-year compound annual growth rate of 0.8 %, which is less than that for total private employment. The source data for the estimates from Table 4.2 and Table 4.3 each have their own method for

Table 4.1: Employment, Annual Survey of Manufactures

NAICS	Meaning of NAICS code	2023 Employees
311	Food manufacturing	1 689 256
312	Beverage and tobacco product manufacturing	289 667
313	Textile mills	77 281
314	Textile product mills	95 517
315	Apparel manufacturing	65 341
316	Leather and allied product manufacturing	23 515
321	Wood product manufacturing	432 202
322	Paper manufacturing	343 429
323	Printing and related support activities	371 273
324	Petroleum and coal products manufacturing	98 208
325	Chemical manufacturing	884 498
326	Plastics and rubber products manufacturing	810 441
327	Nonmetallic mineral product manufacturing	413 857
331	Primary metal manufacturing	348 714
332	Fabricated metal product manufacturing	1 422 014
333	Machinery manufacturing	1 064 872
334	Computer and electronic product manufacturing	807 618
335	Electrical equipment, appliance, and component manufacturing	369 877*
336	Transportation equipment manufacturing	1 696 307
337	Furniture and related product manufacturing	35 7341
339	Miscellaneous manufacturing	53 3134
Total		12 194 362

Data Source: U.S. Census Bureau. (2026). “Annual Integrated Economic Survey.” https://www.census.gov/programs-surveys/aies.html

Table 4.2: Employment by Industry, by Occupation (2025): Current Population Survey

		Management, professional, and related occupations		Service occupations		Sales and office occupations		Natural resources construction, and maintenance occupations			Production, transportation, and material, moving occupations	
	Total employed	Management, business, and financial operations occupations	Professional and related occupations	Protective service occupations	Service occupations, except protective	Sales and related occupations	Office and administrative suppor occupations	Farming, fishing, and forestry occupations	Construction and extraction occupations	Installation, maintenance, and repair occupations	Production occupations	Transportation and material moving occupations
Agriculture and related	2,225	39.3%	3.2%	0.5%	3.6%	0.9%	4.9%	39.6%	0.5%	1.5%	1.9%	4.2%
Mining, quarrying, and oil and gas extraction	531	18.5%	12.6%	0.4%	0.9%	1.9%	7.2%	0.0%	33.5%	6.6%	8.3%	10.4%
Construction	12,121	21.1%	3.3%	0.2%	0.3%	1.3%	4.9%	0.1%	58.5%	5.7%	1.8%	2.7%
Manufacturing	15,134	20.3%	17.0%	0.3%	1.7%	4.0%	7.0%	0.1%	2.3%	4.8%	34.0%	8.5%
Wholesale and retail trade	19,616	8.8%	7.0%	0.4%	3.6%	43.9%	10.0%	0.2%	0.8%	3.6%	3.7%	18.1%
Transportation and utilities	10,209	12.3%	5.2%	0.7%	1.5%	1.7%	22.6%	0.0%	2.1%	5.4%	4.3%	44.2%
Information	2,786	26.5%	41.9%	0.4%	2.5%	7.0%	11.7%	0.0%	0.5%	7.4%	1.0%	1.1%
Financial activities	11,187	45.4%	11.5%	0.6%	2.0%	20.7%	16.2%	0.0%	0.5%	1.6%	0.6%	0.8%
Professional and business services	22,075	28.5%	33.5%	3.1%	15.5%	3.2%	9.9%	0.1%	0.7%	1.3%	1.5%	2.8%
Education and health services	37,955	11.3%	55.9%	0.6%	20.4%	0.4%	9.0%	0.0%	0.2%	0.5%	0.5%	1.2%
Leisure and hospitality	13,950	16.1%	7.8%	1.8%	58.1%	6.1%	5.4%	0.1%	0.1%	1.0%	1.1%	2.3%
Other services	7,760	15.1%	13.4%	0.3%	33.1%	4.3%	7.5%	0.1%	0.7%	15.0%	5.5%	5.0%
Public administration	7,944	20.9%	26.2%	23.5%	6.2%	0.4%	16.3%	0.1%	1.3%	1.8%	1.1%	2.0%
TOTAL	163,493											

Note: Shading aids in identifying high/low percentages where green is high and red is low.
Source: Bureau of Labor Statistics. (2025a) Current Population Survey. "Table 17: Employed Persons by Industry, Sex, Race, and Occupation." <http://www.bls.gov/cps>

how the data was acquired and its own definition of employment. The Current Population Survey considers an employed person to be any individual who did any work for pay or profit during the survey reference week or were absent from their job because they were ill, on vacation, or taking leave for some other reason. It also includes individuals who completed at least 15 hours of unpaid work in a family-owned enterprise operated by someone in their household. In contrast, the Current Employment Statistics specifically exclude proprietors, self-employed, and unpaid family or volunteer workers. Therefore, the estimates from the Current Employment Statistics are lower than the Current Population Survey estimates. Additionally, the Current Employment Statistics include temporary and intermittent employees. The Annual Survey of Manufactures considers an employee to include all full-time and part-time employees on the payrolls of operating establishments during any part of the pay period being surveyed excluding temporary staffing obtained through a staffing service. It also excludes proprietors along with partners of unincorporated businesses.

Between January 2005 and January 2010, manufacturing employment declined by 19.7 %, as seen in Figure 4.1. As of July 2026, employment was still 11.5 % below its 2005 level. Between January 2019 and April of 2020, manufacturing employment declined 10 percentage points to be 20.2 % below its 2005 level. By September 2021, manufacturing employment had risen to 13.1 % below its 2005 level.

Table 4.3: Manufacturing Employment (Thousands): Current Employment Statistics

	Total Private	Manufacturing	Durable Goods	Nondurable Goods
2016	122 111	12 324	7684	4640
2017	124 257	12 407	7708	4699
2018	126 454	12 653	7911	4742
2019	128 292	12 780	8002	4778
2020	120 200	12 127	7533	4594
2021	124 312	12 311	7638	4673
2022	130 330	12 767	7923	4844
2023	133 074	12 873	8023	4849
2024	134 324	12 789	7951	4838
2025	134 948	12 633	7832	4802
5-Year Compound Annual Growth	2.3%	0.8%	0.8%	0.9%

Source: Bureau of Labor Statistics. (2026b) Current Employment Statistics. http://www.bls.gov/ces/home.htm

4.2. Labor Hours, Injuries, and Fatalities

The employees that work in manufacturing offer their time and, in some cases, risk their personal safety in return for compensation. In terms of safety, the number of fatal injuries decreased 4.0 % between 2023 and 2024 (see Table 4.4). Nonfatal injuries decreased as did the injury rate (see Table 4.5). The incident rate for nonfatal injuries in manufacturing remains higher than that for all private industry. As illustrated in Figure 4.2, fatalities, injuries, and the injury rate have a five-year compound growth rate of 2.7 %, -3.7 %, and -3.8 % respectively. During the late 2000s recession, the average number of hours worked per week declined, as seen in Figure 4.3. Unlike employment, however, the number of hours worked per week returned to its pre-recession levels or slightly higher.

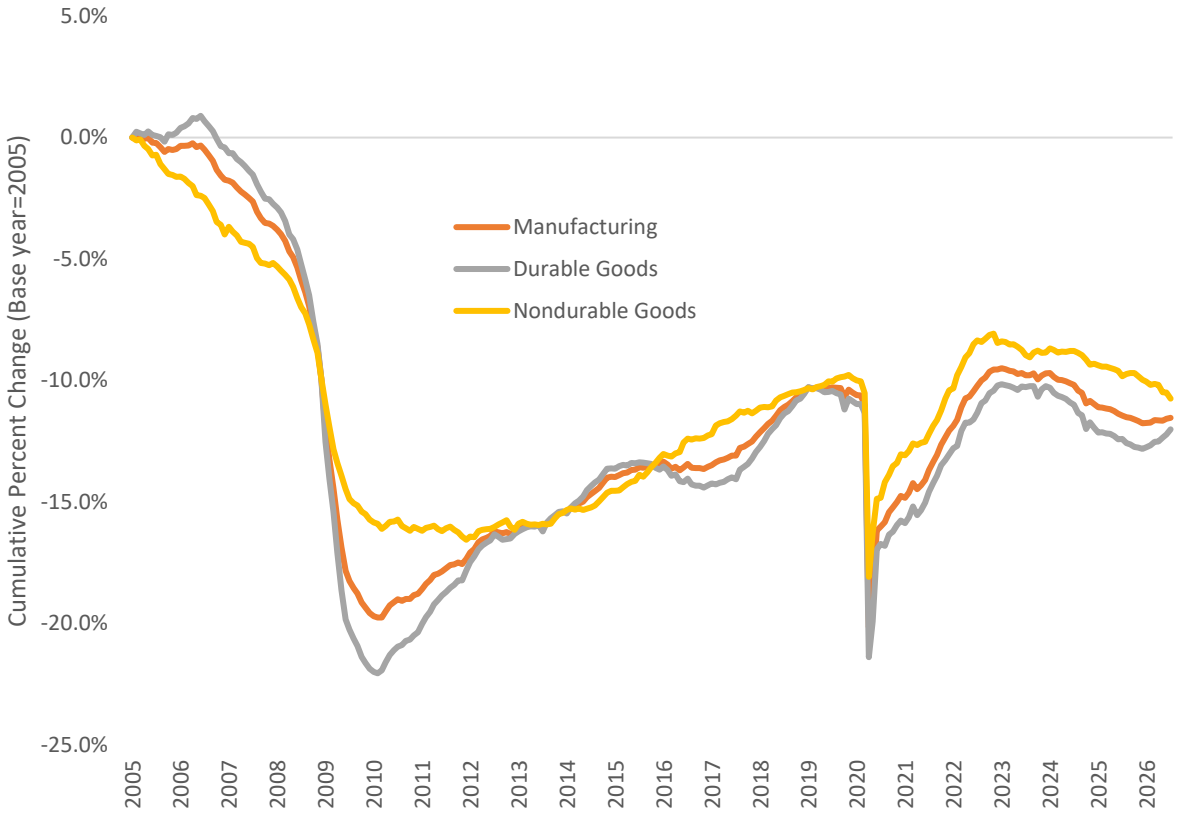


Figure 4.1: Cumulative Change in Percent in Manufacturing Employment (Seasonally Adjusted) 2005-2026

Source: Bureau of Labor Statistics. (2026b) Current Employment Statistics. http://www.bls.gov/ces/

Table 4.4: Fatal Occupational Injuries by Event or Exposure

		Total	Violence and other injuries by persons or animals	Transportation Incidents	fires and explosions	Falls, slips, trips	exposure to harmful sub-stances or environments	Contact with objects and equipment
2023	Total	5283	740	1942	104	885	820	779
	Manufacturing	391	40	80	–	57	71	120
2024	Total	5070	733	1937	93	844	687	756
	Manufacturing	353	49	65	11	52	69	104
Percent Change	Total	-4.0%	-0.9%	-0.3%	-10.6%	-4.6%	-16.2%	-3.0%
	Manufacturing	-9.7%	22.5%	-18.8%	–	-8.8%	-2.8%	-13.3%

Source: Bureau of Labor Statistics. Census of Fatal Occupational Injuries. "Industry by Event or Exposure." <https://www.bls.gov/iif/fatal-injuries-tables.htm>

Table 4.5: Total Recordable Cases of Nonfatal Injuries and Illnesses

		2023	2024	Percent Change
Manu-facturing	Incident Rate per 100 full time workers*	2.8	2.7	-3.6%
	Total Recordable Cases (thousands)	355.8	332.6	-6.5%
Private Industry	Incident Rate per 100 full time workers	2.4	2.3	-4.2%
	Total Recordable Cases (thousands)	2569.0	2488.4	-3.1%

Source: Bureau of Labor Statistics. Injuries, Illness, and Fatalities Program. 2020. http://www.bls.gov/iif/ and https://www.bls.gov/iif/nonfatal-injuries-and-illnesses-tables/soii-summary-historical.htm

* The incidence rates represent the number of injuries and illnesses per 100 full-time workers and were calculated as: (N/EH) x 200,000, where

N = number of injuries and illnesses

EH = total hours worked by all employees during the calendar year

200,000 = base for 100 equivalent full-time workers (working 40 hours per week, 50 weeks per year)

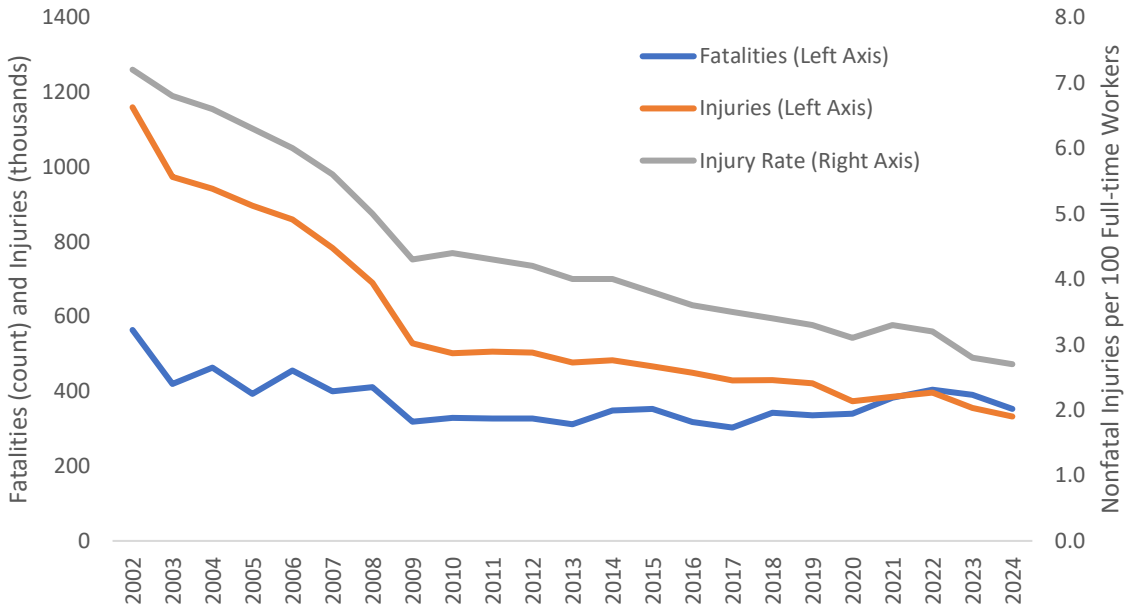


Figure 4.2: Manufacturing Fatalities and Injuries

Source: Bureau of Labor Statistics. (2026e). Injuries, Illness, and Fatalities Program. http://www.bls.gov/iif/
Source: Bureau of Labor Statistics. (2026d) Census of Fatal Occupational Injuries. "Industry by Event or Exposure." <http://stats.bls.gov/iif/oshcfoi1.htm>

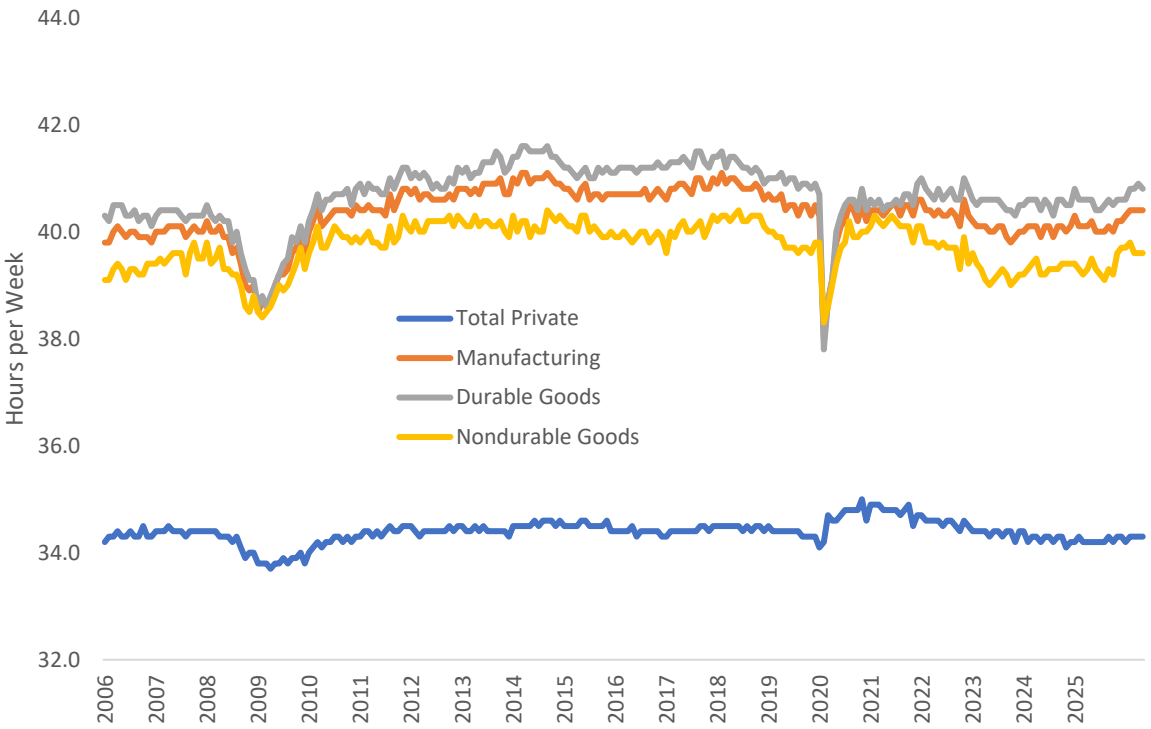


Figure 4.3: Average Weekly Hours for All Employees (Seasonally Adjusted)

Source: Bureau of Labor Statistics. (2026b) Current Employment Statistics. http://www.bls.gov/ces/home.htm

4.3. Wages, Compensation, Profits, and Inflation

Average wages increased significantly during the late 2000's recession and 2020 decline of GDP, as can be seen in Figure 4.4. This is likely because low-wage earners are disproportionately impacted by employment reductions, which suggests that high-wage earners not only receive more pay, but also have more job security. Average hours also dropped during the pandemic and has largely returned to pre-recession levels. Like the late 2000's recession, during the pandemic wages increased while hours and employment decreased.

The compound annual growth rate in constant dollars for private sector wages was 0.1 % between July 2021 and July 2026 and was 0.3 % for manufacturing, as illustrated in Figure 4.4. As illustrated in Figure 4.5, employee compensation in manufacturing, which includes benefits, has had a five-year compound annual growth of -0.8 %. While manufacturing compensation has had a negative trend, that of private industry has had a positive trend with a five-year compound annual growth rate of 0.5 %. Hourly compensation in manufacturing, which includes benefits, still exceeds that of the total private industry; however, the difference has narrowed significantly.

As illustrated in Figure 4.6, the prices received by producers for all manufacturing between July 2020 and July 2022 increased 33.4 % while in the fifteen years prior to that (i.e., June 2005 to June 2020) it only increased 30.1 % total. Thus, more than 15 years of price increases were

pressed into just two years. The 5-year compound annual growth in manufacturing prices was 4.6 %. As seen in Figure 4.7, price increases due to economic restrictions in 2020 were not observed until approximately a year later and lasted for two years. In August of 2025, 82 % of respondents for a survey of manufacturers indicated that their operating costs recently increased with 62 % saying it was an increase of 6 % or more, and 46 % indicating that the increase was 11 % or higher (Endeavor 2025). Approximately one year later in May 2026, the producer price index increased to 12.0 % from 1.0 % the previous year.

For those that invest in manufacturing, corporate profits have had a five-year compound annual growth of 10.3 % after adjusting for inflation using the consumer price index, as illustrated Figure 4.8, and nonfarm proprietors' income for manufacturing has had a five-year compound annual growth rate of 12.3 %, as illustrated in Figure 4.9.

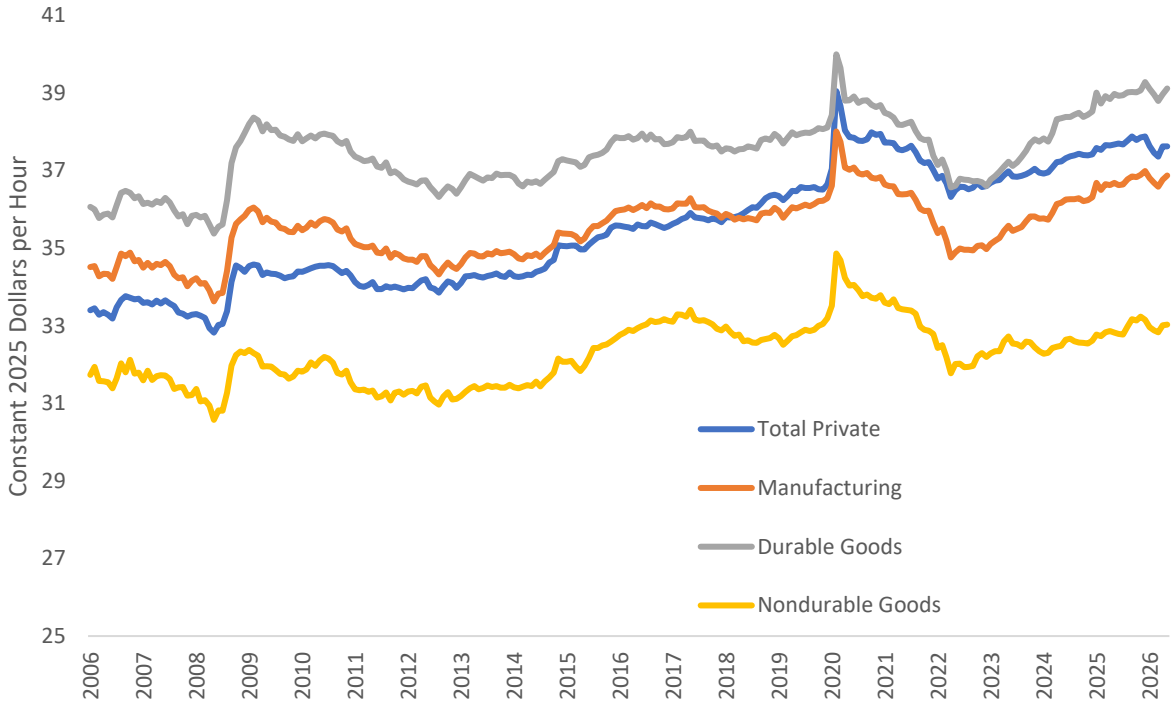


Figure 4.4: Average Hourly Wages for Manufacturing and Private Industry (Seasonally Adjusted)

Source: Bureau of Labor Statistics. (2025b) Current Employment Statistics. http://www.bls.gov/ces/home.htm
Adjusted using the CPI for all consumers. Bureau of Labor Statistics. (2025i). Consumer Price Index. https://www.bls.gov/cpi/data.htm

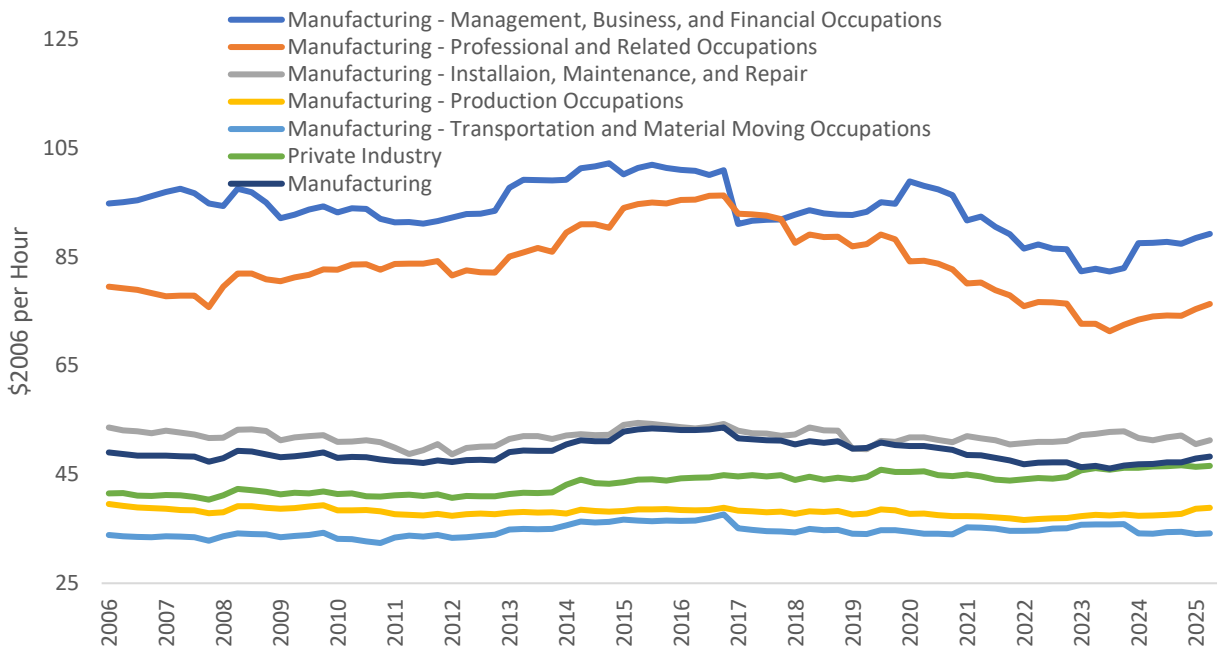


Figure 4.5: Employee Compensation (Hourly)

Source: Bureau of Labor Statistics. (2025f) National Compensation Survey. http://www.bls.gov/ncs/
Adjusted using the Consumer Price Index for all consumers from the Bureau of Labor Statistics.

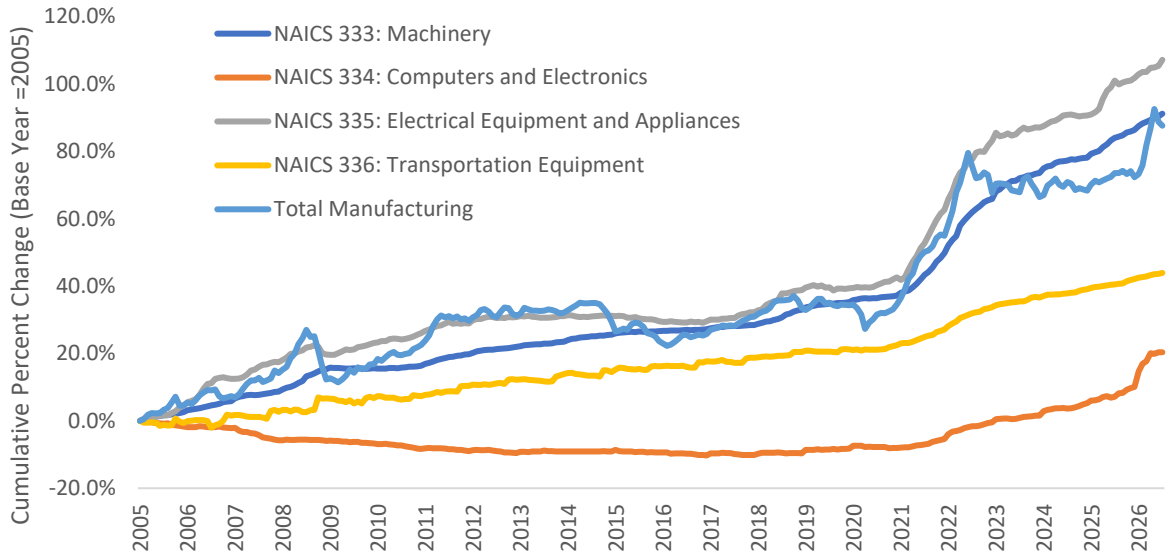


Figure 4.6: Inflation - Cumulative Percent Change in the Producer Price Index (Selling Price Received), 2005-2026

Source: Bureau of Labor Statistics. (2026h). Producer Price Index. https://stats.bls.gov/ppi/databases/

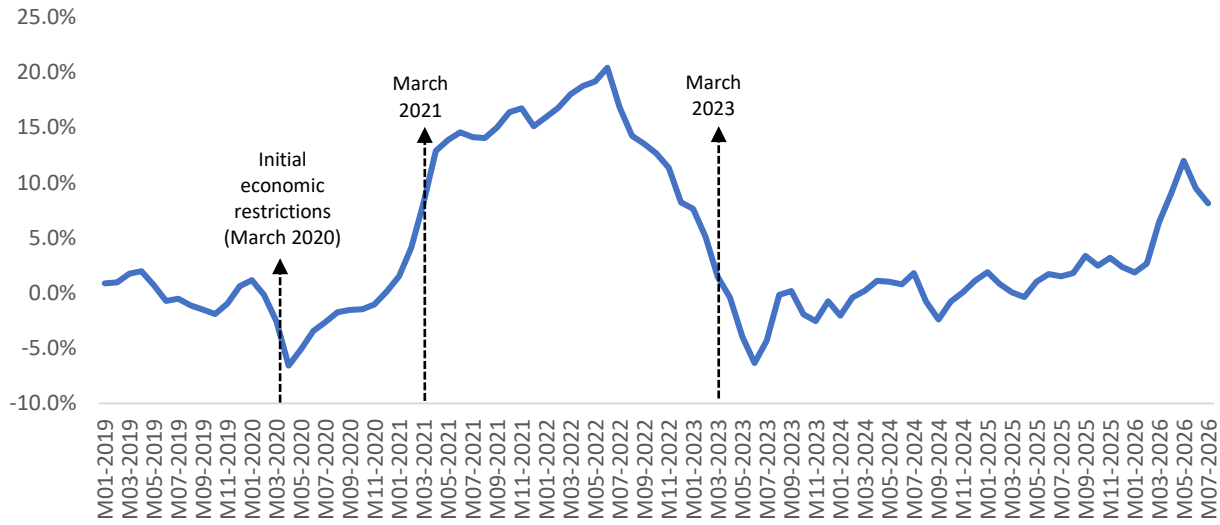


Figure 4.7: Rolling 1-Year Percent Change in the Producer Price Index for U.S. Manufacturing

Source: Bureau of Labor Statistics. (2025h). Producer Price Index. https://stats.bls.gov/ppi/databases/

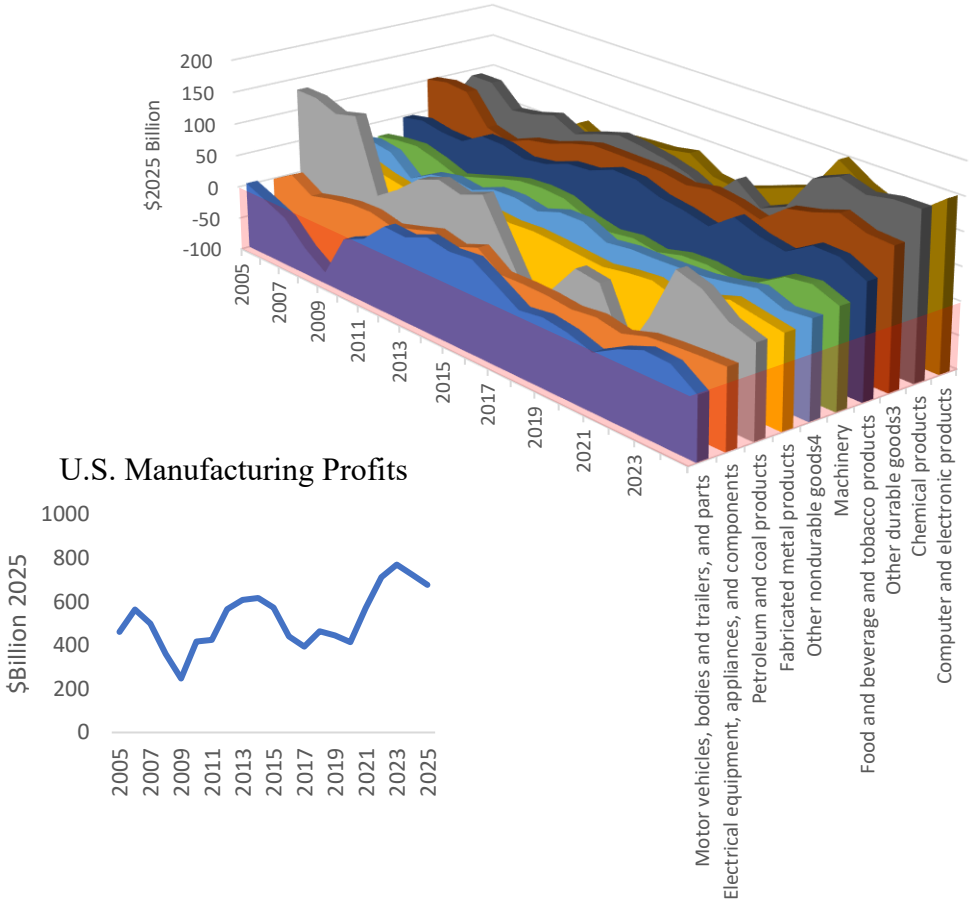


Figure 4.8: Profits for Corporations

Source: Bureau of Economic Analysis. (2026d) Income and Employment by Industry. Table 6.16D. Corporate Profits by Industry. https://apps.bea.gov/iTable/index_nipa.cfm.

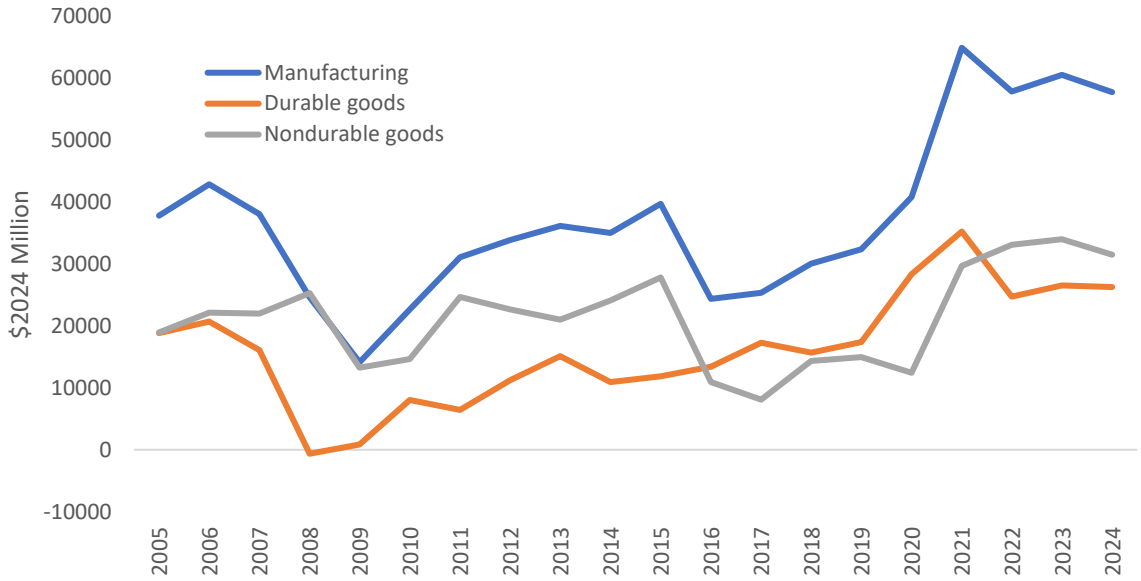


Figure 4.9: Nonfarm Proprietor's Income

Source: Bureau of Economic Analysis. (2025d) Income and Employment by Industry. Table 6.12D. Nonfarm Proprietors' Income. https://apps.bea.gov/iTable/index_nipa.cfm.

4.4. Productivity

There is a substantial amount of literature examining productivity with some suggesting that current measures might underrepresent some forms of productivity improvement (Brynjolfsson, Rock, and Syverson, 2021); thus, some caution is needed when interpreting industry productivity measures. In its simplest form, productivity is the units of output divided by the units of input. A true representation of productivity would likely need to account for not only the inputs and outputs for production of a product but also the use of the product. The evaluation of costs might be similar to how Thomas (2018) evaluates the life-cycle cost of manufactured goods for ground transportation, which includes the time for traveling, fuel, infrastructure costs (e.g., roads), and other costs. The evaluation of outputs would need to measure, in this instance, some unit for distance traveled. Current measures of productivity focus on the production portion of the equation and attempts to account for other costs and benefits through prices; however, prices are unlikely to fully represent the costs and benefits to the user.

An important aspect of manufacturing is the efficiency and productivity with which resources are used. Sustained increases in real GDP per capita only occur as a result of increases in productivity and/or efficiency (Krugman and Wells 2006; Greenlaw et al. 2022). Both private sector and public sector research and development have a key role in economic growth. For instance, an OECD study shows that an increase of 1 % in business research and development (R&D) generates 0.13 % in productivity growth while a 1 % increase in public R&D generates 0.17 % in productivity growth (Guellec and Bruno 2001). A number of other papers suggest that public R&D has as high or higher overall per dollar impact as that of the private sector (Ziesemer

2004; Herzer 2021); thus both are important for economic growth. Below are metrics for productivity with metrics related to research and development being presented in section 5.

The Bureau of Labor Statistics provides an index of labor productivity and total factor productivity. Labor productivity for manufacturing decreased between 2023 and 2024 by 0.7 %, as illustrated in Figure 4.10. The five-year compound annual growth is -0.4 %. The Bureau of Labor Statistics total factor productivity metric measures "the efficiency at which combined inputs are used to produce output of goods and services" (Bureau of Labor Statistics 2023). For U.S. manufacturing, total factor productivity decreased 0.3 % from 2023 to 2024 and has a 5-year compound annual growth rate of less than 0.1 %, as illustrated in Figure 4.11. There is a substantial amount of literature examining productivity with some suggesting that current measures might underrepresent some forms of productivity improvement. In general, productivity for all goods/services in the U.S. is relatively high compared to other countries, as illustrated in Figure 4.12.

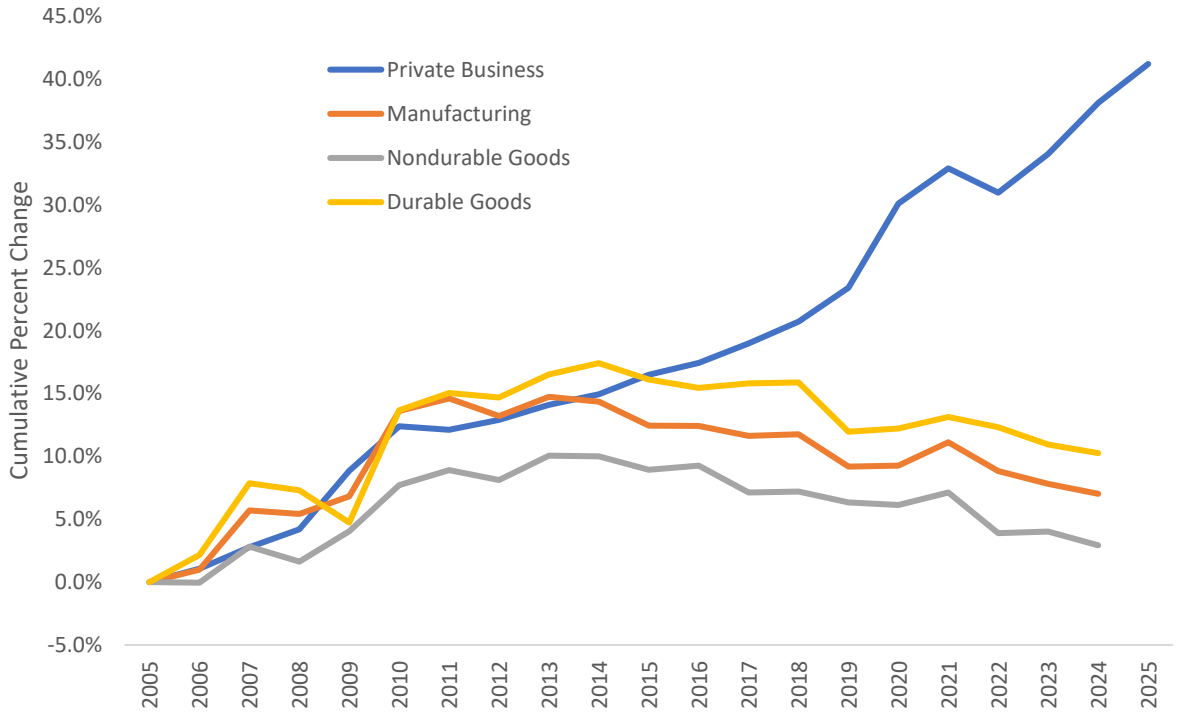


Figure 4.10: Manufacturing Labor Productivity Index (2017 Base Year = 100)

Source: Bureau of Labor Statistics. (2026g) Productivity. https://www.bls.gov/mfp/

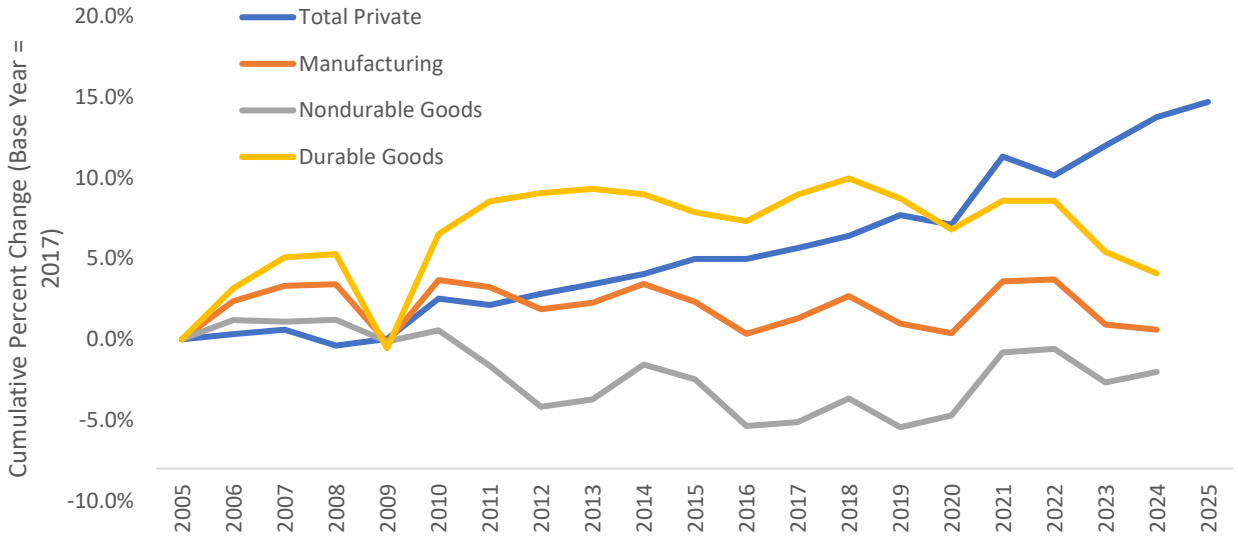


Figure 4.11: Manufacturing Total Factor Productivity Index

Source: Bureau of Labor Statistics. (2026g) Productivity. https://www.bls.gov/mfp/

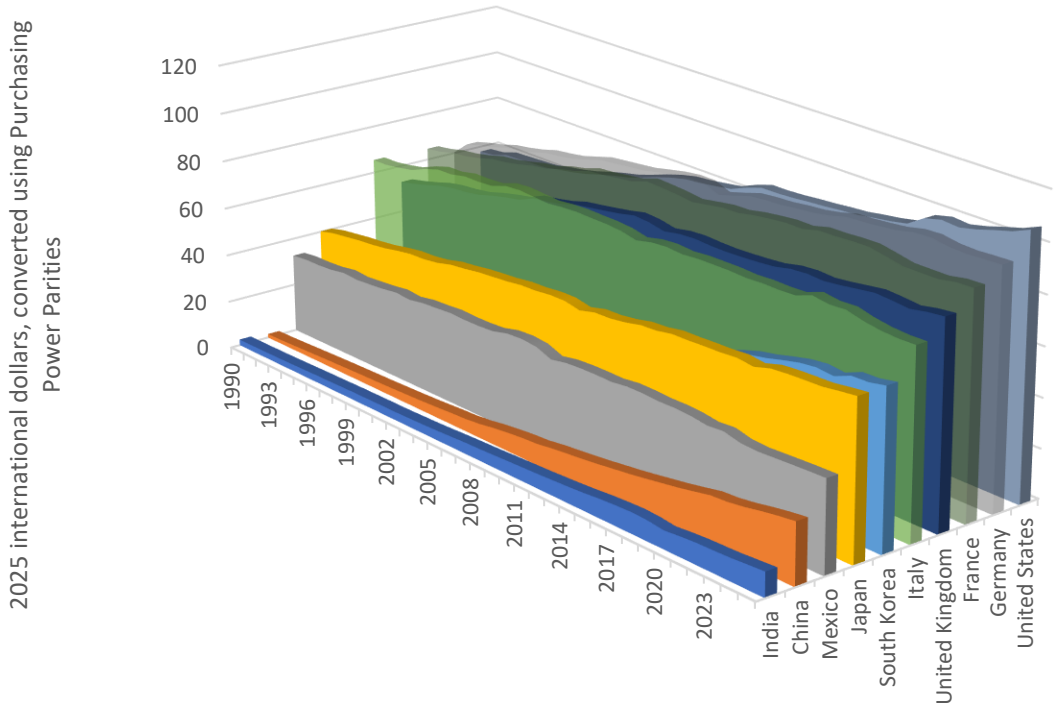


Figure 4.12: Output per Labor Hour (Top Ten Largest Manufacturing Countries from Figure 2.3)

Source: Conference Board. (2026) Total Economy Database: Output, Labor and Labor Productivity. https://www.conference-board.org/data/economydatabase/index.cfm?id=27762

5. Research, Innovation, and Factors for Conducting Business

Creating a successful manufacturing facility involves bringing together many resources in an efficient and innovative way. Similarly, cultivating and advancing national manufacturing activity requires bringing many resources together in just the right way. Manufacturers need skilled and knowledgeable labor, innovators, quality inputs, means for transporting goods, communication systems, energy, and access to customers. Measuring and comparing each of these presents a challenge. This section will present measures of innovation and factors that facilitate manufacturing.

5.1. Measures of Research and Innovation

Measuring and comparing innovation between countries is problematic, as there is no standard metric for measuring this activity. Four measures are often discussed regarding innovation: number of patent applications, research and development expenditures, number of researchers, and number of published journal articles. As seen in Figure 5.1, the U.S. ranked 4th in 2021 in resident patent applications per million people, which puts it above the 95th percentile among 113 countries. Using patent applications as a metric can be problematic though, as not all innovations are patented and some patents might not be considered innovation. The U.S. ranked 5th in research and development expenditures as a percent of GDP in 2023, which puts it above the 95th percentile (see Figure 5.2) among 84 nations. BEA data on U.S. research and development is broken out in Figure 5.3. Note that in 2023 manufacturing accounted for 29.8 % of U.S. value added research and development and for employment it is 25.4 %. The 5-year compound annual

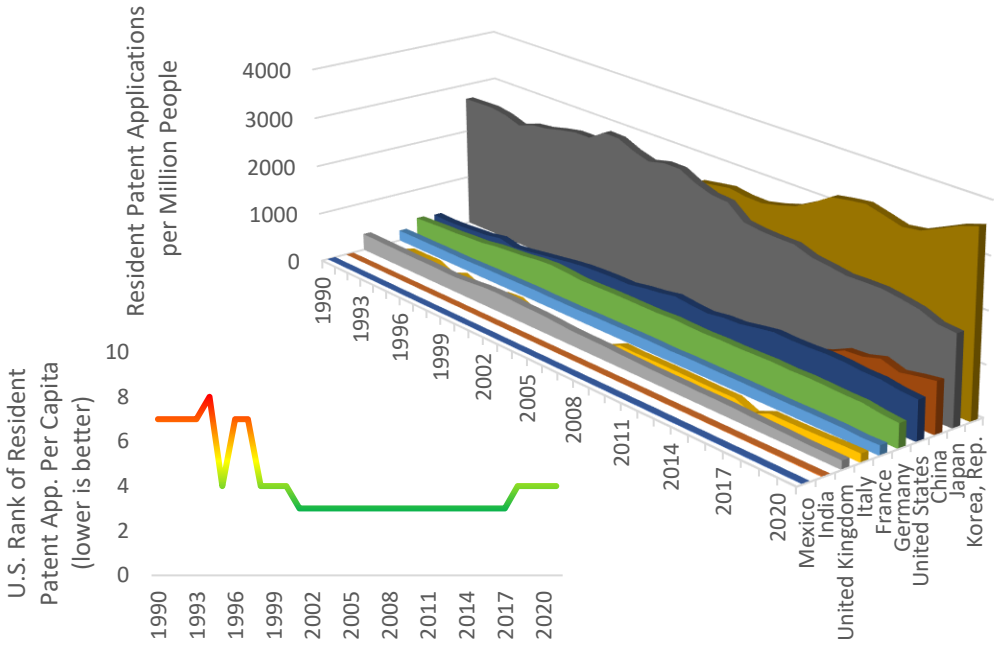


Figure 5.1: Patent Applications (Residents) per Million People, Top Ten Largest Manufacturing Countries (1990-2021)

World Bank. 2026. World Development Indicators. https://data.worldbank.org/products/wdi

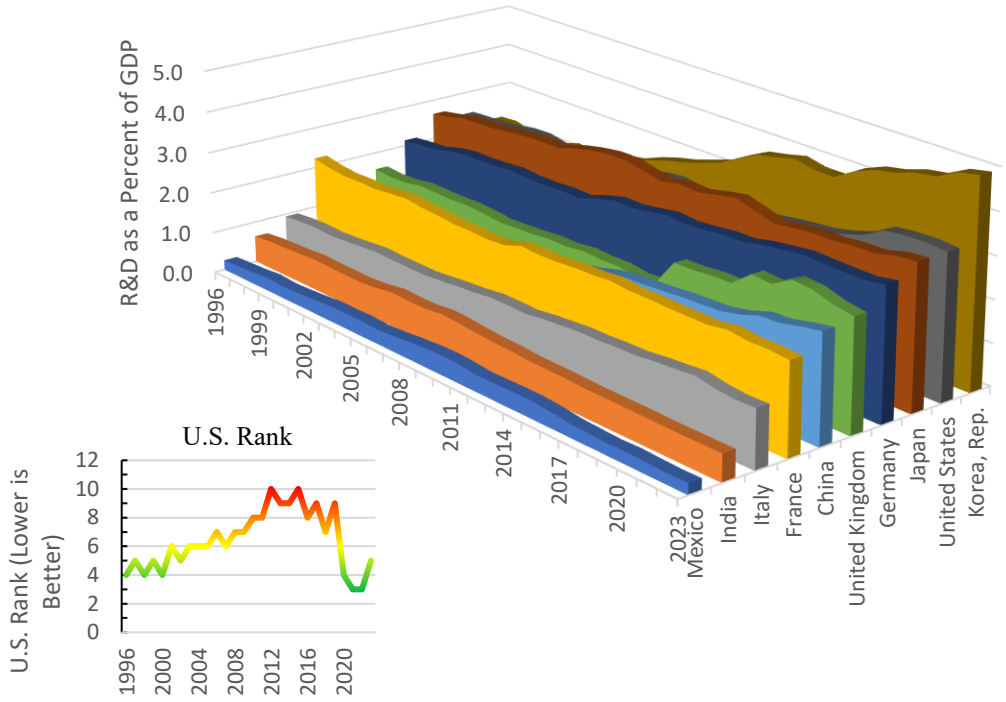


Figure 5.2: Research and Development Expenditures as a Percent of GDP, Top Ten Largest Manufacturing Countries

Source: World Bank. 2026. World Development Indicators. https://data.worldbank.org/products/wdi
* Missing data was interpolated

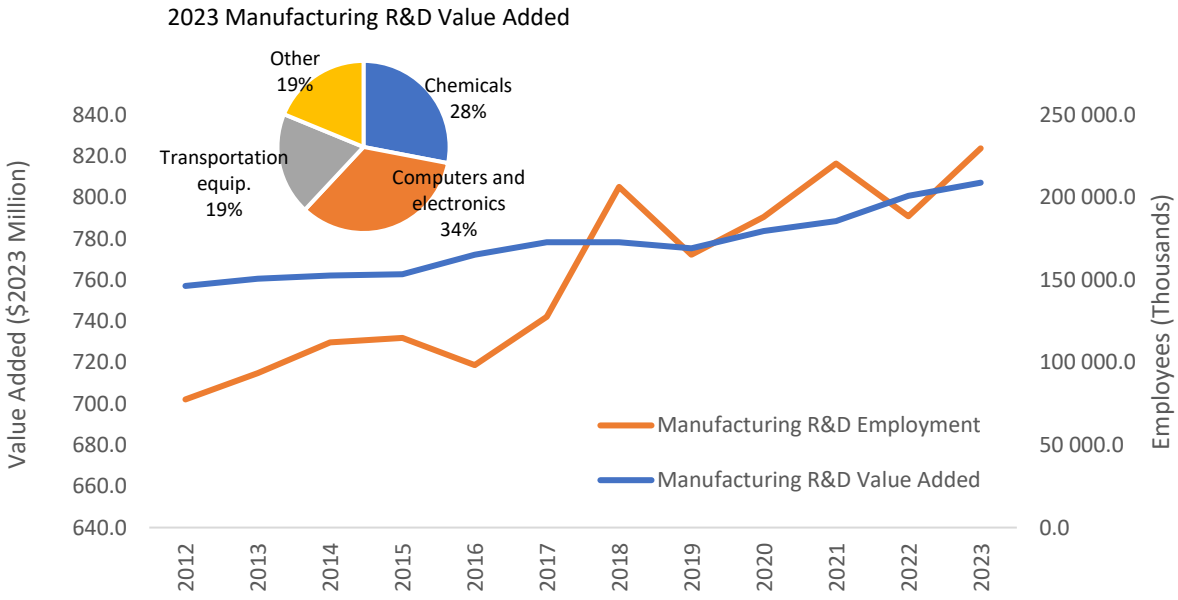


Figure 5.3: U.S. Research and Development Value Added and Employment

Source: Bureau of Economic Analysis. (2025e). "Research and Development Satellite Account." https://www.bea.gov/data/special-topics/research-and-development-satellite-account

growth in manufacturing research and development employment is 0.5 % and for value added is 3.9 %. Although manufacturing represents a disproportionate amount of research and development, it is growing slower than that for all industries (not shown elsewhere).

Despite an increasing trend with a 4.1 % 5-year compound annual growth in researchers per million people, the U.S. rank has ranged between 20th and 25th with the most recent (2022) being 21st (see Figure 5.4) out of 82 countries. While U.S. researchers per million people plateaued somewhat between 2002 and 2012, other countries increased leading to a decline in U.S. ranking. In journal articles per million people the U.S. ranked 28th in 2023 out of 198 countries, and China had more articles than the U.S. (see Figure 5.5) (World Bank 2024). Germany, Japan, South Korea, and China ranked 24th, 43rd, 22nd, and 49th, respectively (not shown) in journal articles per capita. Exports are also frequently seen as a measure of competitiveness. The U.S. was the second largest exporter in 2025, as illustrated in Figure 5.6.

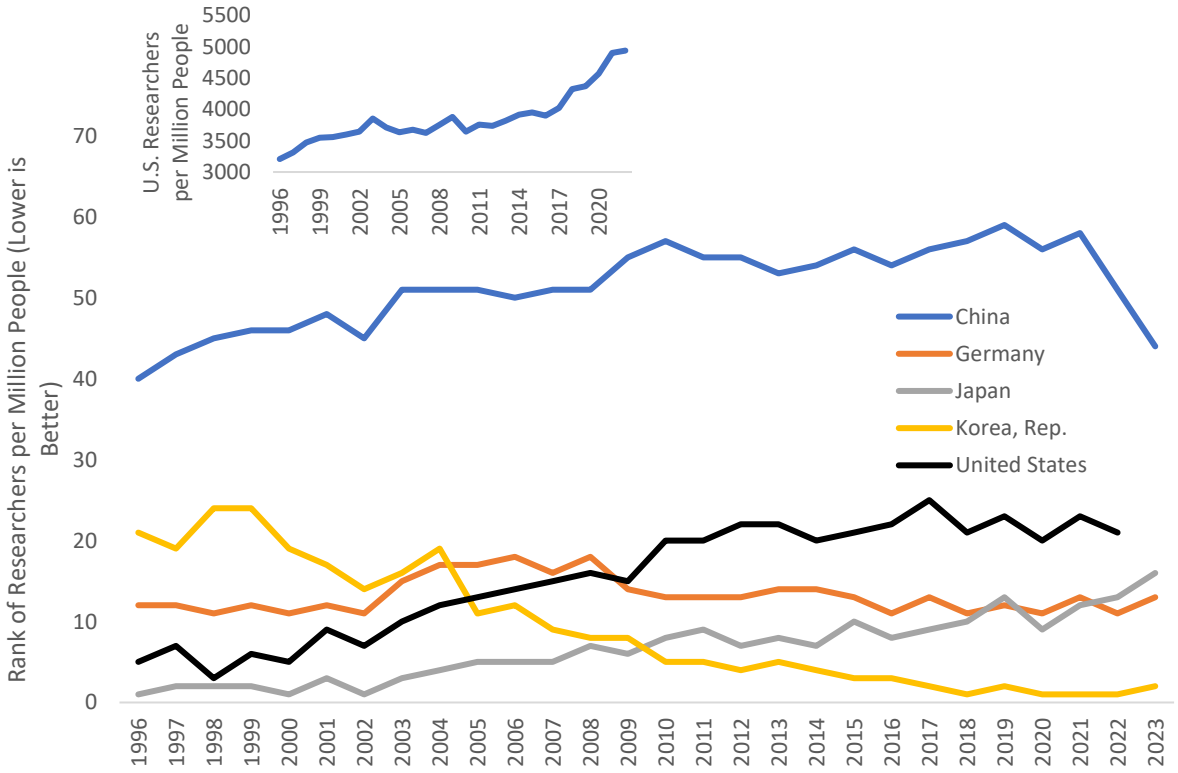


Figure 5.4: Researchers per Million People, Ranking

World Bank. 2026. World Development Indicators. https://data.worldbank.org/products/wdi

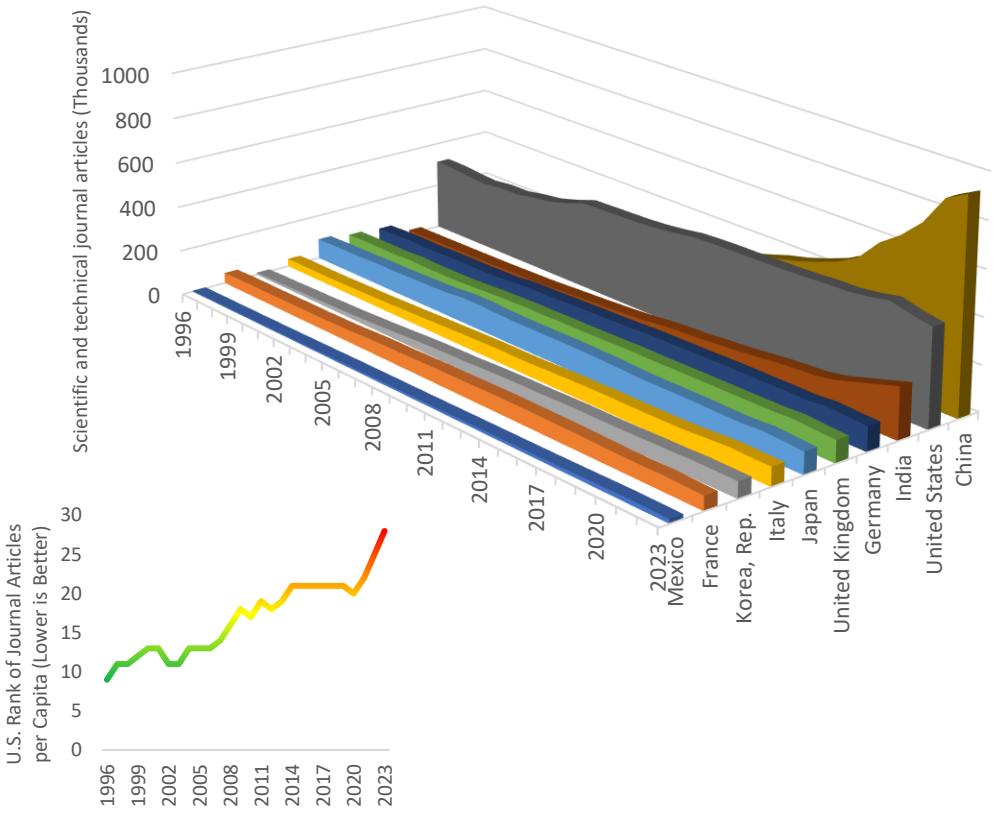


Figure 5.5: Journal Articles, Top 10 Manufacturing Countries

World Bank. 2026. World Development Indicators. https://data.worldbank.org/products/wdi

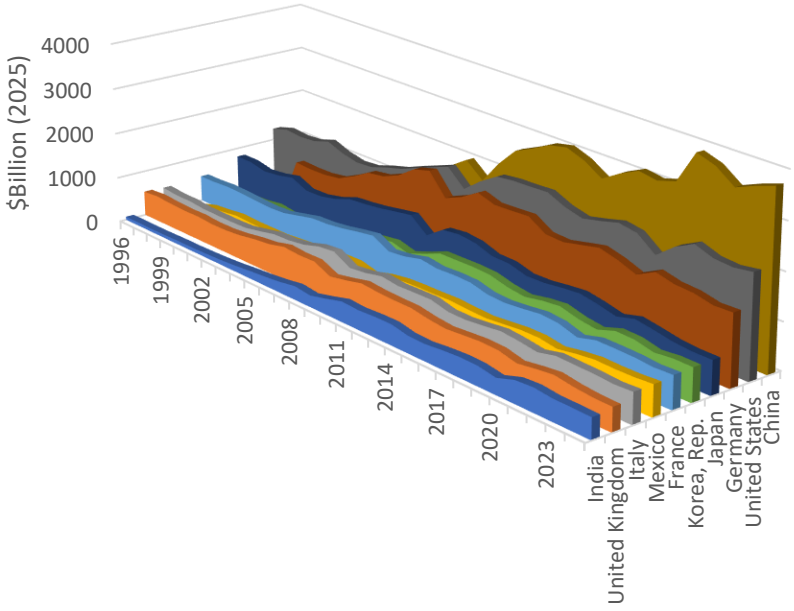


Figure 5.6: Goods Exports, Top Ten Manufacturing Countries

World Bank. 2026. World Development Indicators. https://data.worldbank.org/products/wdi
NOTE: Adjusted using the Consumer Price Index for all consumers from the Bureau of Labor Statistics.

5.2. Factors that Facilitate Innovation and Production

In addition to some of the previously mentioned metrics, a number of indices have been developed that reflect national manufacturing competitiveness. Developing, cultivating, and maintaining a competitive national manufacturing industry requires harmonizing inputs into a well-crafted system. When traffic backs up, electricity grids fail, harbors slow down, or there is a shortage of skilled labor, national manufacturing suffers. This section discusses metrics that examine factors outside of the factories that affect production.

The IMD World Competitiveness Index provides insight into the U.S. innovation landscape. Figure 5.7 provides the U.S. ranking for 20 measures of competitiveness. This provides some indicators to identify opportunities for improvement in U.S. economic activity. In 2026, the U.S. ranked lower in prices, public finance, societal framework, and attitudes and values among other things, which might be areas for improving competitiveness. Overall, the U.S. ranked 10th in competitiveness for conducting business while Germany, Japan, and China ranked 23rd, 30th, and 12th, respectively (IMD 2025). Between 2016 and 2026, 75 % or 15 of the 20 rankings went down for the U.S.

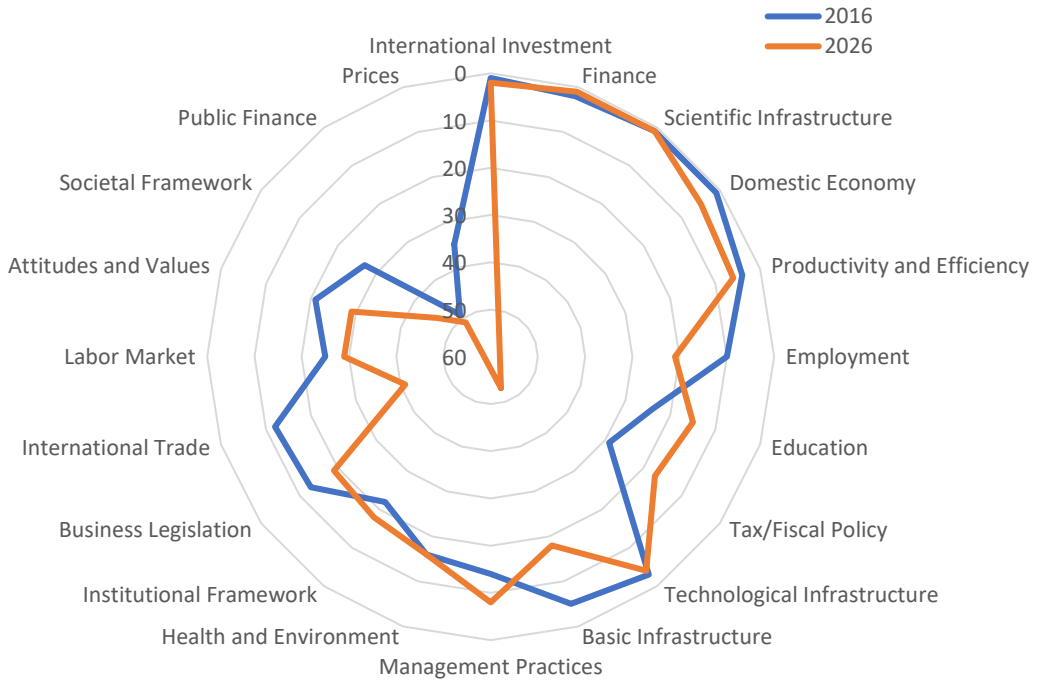


Figure 5.7: IMD World Competitiveness Rankings for the US: Lower is Better (i.e., a Rank of 1 is Better than a Rank of 69) – 69 countries ranked

Source: IMD. (2025). IMD World Competitiveness Country Profile: U.S. https://worldcompetitiveness.imd.org/countryprofile/US

The Global Innovation Index "captures the innovation ecosystem performance of 139 economies and tracks the most recent global innovation trends" (World Intellectual Property Organization

2025). As seen in Table 5.1, this index ranks the U.S. overall as 3rd in innovation with opportunities for improvement in areas of human capital and research, infrastructure, and creative outputs (World Intellectual Property Organization 2025). The U.S. contains 22 of the top 100 science and technology clusters while China has 24 and Germany has 7 (World Intellectual Property Organization 2025). Items shown in orange or red in the table might be seen as areas where there is potential opportunity to improve competitiveness. These might include education, tertiary education, and infrastructure.

The Competitive Industrial Performance Index, published by the United Nations Industrial Development Organization, ranks countries based on 3 dimensions: 1) capacity to produce and export manufactured goods; 2) technological deepening and upgrading; and 3) world impact (United Nations Industrial Development Organization. 2020). The U.S. ranked 6th overall, as seen in Figure 5.8. Germany ranked first followed by China.

Table 5.1: Global Innovation Index and Components for the U.S.

Item	2015 Rank	2024 Rank	2025 Rank
Overall	**5**	**3**	3
Institutions	**16**	**17**	16
Institutional Environment	27	21	22
Regulatory Environment	14	20	20
Business Environment	11	25	25
Human Capital and Research	**14**	**12**	13
Education	42	40	40
Tertiary Education	49	67	63
Research and Development	8	2	2
Infrastructure	**14**	**30**	32
Information and Communication Tech.	8	9	9
General Infrastructure	15	17	13
Ecological Sustainability	62	98	98
Market Sophistication	**1**	**1**	1
Credit	1	3	3
Investment	2	5	4
Trade, Diversification, and Market Scale	11	1	1
Business Sophistication	**9**	**2**	1
Knowledge Workers	11	2	3
Innovation Linkages	12	2	2
Knowledge Absorption	15	7	7
Knowledge and Technology Outputs	**4**	**4**	3
Knowledge Creation	4	10	7
Knowledge Impact	8	1	1
Knowledge Diffusion	18	16	20
Creative Outputs	**23**	**8**	5
Intangible Assets	66	18	11
Creative Goods/Services	18	8	9
Online Creativity	17	10	11

World Intellectual Property Organization. (2025). "Global Innovation Index 2025." https://www.wipo.int/web-publications/global-innovation-index-2025/assets/89507/global-innovation-index-2025-en.pdf

One factor that is important for manufacturing growth is stability. In recent years, policy unpredictability has increased as illustrated in Figure 5.9. Another factor is reputation. Countries are sometimes compared to or alluded to as brands. The Anholt-Ipsos National Brands Index ranking (see Table 5.2) ranks the U.S. as 14th down from 7th. The historically high ranking of the U.S. supports the idea that manufacturers in the U.S. tend to compete based on differentiation rather than cost competition. This is further illustrated in a survey of U.S. contract manufacturers on reshoring where 61 % of respondents indicated that customers order from them instead of offshoring due to *quality/rework/warranty*, which was the top response (Moser and Anemogiannis 2025). The second highest response was *delivery time* (54 %) and *supply chain disruptions* (50 %). The top reasons for reshoring was related to *supply chain disruption and robustness* (<=49 %) with the second being to *have engineering near manufacturing* (45 %) (see Table 5.3). It may not seem like it, but this is consistent with the U.S. being a differentiator as those purchasing items based on cost would tend to include those who have already offshored. If they decide to reshore, it is likely to be related to costs such as those that come with supply chain disruption. According to Moser and Anmogiannis (2025), 32 % of original equipment manufacturers were planning to offshore products in the next two years and when asked to select two reasons, responses include: *cost* (69 %), *availability of products or components* (39 %), *workforce availability* (31 %), *process knowledge* (28 %), *workforce skills* (18 %), and *other* (15 %). These answers tend to be consistent with the U.S. being a differentiator rather than a cost competitor, as those choosing to offshore are primarily doing so because of cost.

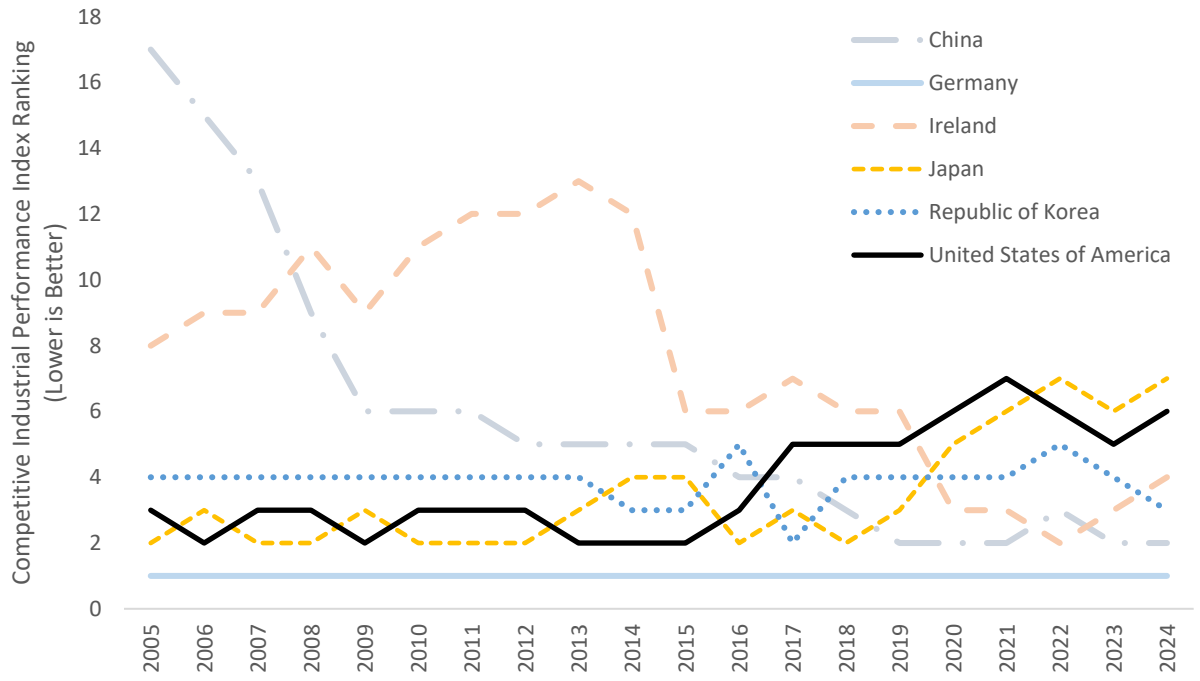


Figure 5.8: Rankings from the Competitive Industrial Performance Index, 152 Total Countries

Source: United Nations Industrial Development Organization. (2026). Competitive Industrial Performance Index. https://stat.unido.org/analytical-tools/country-analytics?country=840&codes=IND_%2CHI_IND

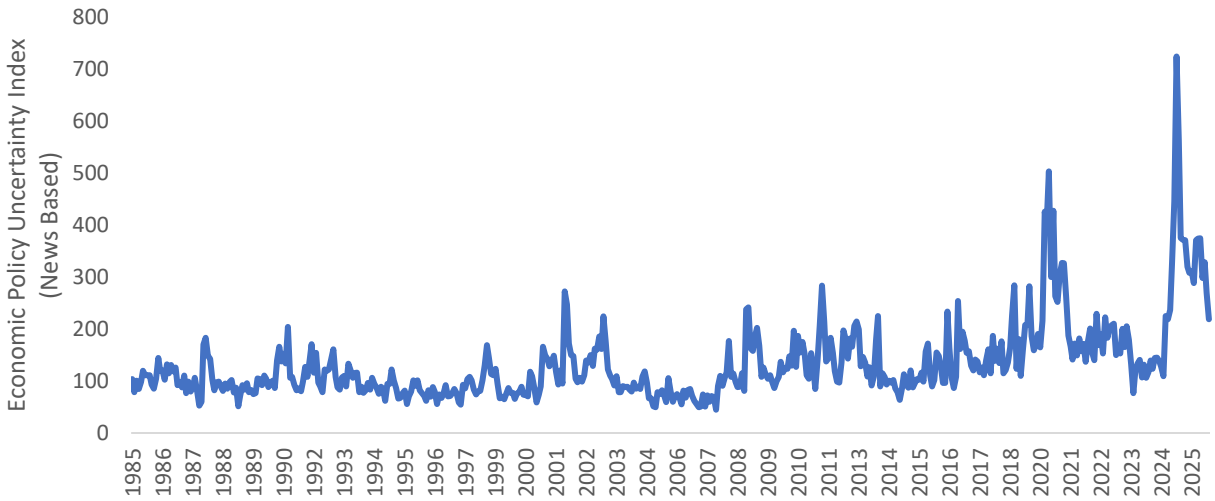


Figure 5.9: U.S. Economic Policy Uncertainty Index

Source: Baker, Scott R; Bloom, Nick; Davis, Steven. (2025). "Economic Policy Uncertainty Index." https://www.policyuncertainty.com/us_monthly.html

2024 Rank (Top 10)	2025 Rank	Country
1	1	Japan
2	2	Germany
6	3	Canada
3	4	Italy
4	5	Switzerland
5	6	United Kingdom
9	7	Australia
10	8	France
8	9	Sweden
-	10	Spain
-	11	Norway
-	12	Netherlands
-	13	Austria
7	14	United States
-	15	New Zealand

Table 5.2: Anholt-Ipsos National Brands Index, 2025

Source: Anholt-Ipsos. (2024). "Nation Brands Index 2024." https://placebrandobserver.com/anholt-nation-brands-index-nbi-2024/ and Anholt & Co. (2025). 30th edition of annual Anholt Nation Brands Index exposes the massive extent of damage to "brand America"; the chief beneficiary is Canada. October 15, 2025.

Table 5.3: Original Equipment Manufacturer's Reasons for Reshoring

Top reason to reshore to U.S. (pick 3)	Percent of Respondents
*Supply chain Disruption and robustness**	*<=49%*
Supply chain disruptions	28%
Robust supply chain	21%
Benefit of having manufacturing near engineering	45%
Reduction in freight and duty costs	45%
Avoid any potential geopolitical risk	38%
Proximity to customer market	35%
Quality/Rework/Warranty	32%
Intellectual property risk	21%
Image/brand of "Made in USA"	17%
Automation/Technology/Lean	10%
Skilled workforce availability	7%
Social/ethical concerns	7%
Section 301 tariffs	4%
3D printing/additive	4%
Manufacturing	4%
Energy/utility costs	4%
Government incentives	4%

Source: Moser, Harry; Anemogiannis, Kathy Nunnally. (2025). Reshoring Survey Report. Reshoring Initiative and Regions Recruiting.
https://reshorenow.org/content/pdf/2025_Reshoring_Survey_Report_Portrait-compressed.pdf
*This category sums two supply chain categories, which likely have overlapping respondents.

6. Manufacturing Industry Forecasts and Outlooks

Previous sections focused on the current or past state of U.S. manufacturing. This section discusses manufacturing outlook. The National Association of Manufacturers reported that those with a positive outlook has fluctuated but is up from the year before, as seen in Figure 6.1. There was a significant drop in outlook and expected growth in sales during the 2020 disruption. Note that there is missing data due to disruptions in 2020 and government funding disruptions in 2025.

As seen in Table 6.1, at the three digit NAICS level 35 % of manufacturing industries (9 out of 26 industries) have forecasted employment growth greater than or equal to that of *total* employment for all industries and 23 % of industries (6 out of 26) are forecasted to have growth in output greater than or equal to that of the *total* for all industries with the growth for total manufacturing projected to be 1.5 % or 75 % of that for the total.

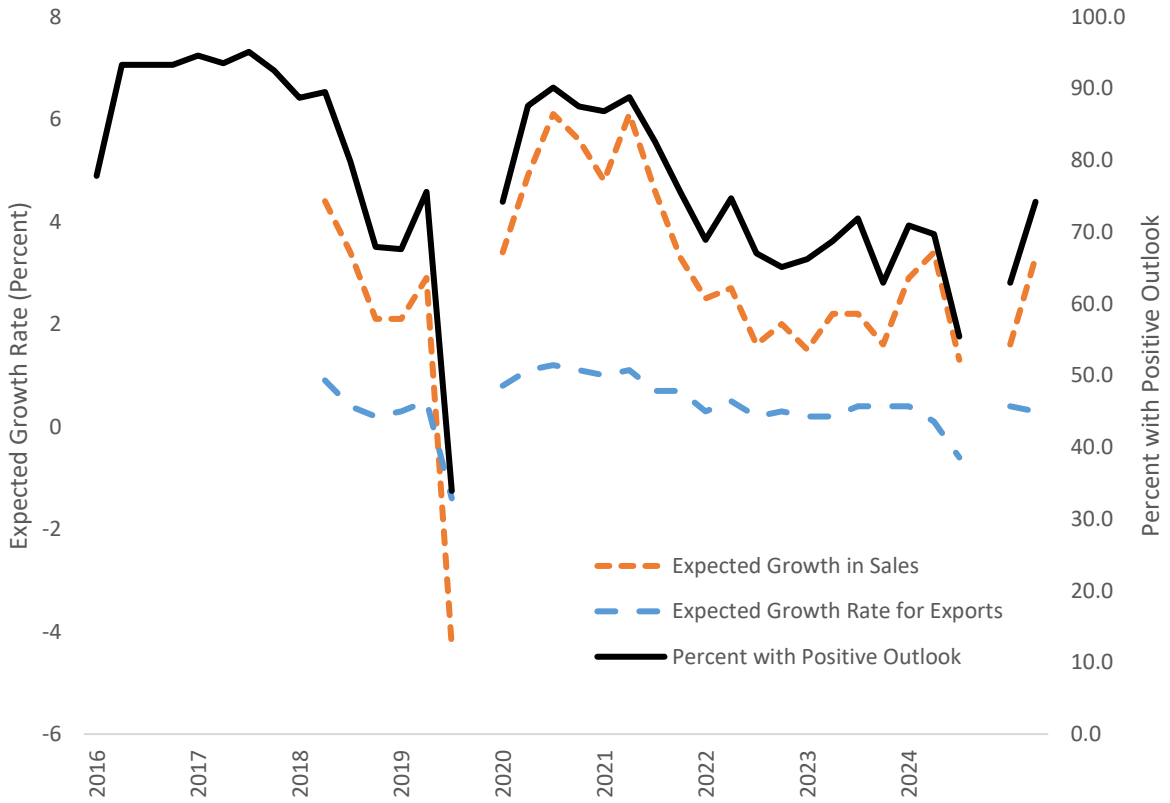


Figure 6.1: Positive Outlook, Expected Growth in Sales (12 Months), and Expected Growth in Exports (12 Months)

Source: National Association of Manufacturers. (2025). Manufacturers' Outlook Survey. 2016-2025. https://nam.org/manufacturers-outlook-survey/

Table 6.1: Forecasted Growth in Employment and Output, Rate and Rank by Industry

2025 National Employment Matrix title	2025 National Employment Matrix code	Compound annual rate of change, employment, 2025–2035	Compound annual rate of change, output, 2025–2035
Total, all industries		0.3	2.0
Manufacturing	31-33	0.1	1.5
Food manufacturing	311000	0.5	1.9
Beverage and tobacco product manufacturing	312000	0.5	1.3
Textile mills	313000	-1.3	0.0
Textile product mills	314000	-1.3	-0.1
Apparel manufacturing	315000	-4.6	-1.0
Leather and allied product manufacturing	316000	-0.9	2.0
Wood product manufacturing	321000	0.0	1.6
Paper manufacturing	322000	-0.4	0.7
Printing and related support activities	323000	-1.8	0.6
Petroleum and coal products manufacturing	324000	-0.1	1.4
Chemical manufacturing	325000	0.4	2.2
Plastics and rubber products manufacturing	326000	0.2	1.4
Nonmetallic mineral product manufacturing	327000	0.2	1.7
Primary metal manufacturing	331000	-0.2	1.3
Fabricated metal product manufacturing	332000	-0.2	0.7
Machinery manufacturing	333000	-0.1	1.3
Computer and electronic product manufacturing	334000	0.4	1.9
Semiconductor and other electronic component manufacturing	334400	0.8	2.5
Electrical equipment, appliance, and component manufacturing	335000	1.1	1.6
Transportation equipment manufacturing	336000	0.1	1.1
Motor vehicle manufacturing	336100	0.7	2.3
Motor vehicle body and trailer manufacturing	336200	0.3	3.0
Motor vehicle parts manufacturing	336300	-1.5	-2.8
Aerospace product and parts manufacturing	336400	1.0	1.9
Furniture and related product manufacturing	337000	-0.7	0.5
Miscellaneous manufacturing	339000	0.1	2.0

Source: Bureau of Labor Statistics. 2026. “Table 2.11 Employment and output by industry (Employment in thousands of jobs; Output in billion of chained 2017 dollars).” Employment Projections. https://www.bls.gov/emp/tables/industry-employment-and-output.htm

7. Strategies for Advancing U.S. Manufacturing Competitiveness

From the data presented in previous sections along with observations in other publications, there are a number of potential means for advancing U.S. competitiveness, as discussed below. Note that strategic and/or supportive tax policies, subsidies, and monetary policies are important and are widely debated in other venues; however, the specifics of these issues are beyond the scope of this discussion. The focus of the discussion below is in regard to facilitating competitive cost, quality, and other characteristics of manufactured products combined with communicating those characteristics to potential users or customers. These strategies are identified as those that are likely to facilitate creating increasingly greater advancements in U.S. manufacturing competitiveness per unit of investment.

Manufacturing competitiveness is the result of an ecosystem that includes the cost, quality, and quantity of labor and capital; supply chains; infrastructure; resilience; research and development; and product differentiation and performance. The characteristics of these factors, and their interactions, can create either opportunities to improve competitiveness or constraints that limit it. The previous chapters describe many of these factors. This chapter considers methods for determining which opportunities warrant attention and how the effects of such efforts can be evaluated. The strategy can be conceptualized as the following:

- **Target** where intervention can have high returns
    - Industries (Section 7.1)
    - Costs (Section 7.2)
    - Supply-Chain Risks (Section 7.3)
    - Ecosystem Constraints (Section 7.4)
    - Information Gaps on Products (Section 7.5)
- **Accelerate** the realization of benefits
    - Adoption and Diffusion (section 7.6)
- **Learn** to make progressively better investment decisions
    - Continuous improvement (Section 7.7)
- **Protect** competitive advantages and value signals
    - Maintain existing advantages and indicators of value (Section 7.8)

7.1. Strategically Target Industries

Resources such as labor, capital, and research capacity for advancing U.S. manufacturing competitiveness are limited. Advancing competitiveness for a selection of industries rather than all industries can avoid overextension or dispersing of resources across many initiatives and losing the focus needed for competitiveness. Sectors that are either critical to the nation or result in higher incomes/profits provide an opportunity for magnifying returns for competitiveness investments. These industries might include those that are the following: products critical to national and/or economic security; products where substantial value results from differentiation (e.g., product quality); and critical supply chain items for the previous two categories. These industries might further include those where the U.S. already has a strategic advantage (see Figure 2.8), including where there are high levels of knowledge and technology outputs (see Table 5.1), scientific infrastructure, technology infrastructure (see Figure 5.7), R&D investment (Figure 5.2), and/or industries where quality is important.

7.2. Strategically Target Manufacturing Costs, Losses, and Quality

Manufacturing competitiveness investments can potentially generate greater returns when they are directed toward the costs, losses, or quality aspects that matter most across the manufacturing system, as discussed in the framework presented in NIST AMS 100-80 (Thomas 2026). NIST research finds that manufacturing costs are highly concentrated (Thomas and Kandaswamy 2019; Thomas 2022). In assembly-centric manufacturing, the distribution of value added has a Gini coefficient of 0.75, while compensation has a Gini coefficient of 0.86, indicating that a relatively small number of activities account for a disproportionate share of resource consumption (Thomas and Kandaswamy 2019). This concentration is also evident in investment returns. Analysis of Department of Energy Industry Assessment Center data finds that 20 % of investment categories account for 82 % of net present value, while 20 % of cumulative investment costs account for 74 % of net present value (Thomas 2022). These findings suggest that change agents can use manufacturer data to identify persistent, high-value cost areas and then target research, standards, technologies, and diffusion toward those areas to achieve higher levels of impact per research dollar. Likewise quality frequently translates into reducing costs or losses for customers. For instance, a car that lasts longer means a customer does not have to buy as many cars in their lifetime. These cost savings also likely are distributed such that 20 % of the improvements account for approximately 80 % of the savings. Focusing on the high return investments can increase quality improvement per dollar of research and development.

7.3. Strategically Strengthen Supply Chain Resilience

Supply chain disruption can result in substantial costs and make otherwise competitive industries vulnerable. The appropriate response is to identify supply-chain exposures for which the expected cost of disruption justifies mitigation. Such mitigation may include supplier diversification, substitution, inventory, domestic capacity, or other measures that reduce the likelihood or consequences from disruption.

The degree of exposure varies substantially across industries. Industries that rely more heavily on imported intermediate goods and services may face greater exposure to international disruptions (see Table 3.6). For example, the motor vehicle industry imports 17.9% of its intermediate inputs. However, import dependence alone does not establish supply-chain risk; the number and geographic distribution of suppliers, substitutability of inputs, inventories, transportation requirements, and other characteristics also affect vulnerability. Consequently, there is a need to improve the measurement and understanding of industry-level supply-chain risk so that mitigation resources can be directed toward the exposures where they are likely to generate the greatest return.

7.4. Strengthen the Manufacturing Ecosystem

Competitiveness is not determined solely by the machinery and staff within the four walls of a manufacturing facility. Establishments compete with their supply chains, their country's transportation infrastructure, the education of their employees, and their country's R&D infrastructure among other things. Indicators suggest that the U.S. lags behind in some of these items, such as education (see Table 5.1 and Figure 5.7) and infrastructure (see Table 5.1) while

having elevated levels of uncertainty (Figure 5.9), which affects competitiveness. Additionally, previous versions of this report have identified a shortage of labor as a challenge for many manufacturers. The types of indicators provided in this report can identify those areas that should be investigated for further development. Ensuring a high performing ecosystem can enable a more competitive industry.

7.5. Develop Standards that Reward Quality and Performance

The Anholt-Ipsos National Brands Index ranking (see Table 5.2) ranks the U.S. as 14th down from 7th in regards to the U.S. as a brand. The high ranking of the U.S. supports the idea that manufacturers in the U.S. tend to compete based on differentiation rather than cost competition. This is further illustrated in a survey of U.S. contract manufacturers on reshoring where 61 % of respondents indicated that customers order from them instead of offshoring due to *quality/rework/warranty* (Moser and Anemogiannis 2025).

One challenge for differentiators is that customers can struggle to see the difference in quality/performance between two products. One product may appear nearly identical to another but have vastly inferior performance. There is a need for standards, technologies, methods, tools, and/or guides that both advance the quality/performance of products and those that facilitate differentiating products. Standards that improve products and allow customers (e.g., consumers or firms that purchase finished or intermediate goods) to differentiate products by their characteristics (e.g., product longevity, repairability, or energy consumption) are likely to advance U.S. competitiveness over those that are cost competitors. This might include standards that differentiate products for consumers or those for manufacturers selecting suppliers of intermediate products. These types of standards will aid customers in making their own forecasts and select the cost/quality combination that fits their purpose. Without standards that convey quality/performance, customers are likely to more frequently default to choosing lower cost items due to the uncertainty in the returns for investing in higher quality/performance products. Some successful examples of this include UL safety markings, Energy Star, and third-party reviews.

7.6. Accelerate Adoption and Diffusion of High-Return Technologies and Practices

Impact is only realized after innovations are adopted. When adoption is slow, impact is delayed or may never be realized. Explicit attention to adoption and diffusion can accelerate both the impact and the next generation of innovations. Adoption can be diminished even when a technology or innovation has been shown to be highly impactful and cost effective. Manufacturers may lack the information about the innovation, the expected returns, or may lack the conditions for adopting the innovation. These barriers can apply particularly to small- and medium-sized manufacturers who often support larger manufacturing operations (i.e., the supply chain). Adoption and diffusion can be accelerated by sharing information, demonstrating cost effectiveness, and providing information that enables adoption. As adoption expands, information about actual costs, benefits, and implementation challenges can also become available to inform subsequent adopters and improve the development of future innovations.

7.7. Create a System of Continuous Improvement for Investments in Competitiveness

Every investment includes a forecast, as a decision to invest assumes that benefits will exceed costs. These forecasts have some level of accuracy and that accuracy can be increased. Suboptimal forecasts lead to suboptimal investments and suboptimal competitiveness. Currently, there is limited research in advancing forecast accuracy of change agent predictions in U.S. manufacturing competitiveness, suggesting there is a substantial opportunity to increase competitiveness via project selection and design. Change agents (e.g., public R&D organizations, trade organizations, or universities) can potentially increase the return on their investments by moving from intuition-based project selection/design toward systematic measurement and continuous learning.

If a prediction cannot subsequently be tested, policymakers have little ability to learn whether their decision process works. NIST AMS 100-80 proposes treating each R&D investment as an experiment: identify an opportunity, establish an ex-ante hypothesis about its expected economic impact, measure the realized impact, and use the difference between predicted and actual results to improve subsequent investment decisions. This is similar to that of the *Organizational Intelligence* category of the Baldrige Excellence Framework in that it proposes a learning system to improve performance (Baldrige Performance Excellence Program, 2026; Baldrige Performance Excellence Program, 2023). It is also consistent with established practices in agricultural R&D, where ex-ante impact assessments have been used to inform research priorities and ex-post assessments have subsequently provided evidence for refining assumptions and informing future investment decisions (Bantilan et al. 2013; Pearson et al. 2012).

The estimates of realized impact can be used to better understand the project designs or common components that result in impact (e.g., methods for disseminating research findings, industries targeted, and company types that adopt). This approach can help shift resources toward project designs that have the greatest potential impact by identifying which combinations of R&D, standards, dissemination, adoption, and other activities produce the highest returns. Shared data, standardized methods, and common platforms can allow organizations to learn across projects over time. The result is a system of continuous improvement where each investment not only generates an economic benefit but also produces information that improves the effectiveness of future investments, increasing impact per dollar over time.

7.8. Protect Competitive Advantages and Value Signals

Differentiation is not only about the quality and performance of a product, it also often about the reputations of the producer, the origin of the product, and capabilities of suppliers. Although the U.S. is a differentiator, its ranking as a brand slipped from 7th to 14th (see Table 5.2). Additionally, factors that affect U.S. products, such as prices and basic infrastructure, decreased in ranking (See Figure 5.7). These trends suggest that the factors affecting competitiveness and the value customers associate with U.S. products cannot be taken for granted.

Competitiveness can be increased not only through cost reduction and product quality, but also through the value that customers associate with products made in the United States. That value,

however, requires credible information about the meaning of “Made in USA.” Clear and consistently applied origin standards, supported by measurement and conformity-assessment systems, can help to ensure that the designation conveys meaningful information rather than becoming diluted through inconsistent or marginal claims.

The U.S. also possesses other important competitive advantages, including strengths in R&D and leadership in select industries and technologies. These advantages can be eroded even as progress is made in other dimensions of competitiveness. For example, gains in cost or productivity may not translate into sustained competitiveness if they are accompanied by the loss of capabilities, technological leadership, supplier strengths, quality attributes, or other sources of cost and differentiation. Protecting competitiveness requires not only creating new advantages, but also maintaining and strengthening the advantages the U.S. already possesses. Sustaining and growing these advantages is essential to ensuring that improvements in one aspect of competitiveness do not come at the expense of another, and that the overall competitiveness of U.S. manufacturing continues to strengthen over time.

8. Discussion

This report provides an overview of the U.S. manufacturing industry. There are three aspects of U.S. manufacturing that are considered: (1) how the U.S. industry compares to other countries, (2) trends in the domestic industry, and (3) industry trends compared to those in other countries. The U.S. remains a major manufacturing nation; however, other countries are rising rapidly. Manufacturing in the U.S. was significantly impacted by the 2000's recession and the 2020 downturn in the economy.

The U.S. is a major contributor to global manufacturing, accounting for 15.2 % of global manufacturing value added, making it the second largest per the United Nations Statistics Division (2006) National Accounts Main Aggregates Database. As seen in Figure 2.1, U.S. compound real (i.e., controlling for inflation) annual growth between 1999 and 2024 was 1.5 %, which places the U.S. below the 50th percentile. This growth exceeded that of France, Japan, and Australia; however, it is slower than that for the world (3.6 %) and many emerging economies.

The largest manufacturing subsector in the U.S. is *chemical products* followed by *computer and electronic products* and *food, beverage, and tobacco products*, as seen in Figure 2.12. In terms of subsectors of manufacturing, China produces more than the U.S. in 11 of the 14 subsectors shown in Figure 2.8. When aggregated together, U.S. and European manufacturing value added exceeds that of Eastern and South-eastern Asia (excluding Japan) for 7 of the 14 subsectors. Computer, electronic, and optical products is among those that Asia produces more value added than the U.S. and European industries together.

Figure 8.1 provides a series of rankings for national branding, multi-factor indices, R&D, and output along with the magnitude of high-tech production. Lower rankings equate to better performance while the red, yellow, green colors highlight the relative level/ranking compared to the other countries shown. The countries shown represent high-quality, high-tech, or high-volume production. Figure 8.2 focuses on details of domestic production, particularly high-tech manufacturing. It provides estimates for past and predicted growth in production, net stock, and labor while also estimating the proportion of intermediate goods/services that are imported.

As seen in Figure 8.1, the U.S. ranks well in multi-factor indices and R&D metrics; however, it is not ranked at the top for any of them and some are in the double digits; thus, there is room for improvement. The U.S. as a brand slipped from 7th to 14th. The U.S. is the second largest in terms of value added; however, its manufacturing growth is ranked below the 50th percentile (i.e., 129th), which is common for advanced economies as they frequently must advance the productivity frontier to increase growth. Out of the six high-tech manufacturing industries shown, the U.S. is the largest for only one and is significantly smaller than that of China for machinery/equipment and electrical equipment. The domestic details in Figure 8.2 further confirm the trend. Machinery and electrical equipment account for low levels of the manufacturing industry value added, have lower growth, and lower forecasted growth compared to the other countries shown. Even further, their growth in net stock for equipment, structures, and property are lower than that of the other industries shown. The transportation equipment manufacturing industry imports the largest proportion of their intermediates, suggesting there might be benefits of providing additional attention to mitigating supply chain risks in this sector.

Although U.S. manufacturing performs well in many respects, there are opportunities for advancing competitiveness. This report identifies eight primary means for advancing U.S. competitiveness that organize into four pillars: Target, Accelerate, Learn, and Protect. The eight methods provide a systematic approach to advancing manufacturing competitiveness by focusing resources where they can generate the greatest returns. The approach begins with targeting strategically important industries; costs, losses, and quality; supply-chain risks; ecosystem constraints; and information gaps that limit competitive performance. The approach turns to accelerating the adoption and diffusion of high-return technologies and then learning through a system of continuous improvement for manufacturing competitiveness investments. Finally, the approach discusses protecting the value signals that allow quality, performance, and other product attributes to be distinguished. Together, these methods shift competitiveness investments from broadly supporting manufacturing toward identifying specific opportunities and constraints, directing resources toward high-return interventions, accelerating their effects, learning from their results, and preserving the value they create:

1. **Target**
    a. *Industries*: Focus limited resources on industries where investments can generate the greatest economic, strategic, or national-security returns.
    b. *Manufacturing Costs, Losses, and Quality*: Direct investments toward the manufacturing costs, losses, and quality aspects that have the greatest potential to increase productivity and competitiveness.
    c. *Supply Chain Risks*: Identify and mitigate supply-chain vulnerabilities where the expected costs of disruption justify investments in resilience.
    d. *Ecosystem Constraints*: Improve the workforce, infrastructure, R&D capabilities, and other conditions that enable individual manufacturers and supply chains to compete effectively.
    e. *Information Gaps*: Develop standards and measurement methods that enable customers to recognize and value differences in product quality, performance, durability, and other attributes.
2. **Accelerate**
    a. *Adoption and Diffusion of High-Return Technologies and Practices*: Accelerate the adoption and diffusion of high-impact innovations by reducing information, cost, and implementation barriers so that proven technologies and practices generate broader and faster competitiveness gains.
3. **Learn**
    a. *Continuous Improvement for Investments in Competitiveness*: Use forecasting, measurement, and feedback loops to improve the selection and design of investments and increase their returns over time, as discussed in NIST 100-80.
4. **Protect**
    a. *the Value of U.S. Manufacturing as a Brand*: Maintain the credibility and value of U.S. manufacturing through reliable origin claims and by strengthening the attributes that customers associate with products made in the United States.

Figure 8.1: International Comparison Quick Reference

	Metric	U.S.	Germany	Japan	South Korea	China
Branding	Ipsos National Brands Index (see Table 5.2)	14	2	1	-	-
Multi-factor Indices (Rankings)	Competitive Industrial Performance Index (see Section 5.2)	6	1	7	3	2
	Global Innovation Index (see Section 5.2)	3	11	12	4	10
	IMD Competitiveness Index (see Section 5.2)	10	23	30	21	12
R&D metrics (Rankings)	Patent applications per million people	2	5	3	4	1
	R&D Expenditures as % of GDP	5	11	6	3	21
	Researchers per million	21	11	13	1	51
	Journal articles	20	32	35	41	14
	Journal articles per capita	28	24	43	22	49
Output and Growth (Rankings)	Goods Exports* (see Figure 5.6)	20	24	28	29	17
	Manufacturing value added (see Figure 2.3)	2	4	3	5	1
	5-year compound annual growth in manufacturing value added (see Figure 2.12)	129	175	135	89	40
	Manufacturing value added per capita (see Figure 2.5)	15	9	10	8	38
High Tech. Production (Percent of Global Value Added)	Chemicals and chemical products	23.0%	4.0%	3.8%	3.5%	28.1%
	Computer, electronic and optical products	22.8%	3.4%	4.5%	8.6%	24.9%
	Machinery and equipment n.e.c.	14.6%	9.0%	10.1%	3.3%	33.4%
	Electrical Equipment	11.3%	7.3%	8.1%	6.2%	38.4%
	Motor vehicles and other transport equip.	20.4%	11.7%	7.2%	3.4%	22.3%
	Basic pharmaceutical products and pharmaceutical preparations	28.5%	3.5%	3.1%	1.7%	17.3%

Note: Indicated above are the sections, tables, or figures where the relevant data is discussed. The aspects presented here are those that are useful for brevity while those discussed in other sections might present slightly different aspects of the data (e.g., the nominal values rather than rankings). Each data value may not be presented elsewhere but rather illustrated or only discussed for the U.S.
Note: The color shading is a visual aid. Better values are shown in green while worse values are red.

Figure 8.2: Domestic Manufacturing Quick Reference

NAICS		Total Manuf. 31-33	Chemicals (incl. pharma.) 325	Machinery 333	Computers 334	Elect. Equip., Appliance, and components 335	Transportation Equip. 336
Production	Value Added as a percent of total manufacturing (see Figure 2.10)	$2397 (Billion)*	20.80%	5.90%	12.40%	2.20%	17.10%
	Value Added Growth: CAG5 (see Figure 2.12)	2.30%	5.00%	0.30%	1.30%	-0.20%	7.30%
	Growth in Manufacturing Output: CAG 2025 to 2035 (see Table 6.1)	1.50%	2.20%	1.30%	1.90%	1.60%	1.10%
Net Stock	Growth in Equipment: CAG5 (see Figure 2.13)	-0.50%	0.10%	-0.40%	-1.80%	0.60%	-1.90%
	Growth in Structures: CAG5 (see Figure 2.14)	3.10%	4.30%	3.80%	2.00%	2.50%	4.70%
	Growth in Intellectual Property: CAG5 (see Figure 2.15)	2.70%	4.20%	1.50%	1.30%	1.40%	1.90%
Labor	Manufacturing Employment, Thousands (see Table 4.1)	12 194	884	1065	808	370	1696
	Manufacturing Employment: CAG 2025 to 2035 (see Table 6.1)	0.10%	0.40%	-0.10%	0.40%	1.10%	0.10%
Supply Chain	Imported Intermediates (see Section 3.2)	11.7%	9.6%	11.7%	7.1%	13.2%	17.9%

CAG: Compound annual growth
CAG5: 5-year compound annual growth
* Chained 2017 Dollars
Note: Indicated above are the sections, tables, or figures where the relevant data is discussed. The aspects presented here are those that are useful for brevity while those discussed in other sections might present slightly different aspects of the data (e.g., the nominal values rather than rankings). Each data value may not be presented elsewhere but rather illustrated or only discussed for the U.S.

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