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# 2016 Top Markets Report **Manufacturing Technology**

A Market Assessment Tool for U.S. Exporters

April 2016



Industry & Analysis' (I&A) staff of industry, trade and economic analysts devise and implement international trade, investment, and export promotion strategies that strengthen the global competitiveness of U.S. industries. These initiatives unlock export, and investment opportunities for U.S. businesses by combining in-depth quantitative and qualitative analysis with ITA's industry relationships.

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## Executive Summary

The United States is a major global producer of manufacturing technology, including emerging sectors like additive manufacturing. With over \$8.1 billion worth of exported machinery in 2015, U.S. producers provide a broad array of high-tech equipment to industrial end-users in markets around the world. Export growth of manufacturing technology, broadly categorized as the equipment used to produce other equipment, is largely tied to economic growth in industrialized markets, particularly in North America, Europe, and the Asia-Pacific regions.

The next two years are forecast to see a slight decrease in U.S. manufacturing technology exports. This decrease is in the context of an economic slowdown in China and a general decrease in the global market for manufacturing machinery. As the value of the U.S. dollar continues to be strong compared with foreign currencies, U.S. exporters will likely see diminished returns in the immediate future.

In the medium- to long-term, U.S. exports of manufacturing technology products will be sustained by robust trade with NAFTA partners Canada and Mexico, with whom the United States holds commanding shares of the import markets. U.S. exports will also likely continue to be sustained in the developed countries of the world, particularly those in Europe. Germany remains the economic engine of Europe and the top European recipient of U.S. machinery; however, growth in EU markets will likely lie in Belgium, the United Kingdom, and the Netherlands, countries that have experienced double-digit growth for the past five years. As these highly industrialized markets continue to seek greater productivity in manufacturing operations, the sales of high value-added equipment should continue to grow.

In the Asia-Pacific region, growth will be led by China and Hong Kong, and sustained by industrialized economies in Japan, South Korea, and Singapore. Between 2009 and 2014, the Chinese import market for manufacturing technology experienced double-digit growth, as did U.S. sales to the market. Despite experiencing an economic slowdown beginning in the summer of 2015, the Chinese market will continue to draw in many U.S. exporters by its sheer size.

This ITA *Top Markets* report attempts to provide insight to companies and U.S. government trade agencies by assessing foreign markets and ranking them based on export potential. Based on trade data and global industrial indices, along with market intelligence from U.S. Foreign Commercial Service Officers, our rankings represent the best current understanding of market opportunities. The report provides exporters with detailed assessments of selected markets by providing five country case studies to illustrate a variety of points for comparison.

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# Overview and Key Findings

## Introduction

The United States is a major global supplier of manufacturing technology products. In 2015, U.S. companies exported over \$8.1 billion worth of machinery to foreign markets. This, however, was down from approximately \$8.5 billion in 2014, and is the third year in a row since 2012 to experience year-on-year declines.

There are a number of global economic factors that are responsible for this decline. To begin, according to Gardner Media, world production and consumption of machine tools have fallen over the last three years.<sup>i</sup> As one of the largest sectors and bellwethers for manufacturing technology, machine tool sales are indicative of a country’s production capacity. Much of this has been a result of the slowing Chinese economy, whose machine tools consumption declined from \$40.8 billion in 2011 to \$31.8 billion in 2014.<sup>ii</sup> In 2015, China, the second largest global economy, suffered significant losses in the stock market. Analysts fear that China is in the beginning of a prolonged economic slump, and this will continue to affect manufacturing technology exports. In the currency markets, the U.S. Dollar has grown significantly in value against the Euro, the Canadian Dollar, the Brazilian Real, the Chinese Yuan and more. A strong U.S. dollar affects exports across all sectors, as it decreases the relative purchasing power of foreign buyers. Other factors also include historically low prices of crude oil and commodity iron ore.

Despite these contractions and expected headwinds through the short-term, it is important that companies consider developing export strategies to

compete over the long-term in the global marketplace. Economic recessions end, and currency values change. Businesses looking to increase sales and reduce domestic market dependency over the long-term are likely to benefit from developing export strategies now. Nearly 96 percent of consumers, as well as two thirds of the world’s purchasing power, live outside the United States.

## Key Findings: Top Markets and Methodology

This ITA *Top Markets* report assesses the global market for manufacturing technology products by analyzing U.S. exports in this sector and determining: what products they are, where they are going, and the dollar value attached to them. To establish a priority of foreign markets that offer the best prospects for U.S. producers of manufacturing technology equipment, four criteria were used:

- total volume of U.S. manufacturing technology exports in 2015, as measured by the U.S. Census Bureau, Foreign Trade Division
- compound annual growth rate (CAGR) of U.S. manufacturing technology exports between 2009 and 2015, as measured by the U.S. Census Bureau, Foreign Trade Division
- most up-to-date ranking (2012) of markets by the United Nations Industrial Development Organization (UNIDO) “Competitive Industrial Performance Index”
- level of growth in industrialization, as measured by the rate of improvement in 2009-2012 UNIDO “Competitive Industrial Performance Index” rankings

U.S. exports are defined as products originating in

**Figure 1: Projected Top Markets for 2016-2017**

1	Mexico	8	Poland	15	Taiwan	22	Israel	29	Ireland
2	Canada	9	Netherlands	16	Turkey	23	Chile	30	Spain
3	China	10	Saudi Arabia	17	Thailand	24	Russia	31	Argentina
4	Germany	11	United Kingdom	18	France	25	Indonesia	32	Hong Kong
5	Japan	12	Czech Republic	19	Brazil	26	Australia	33	UAE
6	Belgium	13	Costa Rica	20	Italy	27	India	34	South Africa
7	South Korea	14	Singapore	21	Switzerland	28	Malaysia	35	Colombia

the United States, which is an important distinction to make in an increasingly globalized economy. Products that do not meet the minimum threshold of content made in the United States are not taken into account.

In ranking markets, ITA placed the most emphasis on total volume of exports in 2015. It is presumed that markets with historically high U.S. exports will continue to have high volumes in the future for a variety of reasons. Historic export trends indirectly take into account factors specific to the United States, such as geography, Free Trade Agreements (FTA), and size of market opportunity.

Some may contend that size of market is the most important factor in ranking. In other words, the largest markets should present the greatest opportunities. While valid to an extent, this calculation does not take into account the variety of economic, historic, and political factors that shape global trade. For example, top-ranked Mexico may not be the “largest” global market for manufacturing technology, a position held definitively by China.

However, Mexico does present unparalleled opportunities for U.S. exporters because of its shared border and lack of tariffs. China, on the other hand, may be the largest importer of manufacturing technology products in the world, but its close geographic proximity to established regional competitors, particularly Japan and Korea, can make it a more challenging market to enter for U.S. exporters. Other factors like tariffs may put U.S. exporters at a price disadvantage. Market size also does not take into account policy prescriptions like export controls, which may apply to U.S. exporters. As a result, while the information provided in this report may be of general use to companies across the industry, its utility is truly intended for U.S. exporters of manufacturing technology.

Based on aggregate trade data and global industrial indices, this report ranks global markets based on their export potential. These rankings represent the best current understanding of market opportunities. Paired with on-the-ground market intelligence from U.S. Foreign Commercial Service Officers, this report aims to assist exporters in better determining global sales opportunities in their industry.

This report focuses on the export forecast for manufacturing technology products that fall broadly into eight categories. These categories focus on machinery used to fabricate products out of metal, plastic, rubber, and composites. They exclude machinery used for creating wooden products. With the exception of additive manufacturing equipment, these sectors generally align with industry groupings specified by the North American Industrial Classification System, which are:

- **Machine tools used for *cutting* metal** through processes like milling, turning, or grinding
- **Machine tools for *forming* metal** pieces through processes like pressing, punching, or bending
- **Machine tool *parts***, both OEM and after-market
- **Tools, dies, jigs, and fixtures** used for various manufacturing applications
- **Welding and soldering equipment**, including arc-welding and laser-welding equipment, but excluding hand-held equipment
- **Plastics and rubber manufacturing equipment**, such as compression, extrusion, and injection-molding machines
- **Industrial molds** primarily used for casting or forming materials like metals, plastics, and rubbers through a variety of processes like injection, compression, blowing, or thermoform.
- **Additive manufacturing equipment**, popularly known as “3D printers”

This report does not take into consideration exports of services, such as those provided by systems integrators, nor does it account for software solutions related to machinery, like Computer-Aided Design (CAD), Computer-Aided Manufacturing (CAM), or others. Trade data derived from services is not readily available or consistent across markets, and therefore, statistics used for manufacturing technology products could be used a proxy indicator for services exports. If a country is a major recipient of U.S. equipment exports, it will likely have associated trade in related services.

This *Top Markets* report ranks 35 geographically and economically diverse countries that account for over 93 percent of all U.S. exports of manufacturing technology. The minimum threshold for exports to each market was \$30 million annually in 2015. While many of the industrialized markets of Western Europe stand-out prominently, growth has been

more widespread and taking root more strongly in Asia and Latin America. For U.S. exporters, the greatest export opportunities are not only in the largest markets, for many other considerations may be taken into account, including geographic and cultural proximity, ease of doing business, tariffs and market access, technical barriers to trade, and more. By ranking markets based on aggregate trade flows, this report helps to account for these considerations while offering further detailed information in the five country case studies.

The five country case studies that were selected for further reference have been chosen to illustrate a variety of points. Canada and Mexico, for example, are highly dependent on U.S. manufacturing technology exports, a fact related to their close geographic proximity and ease of market access through the North American Free Trade Agreement (NAFTA), which is now in its 21<sup>st</sup> year of existence. Across the Pacific, China is both the world's largest producer and consumer of manufacturing technology products. However, going into 2016, the country appears to be gripped in recession. A number of other factors also affect trade with China, including ineffective intellectual property protection, content localization requirements, and export control classifications. Germany, the largest European market and top-ranked by United Nations industrial indices, is seen as one of the most strict but most rewarding destinations to do business. Entering into the German market is often seen as key to entering Europe as a whole. Finally, in South Korea, trade is bolstered by the U.S.-Korea Free Trade Agreement (KORUS). Despite headwinds to the country's export-driven economy as a result of China's slowdown, sales of U.S. products have grown steadily. While these five countries are specifically highlighted, the U.S. Commercial Service maintains a presence in all of the Top Markets ranked in this report.<sup>iii</sup>

Policymakers should appreciate the different competitiveness issues and market characteristics that impact exporters in each sector. This section will provide a general overview of the manufacturing technology industry, which will be augmented by individual sector snapshots at the end of the report. Each offers sector-specific market trends and an assessment of near-term and mid-term export opportunities.

## Industry Overview and Competitiveness

At its base, the manufacturing technology products described in this report are the equipment used to make durable and consumable goods out of various metals, plastics, rubbers, and composite materials. In economics, manufacturing machinery can be framed as one of the many "inputs" to a finished product, or "output." Durable or "hard" goods are products that can be used over the span of several years, such as parts for cars, airplanes, or consumer electronics. On the other hand, consumable or "soft" goods generally last a shorter amount of time, and include products such as cosmetics or pharmaceuticals. While some consumable goods are built using metals or plastics, most notably in the packaging industry, tying the performance of manufacturing machinery to the performance of certain durable goods sectors provides an accessible framework for discussion on manufacturing machinery market drivers.

By and large, the U.S. manufacturing technology sector is highly fragmented and made up of thousands of small-to-medium sized enterprises (SME's) and a handful of larger corporations. Most companies are family-owned, and many are in the second or third generation of family ownership. To illustrate this point, according to Gardner Media's Machine Tool Scoreboard, the two largest U.S. machine-tool manufacturers are Haas Automation of Oxnard, CA, and Gleason Corporation of Rochester, NY. Both are privately held corporations. Gardner estimates Haas' 2012 annual revenue was just under \$1 billion,<sup>iv</sup> while Hoover's estimates Gleason's 2014 annual revenue was roughly \$853 million.<sup>v</sup> A small number of machinery companies are publicly-traded, but even those fall in the small- to mid-cap spectrum. For example, Hardinge, Inc. (NASDAQ: HDNG), based in Elmira, NY, is one of the largest publicly traded U.S. machine tools manufacturers, and had a 2014 annual revenue of \$312 million. 3D Systems (NYSE:DDD), the inventor of additive manufacturing technology and the largest U.S.-headquartered additive manufacturing company, also trades publicly and had annual revenues of \$654 million in 2014. To put this in perspective, the largest U.S. auto manufacturer in 2014, General Motors (NYSE: GM), had annual revenues of almost \$156 billion. In the United States, most manufacturing technology companies are located in fairly close

geographic proximity to each other. Companies based in the Great Lakes region (Michigan, Ohio, Illinois, New York, Wisconsin, Pennsylvania, Minnesota, and Indiana) accounted for almost half of the U.S. exports in this sector in 2014. Along with California and Texas, companies in these ten states accounted for almost 70 percent of U.S. exports in this sector.

### Market Drivers: End-Use Industries

While the performance of manufacturing technology exports generally mirrors the economy at large, a more precise statement would be that the industry is tied to the performance of many end-use industries through their respective supply chains.

One of the largest end-use sectors for manufacturing technology products is automobile production, and increasing global production of motor vehicles will undoubtedly contribute to the expanding market for manufacturing technology. In 2013, almost 76 million new vehicles were produced outside of the United States, up from 73.1 million in 2012 and 70.1 million in 2011.<sup>vi</sup> Market reports estimate the value of the automobile and auto-parts manufacturing industry to be between \$1.2 trillion to \$2 trillion.<sup>vii</sup>

Automobile producers and their multi-tiered supply chains rely extensively on machine tools, dies, jigs, molds, and a host of other types of equipment. Most global automobile manufacturers try to utilize just-in-time production. Therefore, producers of auto components tend to be concentrated near the markets that they serve.<sup>ix</sup> As a result, it is not surprising that this report's top 10 markets accounted for two-thirds of the total automobile production outside of the United States in 2013.<sup>x</sup> The top 35 markets recommended in this report accounted for over 90 percent of the total automobile production outside of the United States in 2013.<sup>xi</sup>

Over the next two years, automobile production is projected to slow down in several key markets, particularly in China and Japan.<sup>xii</sup> <sup>xiii</sup> With auto production being the largest end-use segment for manufacturing technology, and China and Japan accounting for nearly 28 percent of global auto production outside of the United States, this will likely produce headwinds for U.S. manufacturing technology exporters.

Civil aircraft is another major end-use industry. According to Gale Business Insights, global aircraft and parts manufacturing accounted for over \$285 billion dollars in revenue.<sup>xiv</sup> <sup>xv</sup> At the end of 2013, the combined backlog for the two largest civil aircraft manufacturers, Boeing and Airbus, was 10,639. When compared with the 1,273 aircraft that both companies delivered in 2013, one can see that the demand for civil aircraft parts will continue well into the future.<sup>xvi</sup>

In the aerospace industry, top international companies like Italy's Finmeccanica have over 30,000 global suppliers.<sup>xvii</sup> The Dutch-based Airbus Group relies on over 2,000 suppliers based in 20 different countries to deliver components, parts, and hardware for their completed aircraft.<sup>xviii</sup> The list of metal and plastic components used in aircraft is extensive, and as individual parts will often require special manufacturing processes, the opportunities for specialized equipment providers are many.

Other major end-users of manufacturing technology are producers of equipment for upstream oil and gas operations. Field tools, oil derricks, drilling rigs and tools, well logging and surveying devices and other products often require a variety of machine-tools and other machinery to produce. Outside of the United States, upstream oil and gas equipment accounted for over \$124.4 billion in global export revenue in 2013.<sup>xix</sup> Exports originating from this report's top 10 markets accounted for over 62 percent of this revenue, while sales from the top 35 markets in this report accounted for over 87 percent of 2013 revenue.<sup>xx</sup>

Oil and gas equipment producers have been hurt by falling crude oil prices, which reached a six-year low of \$37.04 per barrel in December, 2015.<sup>xxi</sup> Crude oil prices heavily influence oil and gas companies' ability to invest in new equipment, with lower prices leading to less investment. Global revenue for upstream oil and gas equipment has been declining since 2011, as well.<sup>xxii</sup> As a result, machinery companies will face fewer opportunities in the upstream oil and gas equipment sector.

There are obviously many other end-use sectors to consider, but the point to emphasize is that virtually any foreign durable goods manufacturer is a potential customer for U.S. manufacturing technology products.

## Global Competitive Landscape

Competition by and large will come from suppliers in the Asia-Pacific region and Europe. In 2014, the United States was the fourth largest supplier of manufacturing technology products in the world, behind Germany, Japan, and China. For decades, the United States has trailed both Germany and Japan. Germany and Japan have frequently alternated as the number one and number two suppliers but both generally hold a combined 30-35 percent of global market shares. According to U.N. trade data, in 2009, China surpassed the United States as the third largest supplier. China held roughly 10.3 percent of the global export market in 2014. The United States, meanwhile, held 6.7 percent of the market share in 2014, and was followed closely by Italy at 6.3 percent and South Korea at 5.3 percent.

### Asia-Pacific

Japan has held a commanding position ahead of the United States over the last two decades. However, over the past decade, the rise of China has arguably posed the greatest challenge to the U.S. manufacturing technology industry. In 2004, China held only 3.5 percent of global market share and was the seventh largest supplier compared with the United States at 10.2 percent. China has since overtaken South Korea, Taiwan, Switzerland, Italy, and the United States. But while those countries' shares in the global import market have only risen or fallen by less than one percentage point, U.S. market shares over the same period have declined roughly 3.9 percentage points to its 2014 value of 6.3 percent.

While U.S. industry tends to be fragmented and made up of many SMEs, a greater degree of industry consolidation and conglomeration has taken place in the Asia-Pacific region that has direct implications for U.S. competitiveness in the region.

For example, of the twenty largest machine tool producers in the world, 10 are incorporated in the Asia-Pacific region.<sup>xxiii</sup> Of this number, Japan accounts for seven, China for two, and South Korea one. But, although the two largest U.S.-owned machine tool manufacturers Haas and Gleason are primarily focused on machine-tool production, they are more likely to compete in the Asia-Pacific market with subsidiaries of industrial conglomerates that

are highly diversified across a broad array of sectors. For example, Japan's Komatsu (TYO: 6301) is widely known for producing construction and mining equipment to compete with the likes of Caterpillar (NYSE: CAT) or John Deere (NYSE: DE). While the bulk of Komatsu's \$16.6 billion in 2014 annual revenue came from construction and mining equipment, it was also the fifth largest manufacturer of machine tools in the world.<sup>xxiv</sup> Another example is Japan's Jtekt (TYO: 6473). Jtekt, which drew the majority of its \$11.3 billion in 2014 annual revenue from producing automotive and aerospace components, was also the 9<sup>th</sup> largest machine tool manufacturer through its Toyoda brand. South Korea's Doosan (KRX: 000150) is another example of a major construction and heavy industry conglomerate active in the machine-tool industry. Doosan Infracore, the company's equipment subsidiary, had annual revenues of \$7 billion in 2014, and was the 14<sup>th</sup> largest machine tool manufacturer.<sup>xxv</sup> The list of Asian conglomerates goes on.

There are several implications for U.S. competitiveness. Conglomerates have capacity. They benefit from economy of scale, and act as internal customers for their manufacturing operations. They have better access to capital, and are thus more able to set up or acquire existing plants and distribution networks in their target markets.

### Europe

Over the last decade, five of the top ten global supplier countries for manufacturing technology products were Western European (Germany, Italy, Switzerland, Austria, and France). Germany leads the world in output, and it is not surprising that the country ranks highest out of all of the industrialized nations in the United Nations Industrial Development Organization (UNIDO) competitive industrial performance index.

European manufacturing technology producers also tend to be SMEs, with some notable exceptions. But, as a result of limited domestic markets and tighter industry and government integration through compulsory membership in the national Chambers of Commerce, European producers have long relied on exporting goods to build competitiveness. With support from national export promotion agencies, as well as the EU common market and currency, European manufacturers have been more likely to

develop export strategies at an earlier stage, gaining internal knowledge and capacity to conduct international business in the process. For example, according to the European Association of Machine Tool Industries (CECIMO), three quarters of member production is exported, and more than half of member production is exported outside of Europe.<sup>xxvi</sup>

### **Challenges and Barriers**

The International Trade Administration regularly engages with foreign governments to improve opportunities for U.S. exporters.

#### Market Access

Tariffs affect many manufacturing technology products in a number of countries. Manufacturing technology is critical to industrialization, and many governments view the ability to produce items like machine tools as essential to developing their own industrial base. As a result, governments may levy tariffs on imports of foreign goods to support the development of local capacity. Opening market access through tariff reductions remains a critical strategy for the ITA in many countries, including Brazil, China, India, and more. By increasing the price of the product borne on the consumer, tariffs affect the cost-competitiveness of imported items and have a distortionary effect on the market. The United States continues to push for open access to markets by negotiating free trade agreements (FTA), including the Trans-Pacific Partnership (TPP) and Transatlantic Trade & Investment Partnership (T-TIP). The United States also engages partners through established multi-lateral fora like the World Trade Organization (WTO), as well as with other trading partners like China and India through the U.S.-China Strategic & Economic Dialogue and the U.S.-India Strategic & Commercial Dialogue.

#### Content Localization

The ITA also seeks to engage foreign governments on issues of content localization. Content localization requirements are typically set forth by governments as a means of ensuring a certain percentage of inputs into a product are sourced from domestic manufacturers. In return, companies may receive preferential treatment in taxation and subsidies,

among other incentives. While calls by foreign governments to increase local content production are not in themselves barriers to trade, they can raise concerns if they lead to actual requirements. Because of this, the United States carefully monitors calls for content localization that may run counter to the World Trade Organization (WTO) rules. For example, Russia has called for increasing the share of machinery and tool equipment produced locally from the current 10 percent to 60 percent in 2020.<sup>xxvii</sup> As a result, in 2015, the United States and EU officially raised concerns with Russia over the possible extension of local content requirements in procurement of machinery and other sectors by state-owned enterprises.<sup>xxviii</sup> Similarly, in 2015, the Chinese Ministry of Industry and Information Technology unveiled “Made in China 2025,” an industrial policy intended to upgrade Chinese manufacturing through technology and skilled labor. The plan also calls for Chinese companies in targeted sectors to raise domestic content to 70 percent. Among others, one priority sector included is automated machine tools.<sup>xxix</sup> Again, while these calls are not necessarily detrimental to trade, the ITA monitors them closely for their potential to affect U.S. exports. Through multilateral fora like the WTO and bilateral venues like the U.S.-China Joint Commission on Commerce and Trade, as well as with our Free Trade Agreement Partners, the ITA continues to advocate for the same preferential treatment to be given to U.S. exports in these sectors.

#### Technical Barriers to Trade

The ITA closely monitors the development of standards, which include voluntary product specifications set forth by hundreds of regional- and industry-specific standards-developing organizations (SDOs), as well as technical regulations issued by governments to specify product requirements for their markets. Oftentimes, governments will incorporate voluntary standards set by SDOs into their regulatory regimes, making them mandatory for their respective market. When regulations become overly burdensome or have the effect of limiting imports from otherwise qualified vendors, they can become trade irritants, and in some cases, can be classified as technical barriers to trade (or TBT).

Since 1995, the EU has mandated that all machinery used within the 28 EU member states be built to comply with the “Machinery Directive” on safety; European Economic Area countries (EEA, which includes Iceland, Liechtenstein, and Norway) also follow this directive. Machinery manufacturers indicate their compliance with this directive by placing a “CE” marking (short for the French *Conformité Européene*) on their products. The easiest means for demonstrating compliance with the EU Directive is to show conformity with the recognized European Standard associated with it. Thus, by using the “CE” marking, many manufacturers demonstrate conformity to the appropriate standard or standards. However, for U.S. producers that manufacture to standards developed by U.S.-domiciled SDOs, this can require expensive changes to the product. Apart from the direct costs of retooling and reconfiguring models for the European market, there is opportunity cost from lost sales of U.S. products that are not modified for export. As a result, companies interested in doing business in Europe should be well versed in the “Machinery Directive” and its requirements.<sup>xxx</sup>

While CE marking has become an understood cost of doing business in Europe, an area long of concern to the U.S. Government and ITA has been the EU practice of spreading its standards regime to other countries through the EU Neighborhood Policy (ENP) and through European Free Trade Agreements (FTA). The ENP consists of 16 markets in Eastern Europe, Africa, and the Middle East,<sup>xxxi</sup> and is designed to promote closer economic and political integration with markets where the EU has strong trade ties but that are unlikely to become EU members. As part of the ENP or a signatory to an FTA, countries are often provided with aid and technical assistance to develop their markets, and in exchange, are often conditioned to adopt EU standards and directives. The effect is market access barriers in many instances for U.S. companies, and policymakers should be aware of EU agreements with other markets that obligate countries to withdraw from conflicting standards.

### Export Controls

The United States Government restricts the sale of certain products and technologies to foreign countries or persons through a broad, interagency

Export Control policy. The purpose of this policy is to safeguard U.S. national security interests and foreign policy objectives by limiting the sale of sensitive equipment, software, and technology. While most U.S. products shipped to foreign markets are innocuous and used strictly for commercial purposes, other products may possess a “dual-use” capability; that is, they can be used for legitimate commercial applications but can also be used for military or proliferation activities. As a result, the United States Government maintains regulations in tandem with international agreements such as the Wassenaar Arrangement and Missile Technology Control Regime, which lay out rules and restrictions for exporting or releasing products to foreign countries or persons.<sup>xxxii</sup>

For manufacturing technology equipment, many of the applicable licensing requirements are located in the Commerce Control List (CCL) of the Export Administration Regulations (EAR), which enumerates specific items regulated by the U.S. Department of Commerce, Bureau of Industry and Security (BIS).<sup>xxxiii</sup>

While the CCL enumerates specific items that require export licenses, the EAR also contains additional requirements applicable to most other items, which may require licensing based on the receiving entity (end-user) and/or the end-use of the product. For example, further regulatory requirements will likely apply to equipment sold for use in creating weapons or munitions, even if the equipment is not covered by an entry in the CCL. Also, some exports to certain countries may require further licensing, including both embargoed destinations and other countries such as China, India, and Russia. BIS also maintains a *List of Parties of Concern*, which enumerates individuals and entities that may be subject to licensing requirements or whose export privileges are denied outright. Finally, some items are not controlled by BIS, but are instead subject to regulation by another agency which may maintain separate licensing requirements.

While not all manufacturing technology products will require licensing, exporters will save valuable lead-time by familiarizing themselves in advance with the relevant Export Control regulations and availing themselves of the numerous compliance trainings that are regularly scheduled by the Bureau of

Industry and Security.<sup>xxxiv</sup> More importantly, export control violations may carry significant repercussions, including substantial criminal, civil, and administrative penalties. Exporters may also find local assistance through the Department of Commerce's network of 108 local U.S. Export Assistance Centers.<sup>xxxv</sup>

## Opportunities

Despite experiencing difficult head-winds, the global market for manufacturing technology products will continue to be driven by demand for high-quality, innovative, and reliable machinery. By 2025, the world's population is expected to reach 8 billion, with hundreds of millions moving upward into the middle class. While short-term factors will likely limit growth opportunities through 2017, the long-term prospect for manufactured goods remains unchanged. This is not only the case in highly-industrialized economies, but also in developing nations as many companies simply bypass old technologies and leap-frog straight into the trends of today.

Concurrently, as traditional IT principles begin merging with manufacturing, companies that are able to harness concepts of "digital factory" and machine-to-machine communication will be at a distinct competitive advantage in their respective industries.

Many U.S. manufacturing technology companies are keenly sensitive to these facts. Around the globe and across all industries, from aerospace and automotive to industrial goods and utilities, the paradigm of production is shifting towards emerging markets and towards greater digitization. U.S. companies are well-positioned to play a leading role in driving technical change in the global value chain. The ITA is dedicated to partnering with U.S. companies that are looking to sell overseas. With a robust network in over 100 U.S. cities and 80 countries worldwide, the ITA is a ready and able partner in unlocking the potential of exporting.

### **Sector Snapshots**

This section contains sector snapshots that summarize U.S. manufacturing technology export opportunities in each subsector. The snapshots provide export outlook and challenges for each subsector, along with an overview of current trade patterns.

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## Industrial Molds

Industrial Molds are manufacturing implements used for casting shapes and objects out of metal or other materials such as plastics, glass or rubber. Typically, molds are two hardened dies that have been machined, cast, or additively manufactured into the desired shape, and then affixed to each other under pressure to eliminate seams of air. The mold is then affixed to a machine which fills the cavity with the desired material.

Molds are an essential part of the “tooling” in manufacturing processes like plastic injection-molding or aluminum die-casting. While a plastic injection-molding machine can be used to make any number of products, the mold is the variable that makes this possible. Molds must be made and machined with high levels of precision to achieve the nuances of a particular part, as well as the durability and longevity to undergo hundreds of thousands of production runs over a lifetime. As they are injected with hot liquid material, they must be made to take into account the specific cooling qualities of the end-use material.

### Export Outlook

In 2015, U.S. exports of industrial molds accounted for \$624.7 million. More than other manufacturing machinery, industrial molds are typically sold in close regional proximity for a variety of reasons. For one, molds are unique and must be built to order. For this reason many manufacturers prefer to source their molds from relatively close geographic proximity. Another reason is that any change in tooling for a manufacturer can present serious down-time, and therefore many manufacturers

attempt to offset this by sourcing locally or regionally.

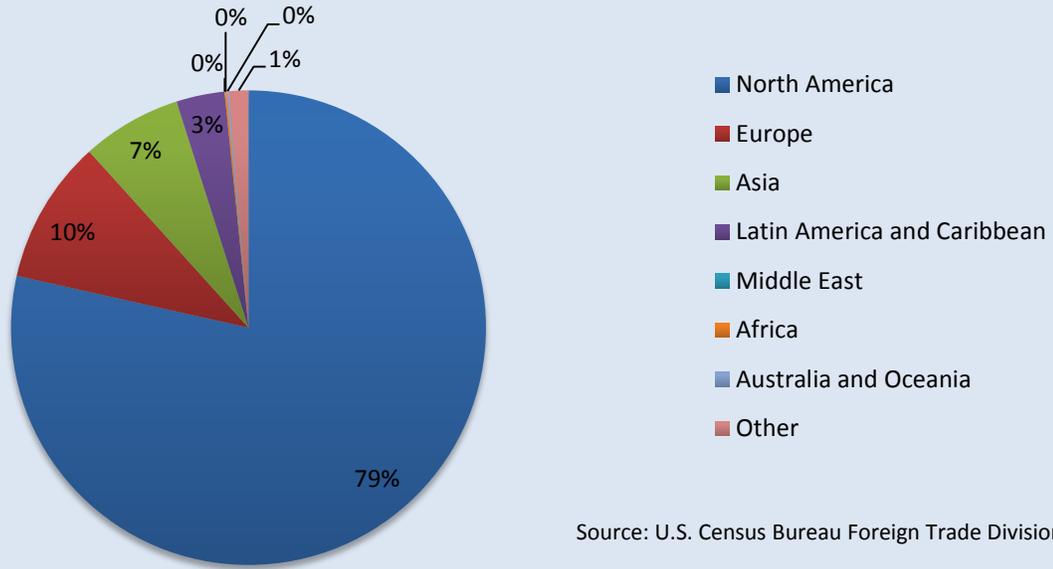
For U.S. exporters, this trend was clearly visible in 2015, when 79 percent of all U.S. mold exports were to Mexico and Canada (see Figure 2). By contrast, China, which is the largest global importer of molds outside of the United States, accounted for only 2.5 percent of U.S. exports in 2015. While exporters will undoubtedly continue to find opportunities in other industrialized markets, ITA projects that Mexico and Canada will remain the largest export markets for mold makers by far through 2017.

### Challenges

Of all the manufacturing machinery subsectors outlined in this Top Markets study, the U.S. industrial mold subsector arguably faces the most headwinds. From 2009 to 2014, U.S. mold exports declined at an average annual rate (CAGR) of 0.8 percent, the most of any subsector. This is largely a result of the general global shift in manufacturing output to the Asia-Pacific region. As manufacturing continues to grow overseas, the need for geographic proximity of mold making operations outlined earlier will also drive the manufacturing of industrial molds to these areas.

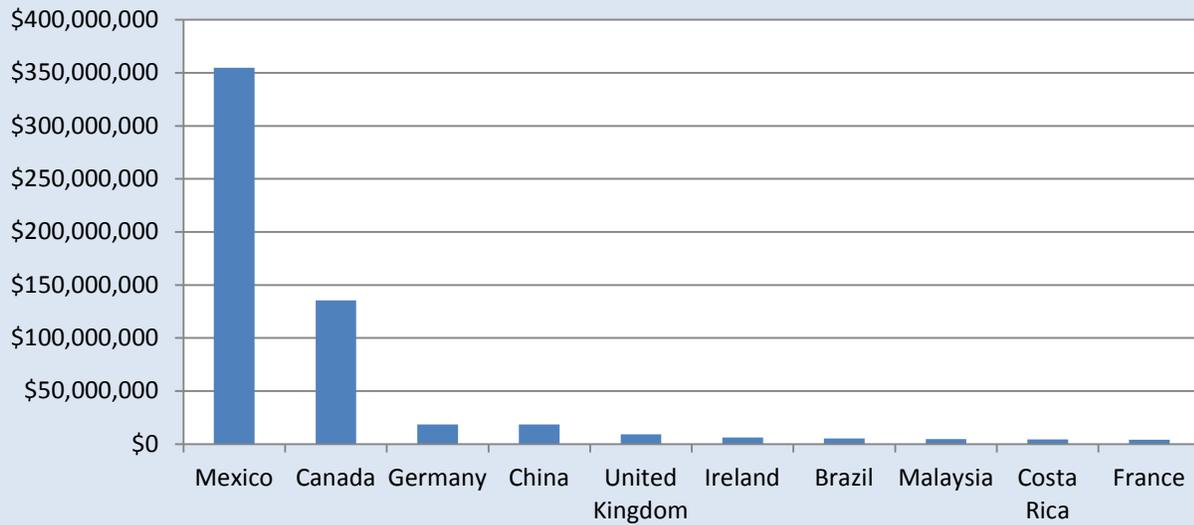
A second challenge on the horizon for mold makers will likely be the increasing adoption of additive manufacturing into supply chains. Industry experts have already noted the growing application of this technology to do “in-house” mold and tooling production, which was not previously feasible without significant investments in equipment and labor.

**Figure 2: U.S. Industrial Mold Exports, 2015 (in USD Millions)**



Source: U.S. Census Bureau Foreign Trade Division

**Figure 3: U.S. Industrial Mold Exports, 2015**



Source: U.S. Census Bureau Foreign Trade Division

## Machine Tool Parts

Machine tool parts are essential to the original and after-market machine tool supply chain. Original equipment manufacturers (OEM's) may source hundreds of components when building their machinery. As with other capital equipment, machine tools represent a significant upfront investment, and customers attempt to prolong the operational lifespan of their machinery for as long as they can. As a result, the demand for replacement parts often surpasses the need for new equipment, making after-market service and sales of spare parts a crucial and ongoing revenue stream for many manufacturers.

For the purposes of statistical collection, the machine tool parts subsector in this report includes parts for both the OEM- and after-market, as well as parts for both cutting and forming machine tools.

### Export Outlook

In 2015, U.S. exports of machine tool parts accounted for just under \$1.1 billion. Compared with U.S. exports of both cutting and forming machine tools, which were just over \$2.5 billion that same year, one can see that the market for parts is still quite substantial. Sales were concentrated primarily in the North America, Asia, and Europe regions. Mexico and Canada were the largest export markets for U.S.-made parts, accounting for a combined \$354 million. Geographic proximity is the largest reason for this. The ability to provide speedy after-market service is a strong competitive advantage for U.S. machinery suppliers in the North America markets. As a result, companies will often leverage their

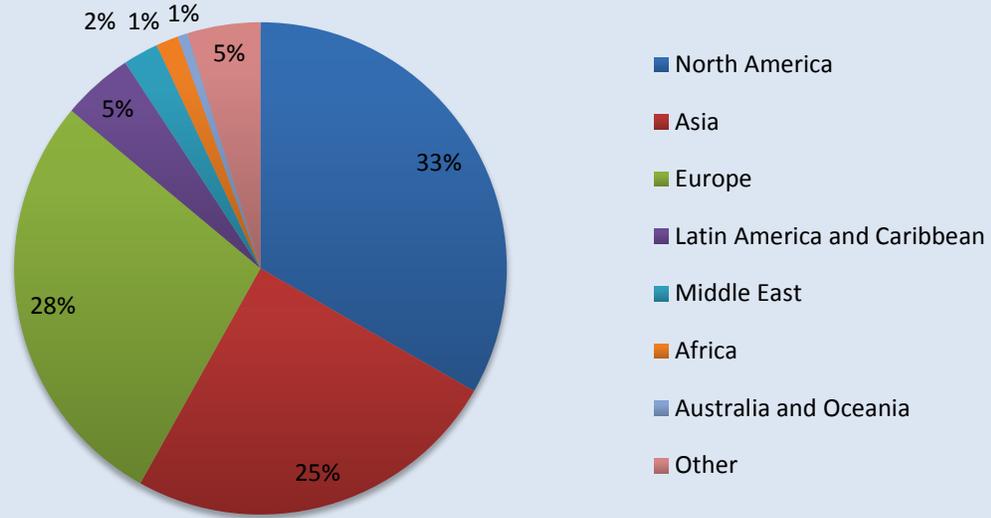
geographic proximity as a means of furthering business through servicing and replacement parts. The third largest U.S. export market for the subsector in 2015 was China, which accounted for \$91 million of exports in the subsector. China is by far the largest global importer of machine tools, but its distance from the United States makes after-market service and support more challenging for many U.S. companies.

Exports of parts can differ widely in proportion to machinery for a number of reasons. In fast-growing markets, sales of machinery may far surpass sales of parts as manufacturing capacity increases. In other more established manufacturing markets with a greater installed base of machine tools or concentration of machine tool OEMs, parts may constitute a much higher proportion of sales.

### Challenges

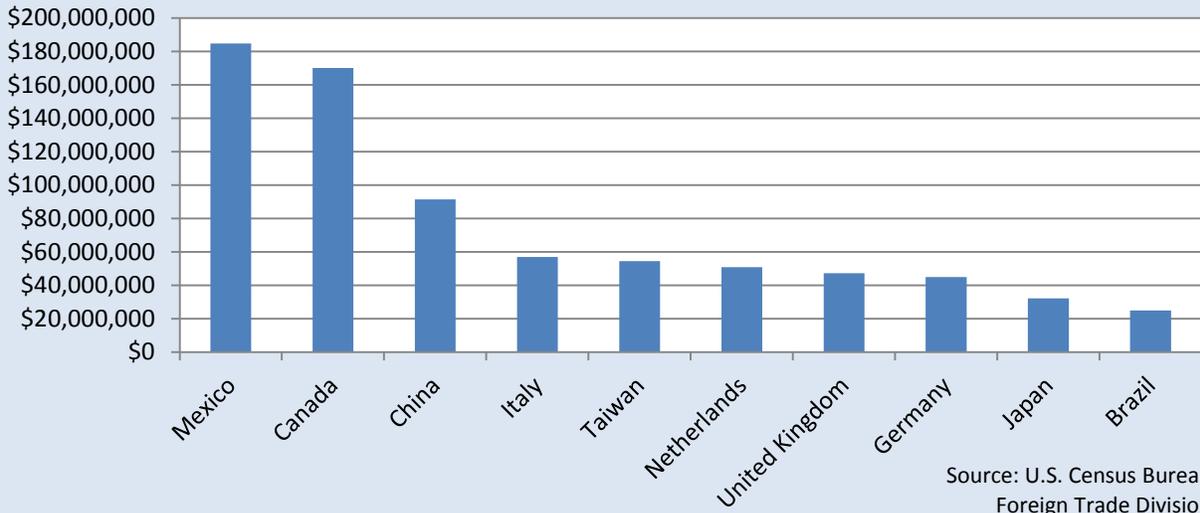
Many parts and components for machine tools are subject to different electro technical and safety standards and regulations in other markets. Electrical requirements for wiring or plugs often vary across markets, and can be an impediment to exports. U.S. companies are encouraged to report these regulatory disparities to the ITA so that they can be analyzed to determine whether they can be characterized as "technical barriers to trade". Technical barriers to trade may have the indirect effect of promoting domestic suppliers at the expense of foreign competitors.

**Figure 4: U.S. Machine Tool Parts Exports, 2015 (in USD Millions)**



Source: U.S. Census Bureau Foreign Trade Division

**Figure 5: U.S. Machine Tool Parts Exports, 2015**



Source: U.S. Census Bureau Foreign Trade Division

## Metal-Cutting Machine Tools

Machine tools used for cutting metal are ubiquitous in metalworking. Some machines such as horizontal lathes have existed in one form or another since antiquity; while others such as computer-numerical controlled (CNC) five-axis vertical machining centers are more recent. Metal-cutting machine tools are generally powered by electric motors and employ one of many cutting processes such as turning, milling, grinding, boring, and more to achieve the desired cut on the metal workpiece. Skilled machinists will use a variety of tools and fixtures to achieve different cuts and levels of precision on a workpiece, which can range from a household screw to a jet-engine turbine blade.

Metal-cutting machine tools are sold based on the needs of the customer. Machines typically price in the five- to six-figure range, while some highly specialized machines can reach into the millions. Many short-run manufacturers may not require the automated precision of CNC, whereas others may require high-volume production with accuracy up to the micrometer. The greater the capability of the machine, typically the greater the price and the greater the skillset required of the machinist and operator.

### Export Outlook

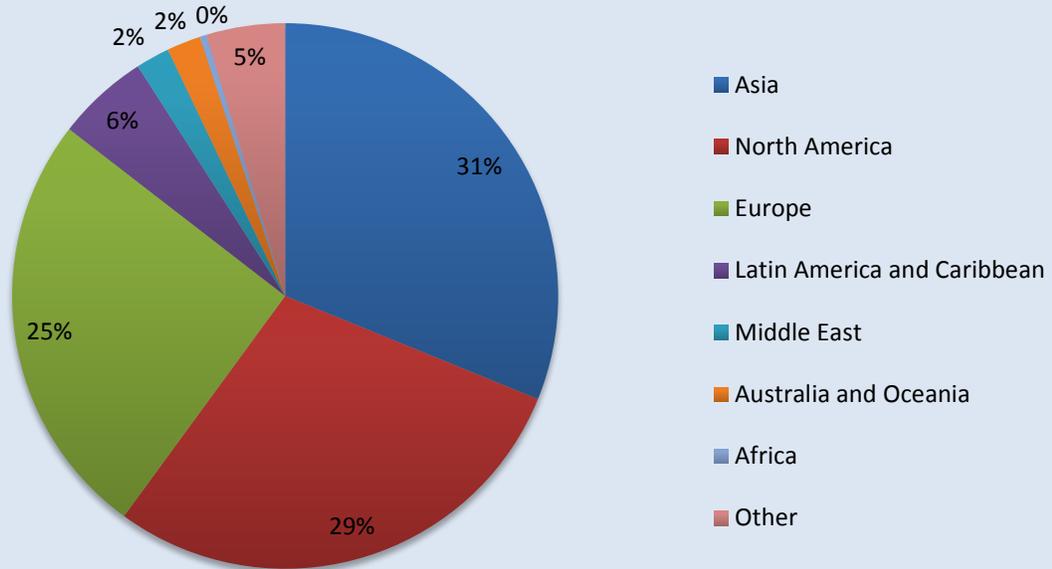
In 2015, U.S. exports of metal-cutting machine tools accounted for \$1.6 billion, the largest subsector in this Top Markets study. Sales were concentrated primarily in the Asia, Europe, and North America regions. China was the largest global importer; however, Mexico was the largest export market for U.S. companies, accounting for \$295.4 million in sales of U.S.-made equipment. The second and third largest U.S. export partners, China and Canada, accounted for \$221.3 million and \$168.2 million in sales, respectively.

For U.S. exporters, growth opportunities in the short term will likely be felt in smaller, but highly developed European manufacturing economies like Belgium and the United Kingdom, along with Asian markets like Singapore. The onset of the Chinese slowdown will likely hinder growth in the short term to China and its principle trade partners, South Korea and Taiwan, though opportunities will exist due to the sheer volume of new manufacturing in the region.

### Challenges

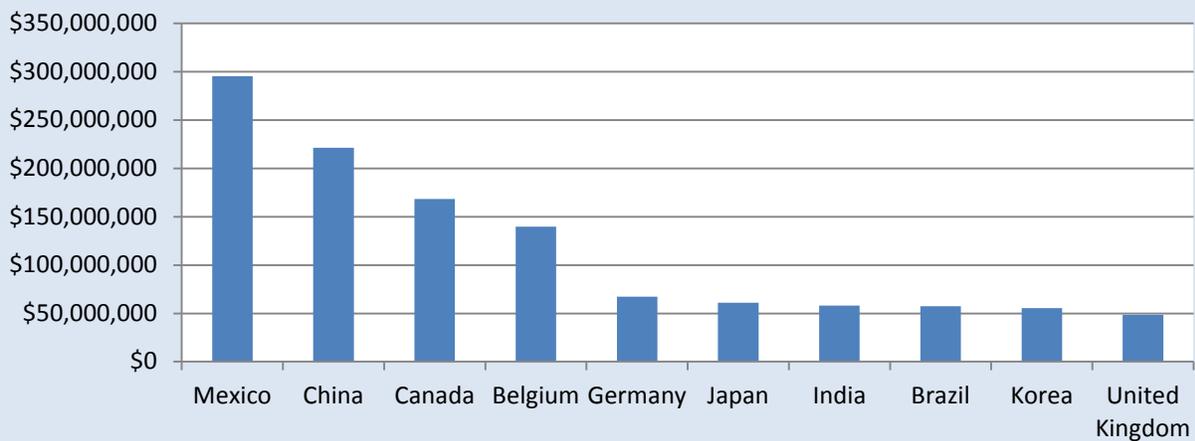
One of the largest challenges for metal-cutting machine tool exporters are meeting the requirements imposed by export controls, in particular to markets such as China, India and Russia. Export controls are used by the U.S. Government to restrict the sale of dual-use technologies for the purposes of national security and foreign policy. Dual-use technologies, or technologies that can serve a commercial as well as military use, often include precision manufacturing equipment like five-axis machining centers or precision measuring equipment. While the overwhelming majority of products will not require a license to be exported, the U.S. Commerce Department's Bureau of Industry and Security (BIS) requires licensure on certain products in order to enter certain markets. This is to ensure that dual-use products are not used for purposes contrary to the national security interest or foreign policy priorities of the U.S. government, including use in missile programs or in nuclear proliferation activities. As a result, exporters of precision machine tools should familiarize themselves with the Export Administration Regulations and any other relevant regulations, or contact the Bureau of Industry and Security for further questions.<sup>xxxvi</sup>

**Figure 6: U.S. Cutting Machine Tool Exports, 2015 (in USD Millions)**



Source: U.S. Census Bureau Foreign Trade Division

**Figure 7: Top Ten U.S. Cutting Machine Tool Export Partners, 2015**



Source: U.S. Census Bureau Foreign Trade Division

## Metal-Forming Machine Tools

Metal-forming machine tools are used to manipulate metal workpieces without adding or removing material. There are many processes for forming metal, including bending, pressing, stamping, extrusion and more. Some of the most common metal-forming machine tools are the stamp variety, which uses a production die and downward hydraulic force to stamp pieces of cold sheet metal into different shapes and parts. Other processes may require the workpiece to be heated in a forge before undergoing pressing or hammering, depending on the application or desired properties of the part. Forged steel parts are often very strong, highly resistant to heat stressors, and are often used as load-bearing, structural components of automobile chassis, aircraft, heavy construction equipment and more.

Metal-forming machines are sold based on a variety of needs such as size, speed, accuracy, tonnage, and more. Machines can be stand-alone or more often integrated into systems that occupy entire factory floors. While forming machines can be highly specialized, the basic technology has existed for many years and is more accessible to lower-end manufacturers.

### Export Outlook

In 2015, U.S. exports of metal-forming machine tools accounted for \$745.8 million. Mexico was the largest export market for U.S. companies, accounting for \$215.2 million in sales, followed by China at \$114.1

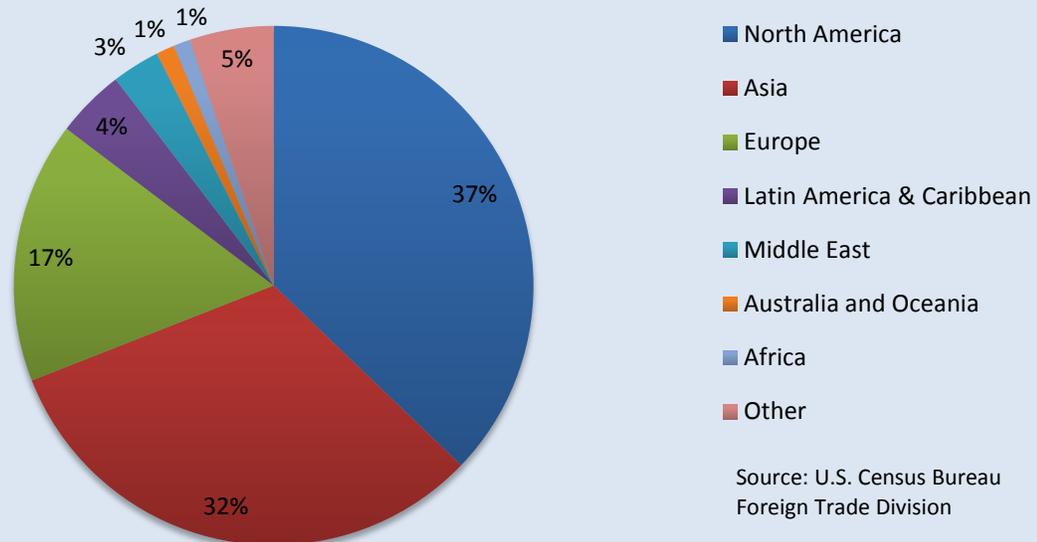
million, and Canada at \$61.9 million. From a regional basis, sales were primarily concentrated in the North American and Asian regions, with Europe accounting for a relatively low 17 percent of total exports. Of note is the relatively high amount of sales made in the Middle East region, which received more forming tools than any other subsector. Within this subsector, Saudi Arabia was the 10<sup>th</sup> largest export market for U.S. forming machine tools, followed by 20<sup>th</sup> ranked United Arab Emirates and 35<sup>th</sup> ranked Iraq. Given recent declines in export volume, ITA expects sales of metal-forming machines to decline slightly through 2017.

For U.S. exporters of metal-forming machine tools, more so than other subsectors, opportunities exist in established trade partners like China and Mexico, as well as some of the lesser developed markets. In the Asia-Pacific region, sales to countries like Thailand and the Philippines will likely continue to grow on the strength of the local automotive industry. Over half of all global exports of metal-forming machine tools originate from Europe, and therefore U.S. exporters may face stiff competition in that region.

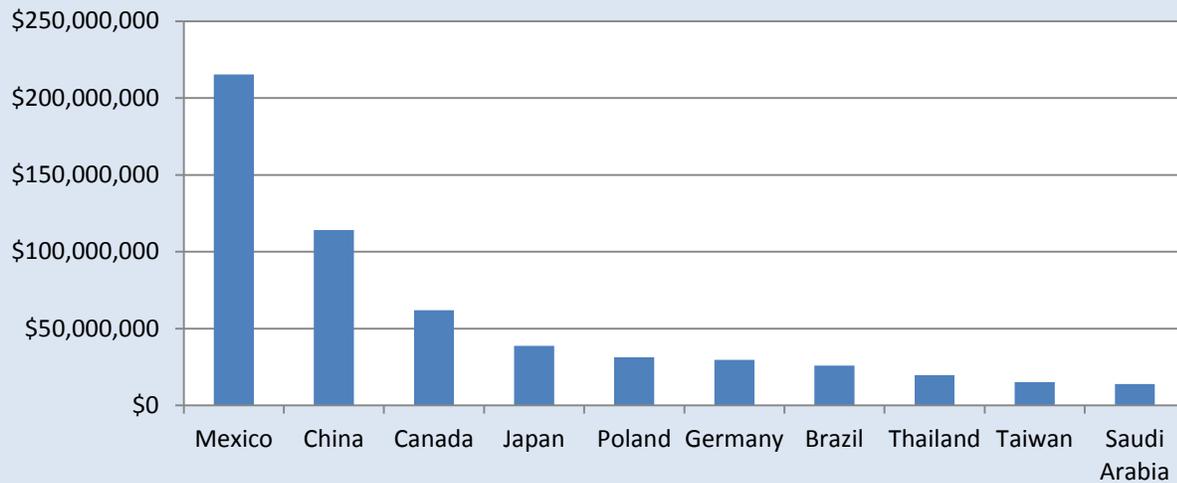
### Challenges

According to latest available U.N. trade data, global trade for metal-forming machine tools has declined nearly 15 percent since 2012, which has largely been a result of a general global slowdown in metalworking consumption. U.S. exports, meanwhile, have declined at a similar rate over the same period, indicating headwinds for the industry at large.

**Figure 8: U.S. Forming Machine Tool Exports by Subsector, 2015  
(in USD Millions)**



**Figure 9: Top Ten U.S. Forming Machine Tool Export Partners, 2015**



### **Country Case Studies**

The following pages include country case studies that summarize U.S. manufacturing technology export opportunities in selected markets. The overviews outline ITA's analysis of the U.S. export potential in each market and offer recommendations to exporters that can improve their competitiveness. The markets represent a range of countries to illustrate a variety of points – and not the top markets overall.

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# Mexico

Mexico ranks first in the Manufacturing Technology Top Markets Report. With a highly developed industrial base and virtually zero market access barriers, Mexico has received the highest volume of U.S. manufacturing technology exports since 2011 and will remain a top destination for U.S. companies.



## Subsector Rankings



ITA expects that U.S. manufacturing technology exports to Mexico will increase through 2017. Between 2009 and 2015, exports to Mexico grew at an average annual rate (CAGR) of 8.9 percent. Despite experiencing a single year decline between 2013 and 2014, ITA projects that exports to Mexico will increase through 2017 particularly as a result of the automotive sector.

### Country Overview

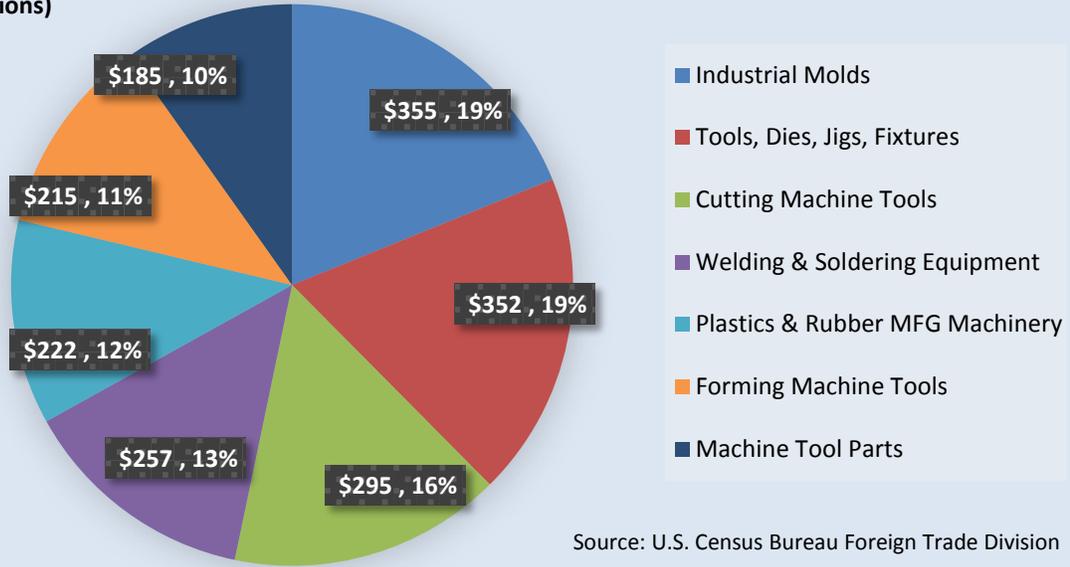
Mexico is a strategic market for U.S. manufacturing technology exporters. Over the past 21 years since entering into the North American Free Trade Agreement (NAFTA), Mexico's economy has increasingly oriented itself away from agriculture and more towards an export-driven manufacturing economy. Between 2002 and 2012, Mexican automotive exports increased by 152 percent from \$27.9 billion to \$70.3 billion, and electronics increased by 73 percent from \$43.3 billion to \$74.9 billion.<sup>xxxvii</sup>

The growing presence of Mexico's automotive industry is a key factor in increasing U.S. exports of manufacturing technology. The automotive growth forecast for 2016 is 6 percent, and by 2020, the industry will produce 5 million vehicles compared to the 2015 production of 3.4 million vehicles.<sup>xxxviii</sup> Vehicle and parts production is growing particularly in the states of Guanajuato, Aguascalientes, and San Luis Potosi.

Mexico's major industrial hubs are the metropolitan areas surrounding Mexico City, Guadalajara, and Monterrey. Mexico's 1,900-mile shared border with the United States has also seen an outgrowth of industrial activity, especially as multinational corporations aim to create vertical supply chains, made possible by NAFTA.

As a signatory of NAFTA, Mexico has virtually zero market access barriers with the United States.

**Figure 10: U.S. Manufacturing Technology Exports to Mexico, 2015  
(in USD Millions)**



Mexico is a net importer of machinery, and the United States is Mexico’s largest source of imports of these products. According to United Nations trade data, in 2014, U.S. products accounted for 29.2 percent of all manufacturing technology imports into Mexico, followed by Japanese products with 18.3 percent, and German products at 12.5 percent. U.S. exporters face stiff competition from Japanese manufacturers, who benefit heavily from the Japan-Mexico Economic Partnership Agreement. Between 2009 and 2014, U.S. market share declined by over 10 percentage points from 39.3 to 29.2 percent, while Japanese share rose from 9.8 percent to 18.3 percent over the same period.

**Export Overview**

Bolstered by a number of conditions, Mexico was the largest export market for six manufacturing technology product categories in 2015. To begin, Mexico is by far the largest destination for U.S. industrial mold exports. The market accounts for well over half of U.S. exports in the subsector. In 2015, U.S. companies sold \$354 million worth of molds to Mexico. Much of this is driven by the Mexican automotive and consumer electronics industries, which draw heavily from mass-produced

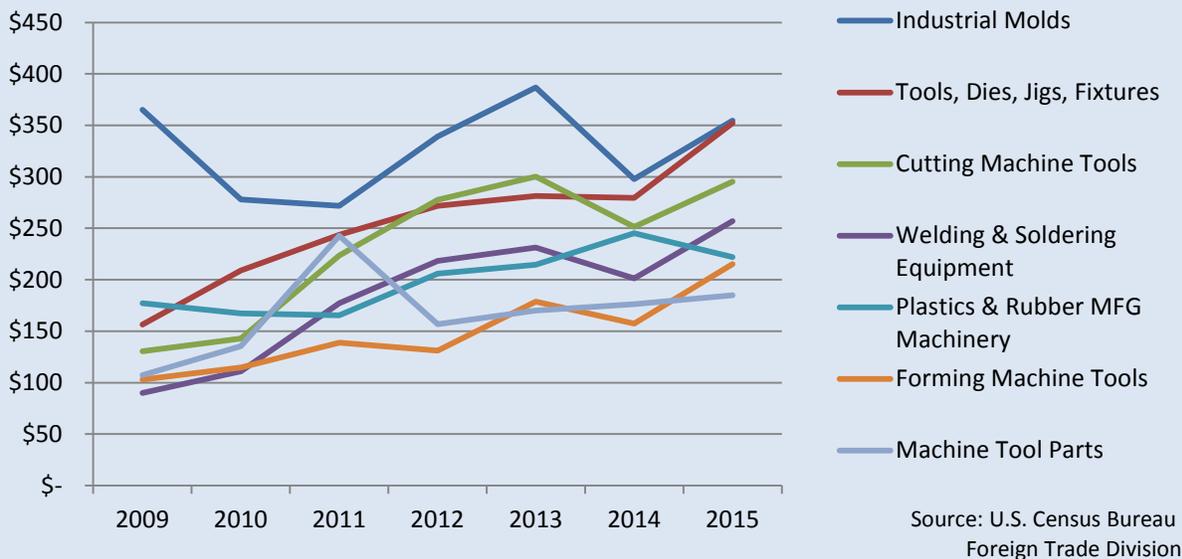
components made using plastic injection molding, metal die casting, and other processes. While U.S. mold exports have experienced steady declines in recent years, Mexico will continue to be the most important export destination for U.S. mold makers through 2017.

In 2015, Mexico was the largest U.S. export market for machine tool parts, accounting for \$184 million in sales. Between 2009 and 2015, average growth (CAGR) in this subsector was 9.5 percent. Growth in U.S. exports has been consistent with growth in the Mexican market, and ITA projects that sales in machine tool parts will continue to grow through 2017.

Mexico is a growing market for tools, dies, jigs, and fixtures. In 2014, U.S. tool and die makers sold \$352 million to Mexican end-users, bolstered particularly by sales in dies used in pressing and stamping operations typical of the automotive industry. Between 2009 and 2015, the subsector experienced 14.5 percent average annual growth.

In 2015, Mexico was the largest export market for U.S. machine tool manufacturers, eclipsing China in both cutting and forming machine tool sales. To begin, cutting machine tools exports have

**Figure 11: Annual U.S. Manufacturing Technology Exports to Mexico, by Subsector (in USD Millions)**



experienced double-digit average annual growth in recent years, though the effects of Mexico’s 2013 metalworking slowdown were felt particularly in these subsectors. Mexican metal parts suppliers are moving rapidly into laser cutting as a faster and cleaner process that helps them avoid additional finishing work. Competing brands of laser cutting machines, including AMADA, Trumpf, Mitsubishi, and others, have dealers in the three major cities of Mexico. In 2015, Mexican businesses purchased \$295 million of U.S. cutting machine tools and \$215 million of forming machine tools, up from just over \$251 million and \$157 million in 2014, respectively. Owing particularly to headwinds in the Chinese market, ITA believes that sales in machine tools to Mexico will continue to be the largest export market for U.S. machine tools through 2017.

In 2015, Mexico dropped to the second largest U.S. export market for plastics and rubber working equipment. Mexico’s automotive industry and its strong food and beverage sectors are major drivers of demand for plastic and rubber products. In 2015, U.S. producers sold \$222 million of equipment to Mexico, down from \$245 million in 2014. Annual growth in this subsector has been slower than other product categories, averaging 3.8 percent growth annually (CAGR) between 2009 and 2015. Machinery sales continue to outperform sales of parts, which

made up roughly 40 percent of exports in this subsector. Thermoplastic extruders experienced strong double digit annual growth between 2009 and 2015, while injection molding machines experienced a steep decline in sales between 2014 and 2015. Despite setbacks in 2015, ITA believes sales in this subsector will continue to grow through 2017 at a moderate pace.

Mexico was the second largest destination for U.S. welding and soldering equipment in 2015, accounting for \$256 million in exports. This was up roughly 27 percent from \$201 million in 2014 as a result of the general metalworking slowdown in that year. ITA expects sales of U.S. welding and soldering equipment to improve through 2017.

Despite advances in manufacturing capacity, Mexico remains an undeveloped market for additive manufacturing equipment. The 3D printing industry was virtually nonexistent in Mexico until 2013, when it was widely reported that the first 3D printing shop opened in the country.<sup>xxxix</sup> The market for systems remains undeveloped largely due to low labor costs and a shortage of skilled workers. However, given the success felt by larger multinational companies like Ford or GE who have incorporated additive manufacturing into their U.S. supply chains, it is likely that Mexican subsidiaries will soon follow suit

and could provide opportunities for U.S. additive manufacturing companies.

### Challenges and Barriers

Mexico is a NAFTA signatory and has eliminated all tariffs on U.S. manufacturing machinery products. U.S. companies should provide a Certificate of Origin to claim preferential tariff treatment for exports under the NAFTA.

The United States and Mexico continue to engage regularly on technical barriers to trade through the NAFTA Committee on Standards Related Measures. In the past they have also cooperated through the U.S.-Mexico High Level Regulatory Cooperation Council,<sup>xi</sup> as well as the USAID-ANSI Standards Alliance.<sup>xii</sup> Mexico provides official standards called *Norma Oficial Mexicana* (NOMs) as well as voluntary standards (NMX) through the Mexican Standards Catalog.<sup>xiii</sup> The U.S. Department of Commerce maintains one of four Standards Attachés worldwide in Mexico City, and most U.S.-domiciled standards developing organizations (SDOs) are engaged with Mexican counterparts.

### Know Your Buyer

Due to its close physical and cultural proximity to the United States, the Mexican market is quite similar to the U.S. market in many respects. Direct sales and sales agents are widely used by manufacturing machinery companies due to close proximity and low shipping costs. Owing to the country's geographic size, it may behoove exporters to work with distributors in multiple hub cities like Mexico City, Guadalajara, or Monterrey, as well as population centers along the 1,900-mile stretch of border with the United States.

Government procurement is decentralized, and Mexican government agencies buy through their own purchasing offices. As a result, government tenders vary between agencies. Public tenders are published in the *Diario Oficial* and are published through an online system.<sup>xliii</sup>

### National and Regional Trade Shows

Expo Manufactura 2016

February 2-4, 2016 – Monterrey, Mexico

<http://www.expomanufactura.com.mx/>

Plastimagen Mexico 2016

March 8-11, 2016 – Ciudad de Mexico

<http://www.plastimagen.com.mx/en/>

[MC]<sup>2</sup> Conference

April 19-21, 2016 – Dallas, TX

<http://mc2conference.com/>

Fabtech Mexico

May 4-6, 2016 – Mexico City, Mexico

<http://mexico.fabtechexpo.com/>

Rapid 2016 (Additive Manufacturing)

May 16-20, 2016 – Orlando, FL

<http://www.rapid3devent.com/>

IMTS 2016

September 12-17, 2016 – Chicago, IL

<http://www.imts.com/>

Fabtech 2016

November 16-18, 2016 – Las Vegas, NV

<http://www.fabtechexpo.com/fabtech-2016/>

TECMA

March 7-10, 2017 — Expo Bancomer, Santa Fé, Mexico City, Mexico

<http://www.tecma.org.mx/>

Promat 2017

April 3-6, 2017 – Chicago, IL

<http://www.promatshow.com/>

FEIMAFE

June 5 - 10, 2017 — Anhembi, São Paulo, Brazil

<http://www.feimafe.com.br/en/>

SPI National Plastics Expo

May 7-11, 2018 – Orlando, FL

<http://www.npe.org/>

# Canada

Canada ranks second overall in this year's Manufacturing Technology Top Markets Report. As one of the first markets to enter into a Free Trade Agreement with the United States, Canada has consistently received the highest or second-highest volume of U.S. manufacturing technology exports. With its close proximity and shared language with the United States, Canada will continue to be a major destination for U.S. equipment exporters.



## Subsector Rankings



ITA expects that U.S. manufacturing technology exports to Canada will decrease slightly through 2017. In 2014, U.S. exports to Canada exceeded \$1.3 billion. Exports to Canada decreased by 6.4 percent between 2014 and 2015, largely tied to the appreciating value of the U.S. dollar against the Canadian dollar. From 2009 through 2015, exports to Canada grew by 5.0 percent annually (CAGR). ITA projects that U.S. sales to Canada will continue to face headwinds due to currency exchange rates through 2017.

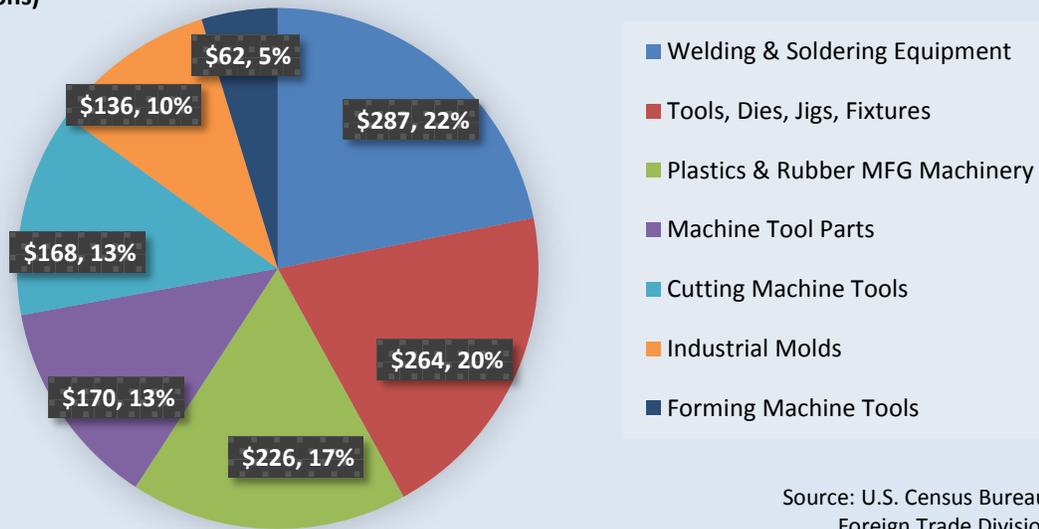
## Country Overview

Canada is a strategic market for U.S. manufacturing machinery exporters. The country is a member of the Group of Seven and has one of the largest and most highly advanced manufacturing economies in the world, which houses robust automobile, metal fabrication, consumer goods, and plastics manufacturing industries. Canada's proximity to the

United States and status as a North American Free Trade Agreement (NAFTA) trading partner are reflected in the level of already existing trade. Canada is a net importer of industrial machinery and equipment,<sup>xiv</sup> and in 2014, according to latest available United Nations trade data, U.S. machinery and equipment accounted for 43.6 percent of the Canadian import market, the largest percentage of all of Canada's trade partners. The U.S. was followed by Japan with 11.4 percent and Germany with 10.5 percent. Japan and Germany remain two principle competitors.

Canada shares over 5,500 miles of border with the United States (including Alaska). Approximately 90 percent of the country's 35 million residents live within 100 miles of the U.S. border. Manufacturing is concentrated in Ontario and Quebec, accounting for roughly two-thirds of all manufacturing sales in the country, followed by Alberta and British Columbia.<sup>xv</sup>

**Figure 12: U.S. Manufacturing Technology Exports to Canada, 2015  
(in USD Millions)**



Source: U.S. Census Bureau  
Foreign Trade Division

### Export Overview

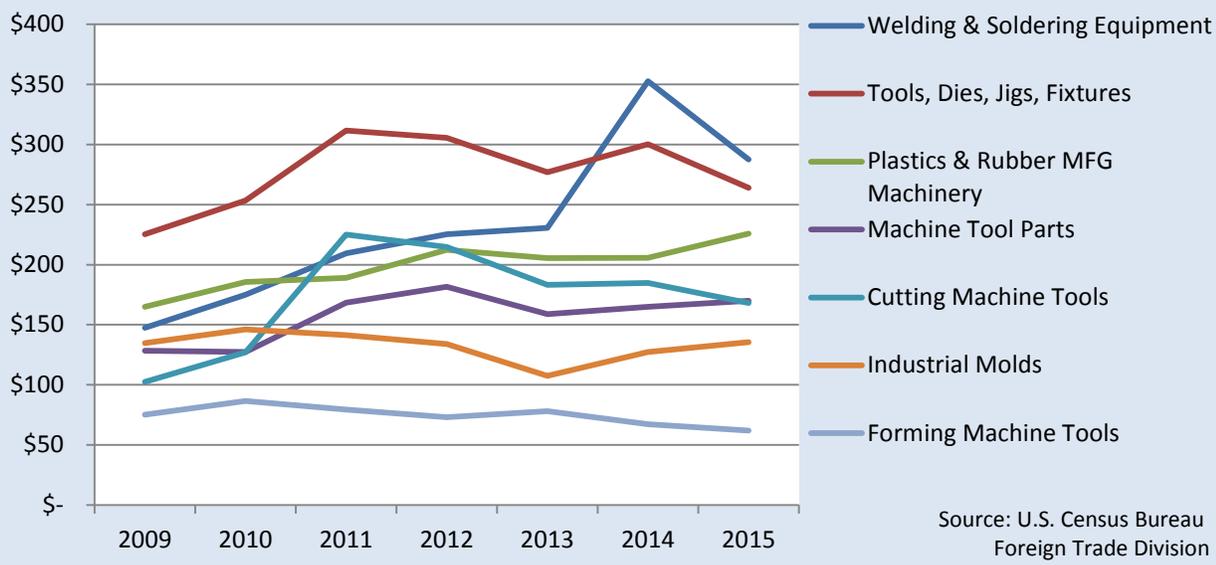
Canada is an important destination for U.S. exporters. In 2015, sales to Canada accounted for over 16 percent of all U.S. manufacturing technology exports. Between 2014 and 2015, exporters were challenged by the appreciating value of the U.S. Dollar against the Canadian Dollar, which grew from 1USD:1.06CAD at the beginning of 2014 to a high of 1USD:1.38CAD at the end of 2015. As with other markets, the strong U.S. Dollar has the effect of increasing prices on U.S. made products in the purchasing country. In order to remain competitive, U.S. producers must either lower prices and diminish profitability, or maintain steady prices at the risk of losing out to lower-cost competitors. Such has been the case in Canada, and will likely continue in the short-term. In November of 2015, General Motors reduced capacity of their Oshawa assembly lines, which has also been a factor in diminished manufacturing technology exports.<sup>xlvi</sup>

In 2015, Canada was the largest export market for two manufacturing technology product categories, which were welding and soldering equipment, and plastics and rubber manufacturing equipment. In 2015, these two categories accounted for 39.1 percent of all U.S. manufacturing technology exports

to Canada. From 2009 to 2015, exports of welding and soldering equipment grew by 11.8 percent annually (CAGR), more than double the rate of total manufacturing technology sales to Canada. Much of this growth has been driven by increased sales of fully or partially automated electric resistance welders, which are used regularly in the automotive and consumer appliance industries. U.S. companies exported \$226 million of plastics and rubber making equipment to Canada in 2015. Sales in this sector have grown modestly at 5.4 percent (CAGR) between 2009 and 2015. Parts for injection molding machines and other plastics machinery accounted for more than half of the exports in this subsector. Between 2009 and 2015, the sales volume of parts accounted for well over half of exports in this subsector.

In 2015, Canada dropped to the second largest U.S. export market for tools, dies, jigs, and fixtures. The largest changes came in composites products. From 2009 to 2015, sales of tools and plates made from sintered carbides grew by 66.5 percent, and were the largest product category in 2015. Meanwhile, sales of tools and plates made of cemented cermet, which were the top export in this category in 2009, dropped over 75 percent and were one of the lowest selling products to Canada in 2015.

**Figure 13: Annual U.S. Industrial Automation Exports to Canada, by Subsector (in USD millions)**



Canada was the second largest U.S. export market for two other manufacturing technology product categories. Industrial mold builders sold \$135 million of products to Canada in 2015, and while this was up from 2014, exports in the subsector have increased by less than one tenth of a percent annually (CAGR) between 2009 and 2015. As highlighted in the Sector Snapshot, Canada accounts for almost 22 percent of all U.S. mold exports. Mold sales are expected to decrease in the next two years as mold production continues to shift to lower cost competitors like China and South Korea. Canada was also the second largest export destination for U.S. machine tool parts. After five years of modest sector growth of 4.8 percent annually (CAGR), in 2015, U.S. companies sold \$170 million of parts. After-market parts will continue to be a source of growth, particularly as sales of forming machine tools is expected to decline due to relative market saturation of original equipment.

Forming machine tool exports to Canada have experienced a 3.2 percent annual decline (CAGR) between 2009 and 2015. As Chinese and South Korean companies have increased their presence in Canada, U.S. market share in this sector has declined from nearly 45 percent in 2009 to less than 30 percent in 2014. This decline is likely to continue in the next two years.

Cutting machine tool exports, meanwhile, have grown at a relatively robust annual rate of 8.6 percent (CAGR) between 2009 and 2015. Sales have been bolstered by growth in high-value machining centers, laser-cutting, and spark-machining tools. U.S. market share has remained steady at roughly 27 percent over the same time frame, indicating a growing opportunity for tool makers.

According to Wohlers Associates, in 2014, Canada accounted for a small percentage (1.9 percent) of the world’s installations of additive manufacturing equipment.<sup>xlvii</sup> Sales of additive manufacturing equipment have gained some momentum in the country, though most activity remains in government and university settings.

### Challenges and Barriers

As a long-time free trade partner, Canada has zero tariffs on U.S. manufacturing technology products. U.S. companies should provide a Certificate of Origin to claim preferential tariff treatment for exports under the NAFTA.

Technical barriers to trade are few and Canadian standards development is closely aligned with that of the United States. Given their close integration, there has been emphasis by Canadian and U.S. standards-developing organizations to collaborate even further to promote shared interests in international fora.

Exporters who also provide after-market services are advised to be well versed in the relevant work permit regulations. After-market service represents an important revenue stream for automation companies, and many companies are unaware of regulations that specifically provide exceptions for after-sales working activities. For more information, exporters are encouraged to visit their local USEAC, or contact relevant U.S. Commercial Service offices located in Canada.

### **Know Your Buyer**

Sales channels in Canada vary based on the subsector. Heavier or specialized equipment typically go through short marketing channels, and direct producer-to-user distribution is common. Machinery of considerable size and value is typically purchased directly by the user, though also through distributors and manufacturers' agents. The Canadian Government licenses customs brokers for importers, and it is typically the importer's responsibility to arrange customs clearance. U.S. exporters are also encouraged to look into the Non-Resident Importer Program, which allows U.S. companies to register and import in Canada without necessitating a physical presence in country.<sup>xlviii</sup>

Information about government procurement practices is available from Public Works and Government Services Canada.<sup>xlix</sup> Companies wishing to compete for government tenders can create an account in the Supplier Registration Information (SRI) system.<sup>1</sup>

### **National and Regional Trade Shows**

Fabtech Canada  
March 22-24, 2016 – Toronto, Canada  
<http://fabtechcanada.com/>

[MC]<sup>2</sup> Conference  
April 19-21, 2016 - Dallas, TX  
<http://mc2conference.com/>

Metalworking Manufacturing and Production Expo  
May 3, 2016 – Coquitlam, British Columbia  
June 7, 2016 – Halifax, Nova Scotia  
<http://www.mmpshow.com/>

Plast-Ex  
May 16-18, 2017 – Toronto, Canada  
[www.plastex.plasticstoday.com](http://www.plastex.plasticstoday.com)

Montreal Manufacturing Technology Show  
May 16-18, 2016 – Montreal, Canada  
<http://mmts.ca/>

Rapid 2016 (Additive Manufacturing)  
May 16-20, 2016 – Orlando, FL  
<http://www.rapid3devent.com/>

IMTS 2016  
September 12-17, 2016 – Chicago, IL  
<http://www.imts.com/>

Fabtech 2016  
November 16-18, 2016 – Las Vegas, NV  
<http://www.fabtechexpo.com/fabtech-2016/>

# China

China ranks third overall in this year's Manufacturing Technology Top Markets Report. The country has the largest market for manufacturing equipment in the world, but concerns of a slowing economy will affect growth opportunities for U.S. exporters. Despite robust trade, the U.S.-China commercial relationship is also fraught with policy challenges that include market access barriers, concerns over intellectual property protection, transparency in standards development, and concerns over dual-use technology transfer.

**Overall Rank**  
**3**

2015 U.S. Exports:  
3rd

2009-2015 Export Growth:  
18th

2012 UNIDO Industrial Competitiveness Ranking:  
4th

UNIDO Industrial Competitiveness Growth Ranking:  
2nd

## Subsector Ranking

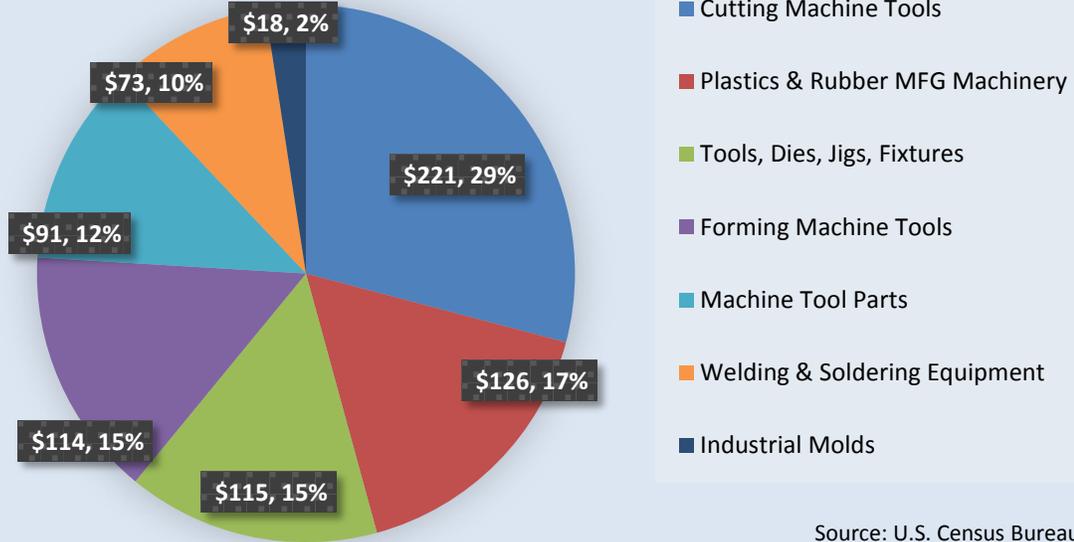


ITA expects that U.S. manufacturing technology exports to China will decline through 2017, owing to the country's general economic slowdown. Exports to China fell sharply by 23.2 percent between 2014 and 2015, and despite robust double-digit average annual growth (CAGR) between 2009 and 2014, many analysts believe China is in the beginning of a long-term economic slowdown that will decrease the country's manufacturing output for some years. Nevertheless, China remains an important market for U.S. exporters due to its sheer volume, and will continue to present opportunities in the near future.

## Country Overview

China is the largest country by population, with 1.3 billion citizens. For the past two decades, the country has sought rapid growth through urbanization, growing its domestic middle class, and increasing manufacturing capability. China is the second largest global economy by nominal GDP, and it is a global leader in industrial output ranging from automobiles to consumer goods, construction and mining, medical devices, and more.

**Figure 14: U.S. Manufacturing Technology Exports to China, 2015  
(in USD Millions)**



Source: U.S. Census Bureau  
Foreign Trade Division

In China, the high-end machinery market is largely composed of state-owned enterprises and multinational companies. These companies often possess significant intellectual property assets in terms of patents, licenses, and trademarks, and can leverage their globally recognized brands to differentiate their products beyond the reach and capabilities of local, smaller competitors. The low-end machinery market is largely dominated by SMEs, mainly due to their cost-cutting structures and price-based competition. Chinese SMEs of machinery are mainly clustered in and around Shanghai City, Shandong Province, Jiangsu Province, and Zhejiang Province.

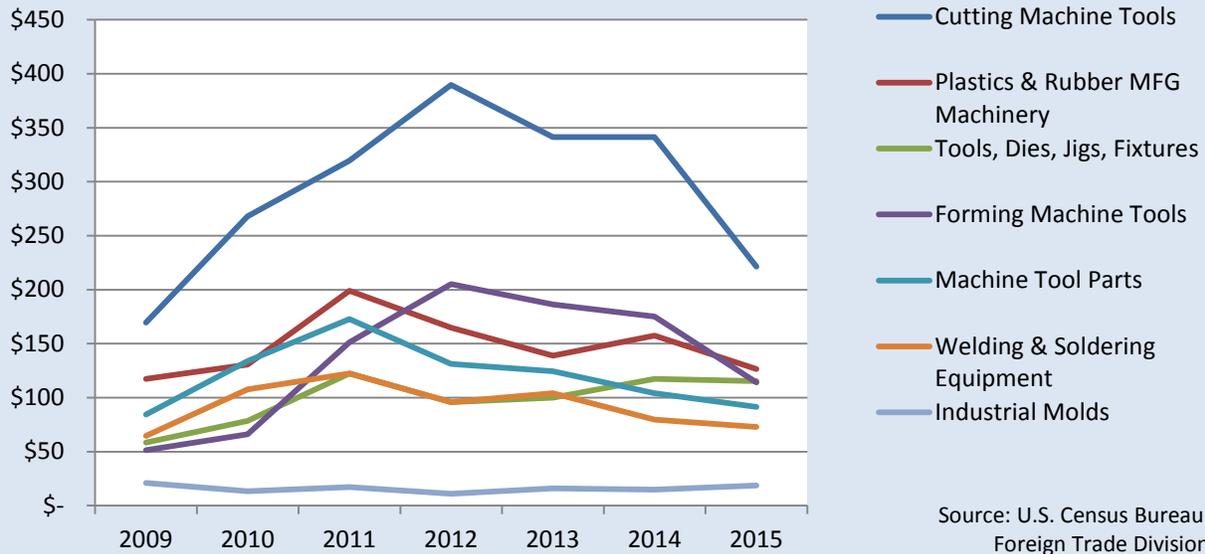
As of 2016, China's growth is forecasted to continue to slow down through 2018 due to a variety of factors. The domestic Chinese stock market took a steep dive in "Black Monday" selloffs in 2015, and the effects on the Chinese financial system have had significant repercussions. China's government devalued the Yuan in August 2015, an indicator of growing concerns over slow growth. China's debt-to-GDP ratio stands at more than 240 percent, and has grown by 50 percentage points in the last four years alone.<sup>li</sup> For U.S. manufacturing technology exporters, the slowdown will likely cause a decline in sales in the short run, and the possibility of further Chinese government intervention to support local industry certainly exists.

### Export Overview

China is the largest global importer of metal-cutting and metal-forming machine tools, and in 2015 it was surpassed by Mexico as the leading U.S. export market for those products. Between 2009 and 2014, sales of U.S. cutting tools to China increased at an average annual rate (CAGR) of 15 percent. However, in 2015, sales plunged 35.2 percent for cutting tools, ending at \$221 million, the lowest amount since 2009. Sales of forming tools also increased at the very robust rate of 27.8 percent (CAGR) between 2009 and 2014. However, by 2015 these numbers had dropped significantly to just above \$114 million, almost 35 percent less than the year prior. While ITA does not expect sales to fall as rapidly in 2017, ITA expects continued decline in these subsectors through the short term. Nevertheless, China will remain an important market for U.S. tool makers in years to come.

China was also the third largest export market for U.S. products in two manufacturing technology subsectors. U.S. suppliers sold \$72.7 million of welding and soldering equipment to China in 2015, down 8.5 percent from the year prior. U.S. exports in the subsector grew at a modest rate of 4.2 percent (CAGR) between 2009 and 2014, though ITA expects that exports will decline further through 2017.

**Figure 15: Annual U.S. Manufacturing Technology Exports to China, by Subsector (in USD millions)**



Sales of machine tool parts for Chinese OEMs and for the after-market accounted for \$91.4 million of U.S. exports in 2015. Annual sales of parts declined by 12 percent between 2014 and 2015, and total sales reached their lowest since 2009. China was the fourth largest export market in 2015 for U.S. mold makers, and the only product group to experience growth between 2014 and 2015. However, it is important to note the difference that exists between the second largest U.S. mold recipient, Canada, and the third, China. In 2014, China received roughly \$18 million in industrial molds from U.S. suppliers, or roughly one-eighth the volume of the same products sold to Canada. As indicated in the Sector Snapshot, U.S. mold makers face stiff competition from low cost-of-labor markets like China and South Korea, and ITA expects sales of molds to China to decline in the near future.

China was the fourth largest export market for U.S. plastics and rubber working equipment. In 2015, U.S. suppliers of plastics and rubber working equipment sold \$126 million of products to China, with finished machinery accounting for roughly two-thirds of that, and parts for the remaining third. In 2015, exports again saw their lowest performance since 2009, and ITA expects U.S. sales in this subsector will continue to fall through 2017.

The sale of tools, dies, jigs, and fixtures represent a relative bright spot in manufacturing technology

sales to China. In 2015, China was the 4<sup>th</sup> largest U.S. export market for this subsector, with \$115 million of products sold. Despite heavy losses in other machinery sectors, sales of dies and tooling declined only 1.6 percent between 2014 and 2015. Exports in this category have grown at an average annual rate (CAGR) of 12 percent from 2009 to 2015. Part of this is due to the competitiveness of more customized and specialized products. While ITA expects the economic slowdown will act as an obstacle for future U.S. exports in this subsector, opportunities for custom tool and die jobs will remain through the near term.

China is a growing market for additive manufacturing equipment. As of 2014, Wohlers Associates estimates that China accounted for 9.2 percent of the world's installations of additive manufacturing equipment.<sup>iii</sup> Wohlers estimates that in 2014, China was the largest recipient of additive manufacturing equipment outside of the United States.

### Challenges and Barriers

The U.S.-China trade relationship is one of the most significant and complex in the world, with multiple sources of tension. Despite implementing many free-market reforms over the past decades, China continues to maintain many state-driven economic

policies that distort trade and investment in the manufacturing technology sector.

Of significant concern to U.S. companies is China's history of poor intellectual property rights (IPR) protection, which is well documented in the United States Trade Representative's "Special 301" report. In this report, China has been placed in a priority category of offender countries every year since the report was first released in 1989. Of particular worry is the oft unchecked theft of trade secrets and industrial espionage conducted through cyber means by state-owned or affiliated enterprises. The U.S. Government will continue to press China to resolve these practices, but the outlook remains questionable for the foreseeable future.

A second set of challenges faced by U.S. companies in IPR-intensive industries are government requirements that compel rights holders to transfer IPR to local domestic entities. In these instances, central, provincial, or local governments may pressure rights holders to give up their IPR through incentives like tax subsidies or requirements that delay or deny market access if the IPR is not disclosed. In many cases, the cost of releasing ownership and the subsequent uncertainty created on the exporter may not be worth the market access.

China has revealed a number of economic policies that will likely pose challenges to U.S. exporters. "Made in China 2025" is a central government policy intended to comprehensively strengthen Chinese industry. It emphasizes 10 industries in particular to be strengthened, which, most notable to this report, includes "automated machine tools & robotics."<sup>liii</sup> The policy's goals are to emphasize high-quality, high-value added manufacturing in China and to raise the domestic content of core components and materials to 40 percent by 2020 and 70 percent by 2025. While there are indications that this policy will rely more upon free market institutions than previous initiatives, ITA is concerned that such goals may in fact be achieved through market-access barriers and other requirements to the detriment of U.S. exporters.

China's system of developing technical standards is generally at odds with the United States. Whereas

U.S.-domiciled standards-developing organizations (SDOs) are generally driven by open, voluntary and consensus-based processes to promote efficiency and superior standards, Chinese SDOs reportedly often deny foreign parties the opportunity to participate in developing standards. Key members in SDOs are typically state-owned or state-affiliated entities, and therefore, may hasten the development of machinery standards that are favorable to the Chinese government rather than to the sector at large. The Chinese are in the process of considering changes to their standards system. ITA will continue to monitor these developments.

U.S. export controls and licensing remain a highly sensitive topic, although the magnitude of their impact on the competitiveness of U.S. manufacturers in China is disputed. China is the largest market for cutting machine tools in particular, a subsector to which many export controls apply. Although one report noted that export controls have not strongly impacted the dollar volume of U.S. machine tool exports to China, it also found that the export advantages afforded to Europeans by licensing processes that are often more swift or dependable are beginning to deeply hurt U.S. machine tool producers in the most advanced segments of the industry.<sup>liv</sup> For example, one major U.S. machine tool company reportedly no longer even offers five-axis equipment in the Chinese market as a result of the added difficulties required by submitting and following up on U.S. export licensing requirements. While it is generally understood within the industry that national security concerns dictate the Export Administration Regulations, some U.S. tool makers have expressed frustration at being beaten to sale by foreign competitors who experience lower average license processing times.<sup>lv</sup> Some of these burdens may have been decreased by export control reform, which has been a multi-year, interagency effort that, at times, requires acts of the Congress to implement. It is, however, unlikely that significant reforms will be made in the machinery sectors in the foreseeable future. For more information on export controls and export licensing, contact the U.S. Department of Commerce Bureau of Industry and Security (BIS).<sup>lvi</sup>

## Know Your Buyer

Entering the Chinese market often relies heavily upon personal relationships developed and maintained at all levels of distribution. China provides permits for both trading (exporting/importing to and from China) and distribution (resale of imported goods within China), although companies may be authorized to do both. Many companies utilize multiple sales channels to overcome the sheer size and cultural diversity of the country.

Chinese companies are very price-conscious, which can affect after-sales service. Labor costs continue to be very low in China. Since the cost of maintaining service plans is often factored into machinery sales, it is important for exporters to consider this as they determine pricing. Some regions and municipalities may have requirements to provide localized after-sales service, which would either require on-site training, or require the local manufacturer representatives to be present.

## National and Regional Trade Shows

### ChinaPlas

April 25-28, 2016 – Shanghai, China

<http://www.chinaplasonline.com/CPS16/Home/lang-eng/Information.aspx>

### China International Import Expo

May 19 - 21, 2016 — Kunshan Jiangsu, P.R.C.

<http://www.importexpo.org/English/#>

### Die & Mold China

June 28 - July 1, 2016 — Shanghai New International Expo Center, Shanghai, China

<http://www.cdmia.com.cn/sites/english/index.html>

### IMTEX 2017 - International Forming Technology Exhibition

January 22 - 28, 2017 – Bangalore, India

<http://www.imtex.in/>

### TIMTOS Taipei International Machine Tool Show

March 7 - 12, 2017 – Taipei, Taiwan

<https://www.timtos.com.tw>

### MTA — Manufacturing Technology Asia

April 4 - 7, 2017 — Singapore Expo, Singapore

<http://mta-asia.com>

### CIMT 2017 - China International Machine Tool Show

April 17 - 22, 2017 – China International Exhibition Center, Beijing, China

<http://www.cimtshow.com/indexen.jsp>

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# Germany

Germany ranks fourth overall in this year's Manufacturing Technology Top Markets Report. Germany is Europe's largest economy and a top global manufacturing market. Germany benefits from a highly skilled labor force and is a leading supplier of machinery, motor vehicles, household appliances, and other manufacturing sectors.



## Subsector Ranking

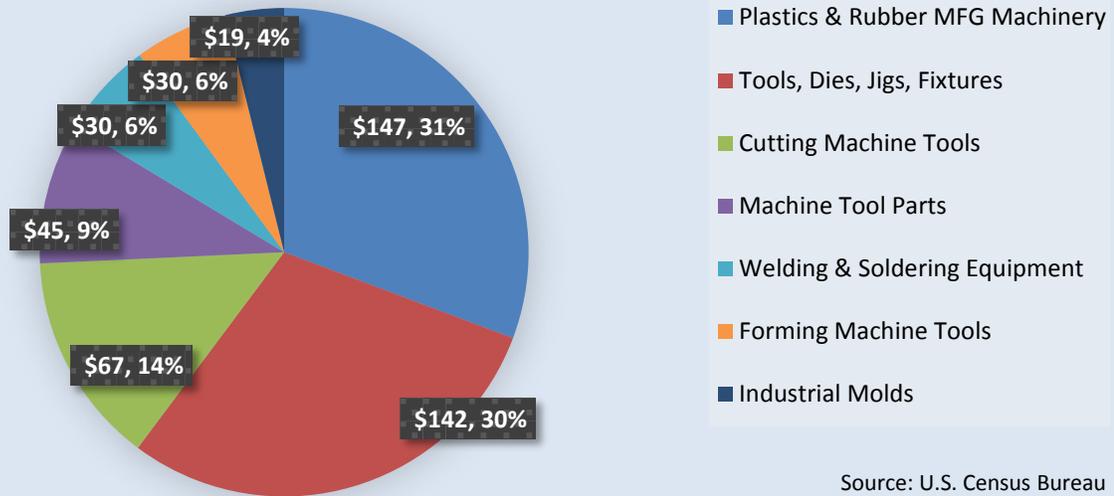


ITA expects that U.S. manufacturing technology exports to Germany will grow through 2017. In 2015, U.S. exports in the sector were valued at just under \$480 million. Germany is the largest European recipient of U.S. manufacturing machinery. Exports to Germany decreased by 3.0 percent between 2014 and 2015, marking the first decline since 2011. This was largely due to appreciating value of the U.S. Dollar against the Euro. At the beginning of 2014, exchange rates were 1USD:0.73EUR. By the end of 2015, rates had reached 1USD:0.92EUR, resulting in headwinds for U.S. exports. Between 2009 and 2015, exports grew at an average annual rate (CAGR) of 7.0 percent. Despite the single year decline in 2014, ITA expects that exports to Germany will grow on the continuing strength of the country's manufacturing output, both in the short-term and long-term.

## Country Overview

Germany is the economic powerhouse of Europe. It is the most populous European country with roughly 81 million residents, and it is the fourth largest global economy by GDP. Germany is a major consumer and also net exporter of motor vehicles, machinery, electrical equipment, rubber and plastics products, and more. The country's emphasis on advanced vocational apprenticeship programs has helped to make "German engineering" synonymous with advanced, precision manufacturing. As of 2015, Germany is the largest global supplier of manufacturing technology products. According to latest available U.N. trade data, the United States was the 6th largest supplier of manufacturing technology products to Germany, behind Switzerland, Italy, China, Austria and Japan. The United States captured 5.4 percent of the import market in 2014, a position it has sustained with relative stability since 2009.

**Figure 16: U.S. Manufacturing Technology Exports to Germany, 2015 (in USD millions)**



Source: U.S. Census Bureau  
Foreign Trade Division

Despite being the largest competing supplier of manufacturing technology products, Germany remains a growing consumer of U.S. exports in this sector, particularly for highly specialized items. For many companies, entering the German market is an important element of any comprehensive export strategy to Europe.

#### Export Overview

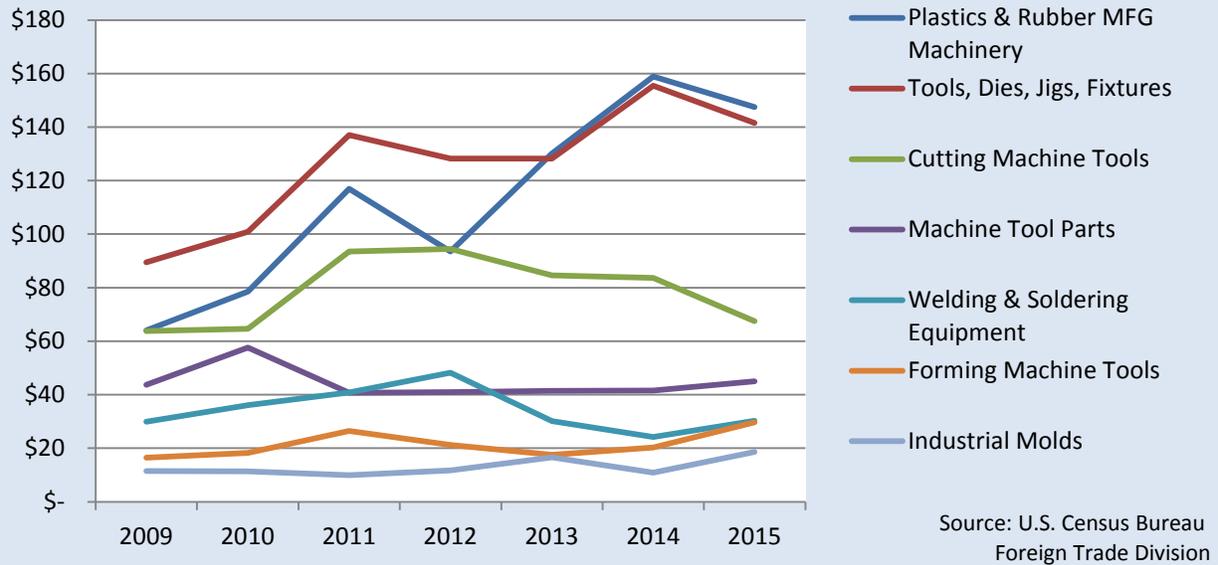
In 2015, Germany was the third largest recipient of U.S. products in three manufacturing technology subsectors. Plastics and rubber working equipment accounted for \$147 million and was the largest volume of exports to Germany in 2015. Between 2009 and 2015, exports in the subsector grew at an average annual rate (CAGR) of 14.9 percent. ITA expects that sales opportunities for machinery and parts to Germany will continue to be strong in this subsector through 2017.

Tools, dies, jigs and fixtures represent another major subsector. In 2015, sales were \$141 million. Between 2009 and 2015, sales of these products grew by 7.9 percent annually (CAGR). Subsector growth was bolstered largely by sales of inserts and accessories made from sintered carbides, which accounted for \$65 million in 2015, or just under half of sales in this subsector. Sintered carbide toolmakers experienced 13.3 percent sales growth (CAGR) between 2009 and 2015, and ITA expects further growth opportunity particularly for this product in Germany through 2017.

Despite accounting for a relatively small proportion of total manufacturing technology exports to Germany, industrial mold sales in 2015 were \$18.6 million, making Germany the 3rd largest export market for U.S. mold makers. Sales in this subsector have increased at an average annual rate of 8.3 percent (CAGR) from 2009 to 2015. However, it is important to note that sales to Germany remain relatively marginal, accounting for less than 3 percent of total U.S. mold exports in 2015.

Germany is a major consumer of machine tools, and in 2014 it was the fifth and sixth largest recipient of U.S. cutting and forming machine tools, respectively. Sales of cutting tools, typically higher valued machines, have declined consistently since 2012, and were \$67 million in 2015, the lowest since 2010. Exports of forming tools, however, saw improvements in 2015, accounting for just under \$30 million. Average annual growth between 2009 and 2015 in this subsector was 10.2 percent (CAGR). According to latest available United Nations trade data, between 2009 and 2014, U.S. share of the German import market for both subsectors remained relatively stable, at roughly 3.5 percent for cutting tools and 4.2 percent for forming tools. The greatest value of U.S. exports in the subsector came from highly advanced computer-numerical control (CNC) laser and photon beam machine tools to achieve highly precise cuts. This is important to note as it highlights the continued opportunities for U.S. companies with competitive products regardless of subsector. As noted in the Executive Summary and later in the Sector Snapshots, Germany is the

**Figure 17: Annual U.S. Manufacturing Technology Exports to Germany, by Subsector (in USD Millions)**



dominant global supplier of manufacturing technology outlined in this report. Trumpf, Schuler and DMG Mori Seiki AG all are prominent machine tool producers in Germany. However, U.S. companies that produce high-tech, high-quality products will still find opportunities in advanced manufacturing markets.

Germany was the 8th largest export market in 2015 for U.S. machine tool parts, as well as welding and soldering equipment. Sales of components and after-market parts for machine tools accounted for \$45 million in sales that year, while sales in welding and soldering equipment were \$30 million.

Germany is a growing market for additive manufacturing equipment, and is a major global competitor in the powdered metal realm. Additive manufacturing has garnered considerable attention in Germany as it relates to the Industrie 4.0 initiative, which focuses on machine connectivity and supply-chain integration. According to Wohlers Associates, Germany holds approximately 8.7 percent of the global installed base for additive manufacturing equipment, and is home to top companies like EOS, Arburg, Concept Laser, and more.<sup>lvii</sup> With machine tool giants Trumpf Group and DMG Mori Seiki AG also entering the additive manufacturing subsector, Germany will remain a top market for additive manufacturing equipment.

### Challenges & Barriers

Germany maintains a highly open and transparent business environment, and there are few formal market access barriers. However, navigating the complex German regulatory landscape can present challenges. Regulations are heavily enforced, though they are applied consistently.

Probably the greatest challenge to entering the German market is overcoming German electro-technical standards and conformity assessment procedures, which differ markedly from those in the United States. For most electrical components such as plugs and cables, U.S. and European standards are nonaligned. In practice this means that for most U.S. machinery makers, the additional labor required to assemble machinery for the German market will affect pricing, inflating the price paid by the customer while decreasing the cost competitiveness compared with domestic and other European-made machines. This is also true for German manufacturers in the U.S. market.

To date, standards nonalignment remains a controversial topic between the U.S. Government and the European Commission, particularly in the context of the ongoing Transatlantic Trade and Investment (T-TIP) negotiations. To overcome this obstacle, U.S. companies are advised to be well-

versed in the relevant standards in place for the German market.<sup>lviii</sup>

As part of the European Commission's "Machinery Directive," machinery sold within Germany and the EU is required to obtain a CE marking whenever the product is covered by specific product legislation. CE stands for "Conformité Européenne," and it is intended to demonstrate compliance with European safety and environmental standards.

In many regards, the intense competitive nature of the German market cannot be overlooked as a market barrier. According to a joint study by McKinsey and VDMA, one of the largest German trade associations for mechanical engineering industries, less than one percent of German companies operate in the low-price segment. The remaining companies operate in the medium- or premium- price segment, with 64 percent identified as operating in only the premium.<sup>lix</sup> As a result, the competitive landscape for U.S. firms is quite stiff, and success is highly dependent on superior quality product offerings and robust localized customer service.

### **Know Your Buyer**

In Germany, arguably more so than any other country, the role of trade fairs is critical to facilitating commerce, especially among larger items like capital goods. Germany is home to the world's largest industrial technology trade show, the Hannover Fair, as well as many of the largest vertical international trade events such as METAV, EuroMold, and AMB. Germany fosters a free market system, and there are no regulations to bind U.S. exporters to a particular sales channel. Direct sales or indirect sales through distributors, agents, commercial representatives, and more are the norm, and the country's transparent business climate makes conducting due diligence more practical.

### **National and Regional Trade Shows**

#### **HANNOVER MESSE**

April 25-29, 2016 — Hannover Exhibition Grounds, Hannover, Germany

<http://www.hannovermesse.de/home>

#### **Poznan MACHTOOL**

June 7 - 10, 2016 — Poznan, Poland

<http://machtool.mtp.pl/en/>

#### **AMB**

September 13-17, 2016 – Stuttgart, Germany

<http://www.messe-stuttgart.de/en/amb/>

#### **Motek**

October 10-13, 2016 – Stuttgart, Germany

<http://www.motek-messe.de/en/motek/>

#### **K – Trade Fair for Plastics and Rubber**

October 19-26, 2016 – Düsseldorf, Germany

<http://www.k-online.com/>

#### **Euromold**

December 6-9, 2016 – Düsseldorf, Germany

[www.euromold.com/en/](http://www.euromold.com/en/)

#### **EMO Hannover 2017**

September 18-23, 2017 – Hannover, Germany

[www.emo-hannover.de](http://www.emo-hannover.de)

#### **International Trade Fair Joining, Cutting, Surfacing**

September 18-23, 2017 – Essen, Germany

<http://www.schweissen-schneiden.com/joining-cutting-surfacing/>

#### **METAV**

February 20-24, 2018 – Düsseldorf, Germany

[www.metav.com](http://www.metav.com)

#### **Plast 2018**

May 29-June 1, 2018 – Milan, Italy

<http://www.plastonline.org/en/>

# South Korea

South Korea ranks seventh overall in this year's Manufacturing Technology Top Markets Report. South Korea has a highly developed manufacturing economy, and U.S. exporters face virtually zero market access barriers as a result of the U.S.-Korea Free Trade Agreement (KORUS) that went into effect in 2012.

Overall Rank

7

U.S. Exports:  
8th

Export Growth:  
5th

2012 UNIDO Industrial  
Competitiveness  
Ranking:  
3rd

UNIDO Industrial  
Competitiveness  
Growth Ranking:  
6th

## Subsector Rankings



ITA expects that U.S. manufacturing technology exports to South Korea will remain stable through 2017. Exports to South Korea increased by 14.6 percent between 2014 and 2015, and U.S. annual export growth to the country averaged 9.5 percent (CAGR) between 2009 and 2015. However, ITA believes that China's forecasted slowdown will have an outsized effect on the South Korean economy. China is South Korea's largest export partner, which accounts for over 25 percent of Korean exports. As a result, U.S. manufacturing technology sales to South Korea will likely face headwinds through 2017.

### Country Overview

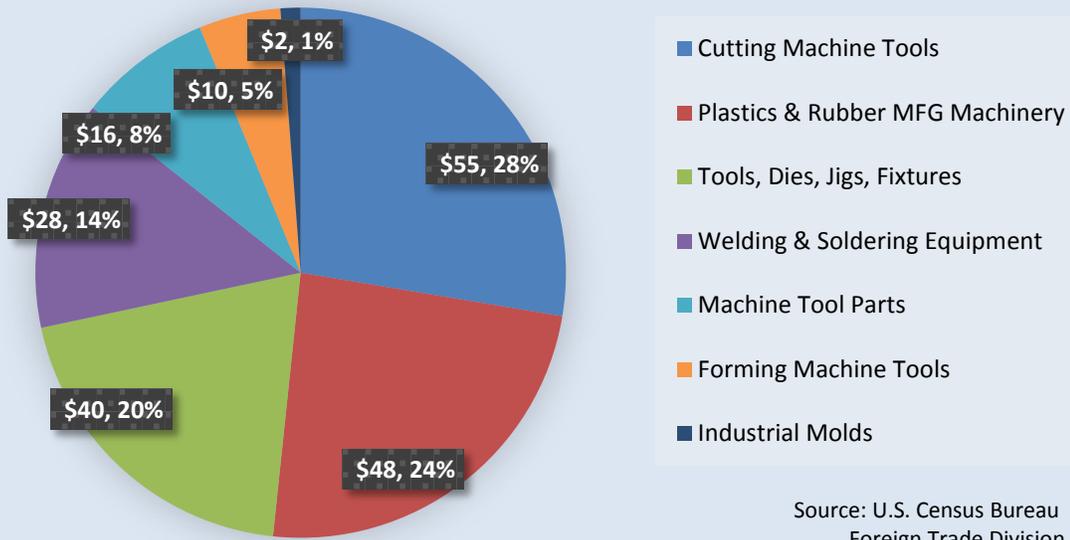
South Korea has emerged over the past decades as a globally competitive manufacturing economy with tight integration into global markets. In 2014, it was the 13<sup>th</sup> largest economy by GDP, with a population

just exceeding 49 million residents. South Korea is a sophisticated manufacturing economy, particularly in semiconductors, consumer electronics, automobiles, and construction equipment. In 2011, South Korea and the United States ratified the U.S.-Korea Free Trade Agreement (KORUS), which will substantially eliminate tariffs between the two countries. By 2017, nearly 95 percent of bilateral trade in consumer and industrial products will become duty free.

For decades, the South Korean economy has relied heavily on exports at the expense of developing domestic-oriented sectors. Exports comprise over half of the country's GDP, and forecasted sluggishness in the Asia-Pacific region will likely be a headwind to growth of U.S. sales to South Korea.

### Export Overview

**Figure 18: U.S. Manufacturing Technology Exports to South Korea, 2015  
(in USD Millions)**



Source: U.S. Census Bureau  
Foreign Trade Division

In 2015, South Korea was the fifth largest export market for U.S. plastics and rubber working equipment. Between 2014 and 2015, sales grew rapidly by 47.6 percent to account for \$48 million in volume. Between 2009 and 2015, U.S. exports of this equipment increased at an average annual rate (CAGR) of 15.3 percent. ITA expects sales opportunities in this subsector will continue to grow, but at a slower pace through 2017.

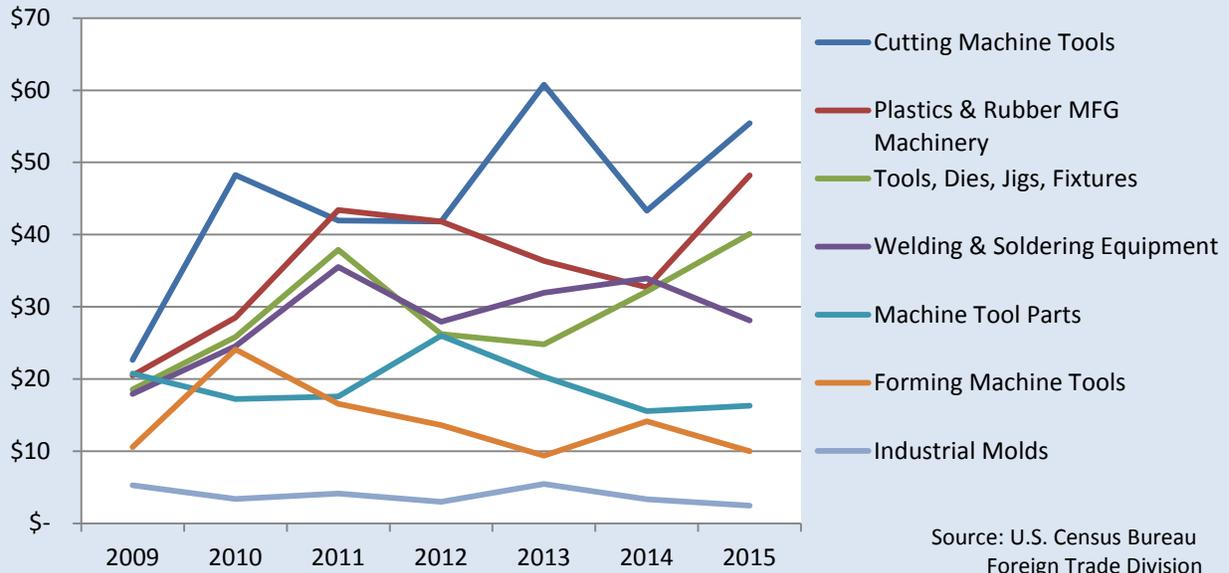
South Korea was the sixth largest export market for U.S. welding and soldering equipment in 2015, which accounted for \$28 million in exports that year. While sales of automated electric welders grew, the subsector as a whole experienced a double-digit decline between 2014 and 2015. ITA expects continued challenges in this subsector through 2017. South Korea was the ninth largest market for U.S. cutting and forming machine tools. Cutting machine tools accounted for over one quarter of U.S. manufacturing technology exports to South Korea in 2015. However, sales of U.S. machine tools to South Korea have been volatile in recent years. Between 2009 and 2015, exports in the cutting-tool subsector experienced robust double-digit growth, peaking at \$60 million in sales in 2013. However, between 2013 and 2014, U.S. exports to South Korea in this subsector dropped precipitously by 28.7 percent to just over \$43 million. By 2015, sales had reached \$55 million, still below their peak in 2013.

Exports in forming tools fared similarly, with a wide degree of variability in sales volume between years. Despite strong growth between 2013 and 2014, exports of forming tools fell sharply in 2015. In all, sales of forming tools accounted for a small percentage of total manufacturing technology products sold to South Korea. ITA expects a continued softening in this subsector due largely to the Chinese slowdown.

South Korea was the ninth largest export destination for U.S. makers of special tools, dies, jigs and fixtures, which accounted for \$40.1 million in 2015. Similarly with other subsectors like machine tools, annual growth in this subsector has been volatile and prone to leaps and backslides. Between 2009 and 2015, average annual growth (CAGR) was 13.7 percent, and though ITA expects continued growth through the medium-term, the short-term outlook remains unclear.

Despite growth in 2015, sales of parts for machine tools have declined by roughly a quarter between 2009 and 2015, and ITA expects this trend to continue as demand for machinery declines. In 2015, sales of machine tool parts accounted for \$16.3 million, making South Korea the 14<sup>th</sup> largest export destination for U.S. manufacturers in this subsector.

**Figure 19: Annual U.S. Manufacturing Technology Exports to South Korea, by Subsector (in USD Millions)**



U.S. industrial mold exports to South Korea accounted for \$2.4 million in sales in 2015, and were the smallest subsector by volume to that market. South Korea was the 19<sup>th</sup> largest export destination for U.S. mold makers, though accounting for less than 0.4 percent of global U.S. exports in the subsector.

According to estimates made by Wohlers Associates, in 2014, South Korea accounted for roughly 2.7 percent of all installed additive manufacturing systems in the world, and had the third largest number of machines in the Asia-Pacific region.<sup>lx</sup> South Korea is home to several established additive manufacturing companies such as Carima and InssTek, and in 2015 the country’s technology giant Samsung announced it had filed a patent on a new multicolor 3D printer.<sup>lxi</sup> Despite South Korean companies’ relatively late adoption of the subsector, ITA expects that South Korea will be a growth market for additive manufacturing technologies through 2017 and beyond.

**Challenges and Barriers**

The South Korean market is generally quite open and transparent, and in 2015 it was ranked fourth out of 189 in the World Bank Ease of Doing Business economic rankings.

In South Korea, domestic industry is largely dominated by conglomerates known as “Chaebols.” These very large conglomerates were historically family-controlled entities that were highly-diversified internationally and across sectors. While efforts have been made to regulate them and limit their influence in the Korean economy and governing class, chaebols continue to be major players in the Korean market. For example, two of the largest historic chaebols, the electronics giant Samsung Group and the Hyundai Motor Group, are also leading manufacturers of machine tools through strategic acquisitions. Given the highly diversified nature of their parent companies, these subsidiaries are virtually guaranteed a robust stream of revenue through internal sales to parent and other subsidiary companies. As a result, U.S. exporters may face challenging market-entry conditions.

**Know Your Buyer**

Establishing local representation is often the key to success in entering the Korean market. Distributors and offer agents who import in their own name must register with the Korea International Trading Association (KITA).<sup>lxii</sup> Korea is home to a number of trading firms that essentially act as distributors diversified over several sectors, and many provide representation for U.S. suppliers.

Personal relationships are highly valued, and sellers of capital equipment are often most successful after conducting site visits to build rapport with plant engineers and foremen. For OEMs, retaining localized maintenance personnel for after-market services can be an important determinant in competitiveness.

Another important determinant is pricing. U.S. firms primarily compete with low-cost domestic or Chinese companies in South Korea. As a result, many manufacturers are highly price-conscious and more likely to select products based on cost constraints rather than additional features.

#### **National and Regional Trade Shows**

SIMTOS

April 13-17, 2016 – Go-yang, South Korea

<http://www.simtos.org/eng/Index.do>

MTA — Manufacturing Technology Asia

April 4 - 7, 2017 — Singapore Expo, Singapore

<http://mta-asia.com>

## Addendum: Resources for U.S. Exporters

*The U.S. Government has numerous resources available to help U.S. exporters: from additional market research, to guides to export financing, to overseas trade missions, to staff around the country and the world. A few key resources are highlighted below. For additional information about services from the International Trade Administration (ITA), please visit [www.export.gov](http://www.export.gov).*

### Country Commercial Guides

<http://export.gov/ccg/>

Written by U.S. Embassy trade experts worldwide, the *Country Commercial Guides* provide an excellent starting point for what you need to know about exporting and doing business in a foreign market. The reports include sections addressing: market overview, challenges, opportunities, and entry strategies; political environment; selling U.S. products and services; trade regulations, customs, and standards; and much more.

### Basic Guide to Exporting

<http://export.gov/basicguide/>

*A Basic Guide to Exporting* addresses virtually every issue a company looking to export might face. Numerous sections, charts, lists and definitions throughout the book's 19 chapters provide in-depth information and solid advice about the key activities and issues relevant to any prospective exporter.

### Trade Finance Guide: A Quick Reference for U.S. Exporters

<http://www.export.gov/tradefinanceguide/index.asp>

*Trade Finance Guide: A Quick Reference for U.S. Exporters* is designed to help U.S. companies, especially small and medium-sized enterprises, learn the basics of trade finance so that they can turn their export opportunities into actual sales and achieve the ultimate goal of getting paid on time for those sales. Concise, two-page chapters offer the basics of numerous financing techniques, from open accounts to forfaiting and government assisted foreign-buyer financing.

### Trade Missions

<http://www.export.gov/trademissions/>

Department of Commerce trade missions are overseas programs for U.S. firms that wish to explore and pursue export opportunities by meeting directly with potential clients in local markets.

Trade missions include, among other activities, one-on-one meetings with foreign industry executives and government officials that are pre-screened to match specific business objectives.

### Certified Trade Fairs

[http://www.export.gov/eac/show\\_short\\_trade\\_events.asp?CountryName=null&StateName=null&IndustryName=null&TypeName=International%20Trade%20Fair&StartDate=null&EndDate=null](http://www.export.gov/eac/show_short_trade_events.asp?CountryName=null&StateName=null&IndustryName=null&TypeName=International%20Trade%20Fair&StartDate=null&EndDate=null)

The Department of Commerce's trade fair certification program endorses overseas trade shows that are reliable venues and good markets for U.S. firms to sell their products and services abroad. These shows serve as vital access vehicles for U.S. firms to enter and expand into foreign markets. The certified show/U.S. pavilion ensures a high-quality, multi-faceted opportunity for American companies to successfully market overseas. Among other benefits, certified trade fairs provide U.S. exhibitors with help facilitating contacts, market information, counseling and other services to enhance their marketing efforts.

### International Buyer Program

<http://export.gov/ibp/>

The International Buyer Program (IBP) brings thousands of international buyers to the United States for business-to-business matchmaking with U.S. firms exhibiting at major industry trade shows. Every year, the International Buyer Program results in millions of dollars in new business for U.S. companies by bringing pre-screened international buyers, representatives and distributors to selected shows. U.S. country and industry experts are on site at IBP shows to provide hands-on export counseling, market analysis, and matchmaking services. Each IBP show also has an International Business Center where U.S. companies can meet privately with prospective international buyers, prospective sales representatives, and business partners and obtain assistance from experienced ITA staff.

**The Advocacy Center**

<http://www.export.gov/advocacy/>

The Advocacy Center coordinates U.S. government interagency advocacy efforts on behalf of U.S. exporters that are bidding on public-sector contracts with overseas governments and government agencies. The Advocacy Center helps to ensure that sales of U.S. products and services have the best possible chance competing abroad. Advocacy assistance is wide and varied but often involves companies that want the U.S. Government to communicate a message to foreign governments or government-owned corporations on behalf of their commercial interest, typically in a competitive bid contest.

**U.S. Commercial Service**

<http://www.export.gov/usoffices/index.asp>

With offices throughout the United States and in U.S. Embassies and consulates in nearly 80 countries, the U.S. Commercial Service utilizes its global network of trade professionals to connect U.S. companies with international buyers worldwide. Whether looking to make their first export sale or expand to additional international markets, companies will find the expertise they need to tap into lucrative opportunities and increase their bottom line. This includes trade counseling, actionable market intelligence, business matchmaking, and commercial diplomacy.

## Appendix 1: Methodology

To establish a priority of foreign markets that offer the best prospects for U.S. producers of manufacturing technology equipment, this report identified four criteria that were weighted according to perceived relevance. These criteria were:

- total volume of U.S. manufacturing technology exports in 2015, as measured by U.S. Census Bureau, Foreign Trade Division (50%)
- compound annual growth rate (CAGR) of U.S. manufacturing technology exports between 2009 and 2015, as measured by U.S. Census Bureau, Foreign Trade Division (20%)
- most up-to-date ranking (2012) of markets by United Nations Industrial Development Organization's (UNIDO) "Competitive Industrial Performance Index" (15%)
- level of growth in industrialization as measured by rate of improvement in 2009-2012 UNIDO "Competitive Industrial Performance Index" rankings (15%)

To determine total volume and annual growth of U.S. manufacturing technology exports, ITA identified 234 unique 10-digit Schedule B codes. "Schedule B" codes are those used by U.S. companies to declare their exported products, and thus reflect the dollar value of items reported to the U.S. Census Bureau Foreign Trade Division.

In ranking markets, ITA placed the most emphasis on total volume of exports in 2015. It is presumed that markets with historically high U.S. exports will continue to do so in the future for a variety of reasons. Historic export trends indirectly take into account factors specific to the United States, such as geography, Free Trade Agreements (FTA), and size of market opportunity.

Markets for manufacturing technology are largely predicated on a minimum threshold of industrialization. Industrialization is understood to cover a wide range of social and economic activities within a society. The United Nations Industrial Development Organization's (UNIDO) "Competitive Industrial Performance" Index (CIP) is a composite index that consists of sub-indicators of industrial competitiveness. It is presumed that the greater the value of a country's CIP ranking, the more likely that country will house a market for manufacturing technology products. Likewise, it is presumed that countries experiencing growth over time in their CIP ranking will represent growing demand for manufacturing technology products.

One product category, additive manufacturing, remains too small of a global industry to be classified within the Harmonized System. According to Wohlers Associates, the global market for all additive manufacturing sales of equipment, materials, and software was approximately \$4.5 billion in 2015, a tiny fraction among other subsectors counted in this report. As a result, rankings for Additive Manufacturing equipment are based on the number of installed additive manufacturing machines in markets derived by Wohlers Associates, a private market research and consulting firm widely regarded as a leading voice in additive manufacturing analysis.

It should be noted that the 2015 Manufacturing Technology Top Markets Report focuses on *physical equipment* exports. It does not take into account exports of accompanying software solutions, such as those that accompany controllers for machinery, Computer Aided Design (CAD), or Computer Aided Manufacturing (CAM) software for machine tools or additive manufacturing equipment. It also does not take into account *services*, such as those provided by third party systems integrators, distributors or consultants. While services undoubtedly play an important role in this sector, particularly after-market service and repair for machinery, precise export data on software and accompanying services is neither readily available nor consistent across markets. It is presumed that a country that imports a high volume of equipment will likely have associated trade in related services. Therefore, trade statistics for equipment can be used as a proxy indicator for services.

Market	2012 Industrial Performance	Industrial Performance Growth: 2009 to 2012	2015 Merchandise Exports	Merchandise Export Growth, 2009 to 2015	Total Score
<i>Weights:</i>	<i>0.15</i>	<i>0.15</i>	<i>0.5</i>	<i>0.2</i>	<i>1</i>
Mexico	31	53	100	49	72
Canada	38	44	69	32	53
China	62	73	39	32	46
Germany	100	46	24	41	42
Japan	88	57	14	43	37
Belgium	52	28	8	100	36
Korea	73	58	9	52	35
Poland	29	53	3	100	34
Netherlands	56	47	8	46	28
Saudi Arabia	15	100	4	41	28
United Kingdom	48	46	12	34	27
Czech Republic	37	53	0	65	26
Costa Rica	4	53	2	66	23
Singapore	58	67	5	4	22
Taiwan	52	60	5	8	21
Turkey	21	53	1	43	20
Thailand	25	53	3	35	20
France	52	28	3	29	19
Brazil	15	53	10	20	19
Italy	52	28	5	19	18
Switzerland	60	41	0	15	18
Israel	21	26	1	47	17
Chile	8	53	0	32	16
Russia	17	72	1	5	15
Indonesia	44	38	0	9	14
Australia	21	39	3	15	14
India	10	53	5	6	13
Malaysia	29	53	2	0	13
Ireland	52	28	0	4	13
Spain	35	26	0	17	13
Argentina	12	53	0	9	12
Hong Kong	0	0	2	44	10
United Arab Emirates	8	26	0	18	9
South Africa	10	29	1	10	8
Colombia	2	11	1	6	3

## Appendix 2: Citations

- <sup>i</sup> Gardner Research “2015 World Machine-Tool Output & Consumption Survey” *Gardner Media*  
<http://www.gardnerweb.com/cdn/cms/GR-2015-WMTS.pdf>
- <sup>ii</sup> *ibid.*
- <sup>iii</sup> Note: Both Switzerland and Venezuela are “Partner Post” countries, meaning export promotion and commercial responsibilities are delegated to the State Department in the Economic Section of the U.S. Embassy in Bern and Caracas, respectively.
- <sup>iv</sup> <http://www.metalworkinginsider.info/scoreboard.htm>
- <sup>v</sup> “Gleason Corporation, Rochester NY” *Company Overview, Hoovers, Inc.*, accessed 10/21/2015.
- <sup>vi</sup> Alan K. Binder, ed. “Ward’s Automotive Yearbook 2014” *Ward’s Automotive Group* (Southfield, MI)
- <sup>vii</sup> “Automobile Manufacturing”, *Industry Profile, Gale Business Insights Online Collection*, 2015.
- <sup>viii</sup> “Global Car & Automobile Manufacturing Market Research Report”, *IBISWorld*, February 2015.
- <sup>ix</sup> Jeffrey Williams “2015 Auto Parts Top Markets Report” *U.S. International Trade Administration*, 2015.Pg. 3.
- <sup>x</sup> Binder, *Ward’s*
- <sup>xi</sup> Binder, *Ward’s*
- <sup>xii</sup> Business Monitor International “China Autos Report Q4 2015”
- <sup>xiii</sup> Business Monitor International “Japan Autos Report Q4 2015”
- <sup>xiv</sup> “Aircraft Engine and Engine Parts Manufacturing” *Industry Profile, Gale Business Insights Online Collection*, 2015.
- <sup>xv</sup> “Other Aircraft Part and Auxiliary Equipment Manufacturing” *Industry Profile, Gale Business Insights Online Collection*, 2015.
- <sup>xvi</sup> Fred Elliot “2015 Aircraft Parts Top Markets Report” *U.S. International Trade Administration*, 2015.Pg. 6.
- <sup>xvii</sup> <http://www.finmeccanica.com/en/nostro-impegno-our-commitment/conduzione-business-conduct/business-fornitori-suppliers>
- <sup>xviii</sup> <http://www.airbus.com/tools/airbusfor/suppliers/>
- <sup>xix</sup> UNComtrade Data
- <sup>xx</sup> UNComtrade Data
- <sup>xxi</sup> <http://www.wsj.com/articles/oil-prices-rise-but-supply-glut-caps-gains-1451560147>
- <sup>xxii</sup> Julius Svoboda “2015 Upstream Oil and Gas Equipment Top Markets Report” *U.S. International Trade Administration*, 2015.Pg. 4.
- <sup>xxiii</sup> <http://www.metalworkinginsider.info/scoreboard.htm>
- <sup>xxiv</sup> *ibid.*
- <sup>xxv</sup> *ibid.*
- <sup>xxvi</sup> <http://www.cecimo.eu/site/>
- <sup>xxvii</sup> United States Trade Representative “2015 National Trade Estimate Report on Foreign Trade Barriers” p. 340.  
<https://ustr.gov/sites/default/files/2015%20NTE%20Combined.pdf>
- <sup>xxviii</sup> [https://www.wto.org/english/news\\_e/news15\\_e/monit\\_16apr15\\_e.htm](https://www.wto.org/english/news_e/news15_e/monit_16apr15_e.htm)
- <sup>xxix</sup> Scott Kennedy “Overview: Made in China 2025” *Center for Strategic & International Studies*, June 1, 2015.  
<http://csis.org/publication/made-china-2025>
- <sup>xxx</sup> [http://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/machinery/index\\_en.htm](http://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/machinery/index_en.htm)
- <sup>xxxi</sup> [http://eeas.europa.eu/enp/index\\_en.htm](http://eeas.europa.eu/enp/index_en.htm)
- <sup>xxxii</sup> <http://www.wassenaar.org/>
- <sup>xxxiii</sup> <https://www.bis.doc.gov/index.php/regulations/commerce-control-list-ccl>
- <sup>xxxiv</sup> <http://www.bis.doc.gov/index.php/compliance-a-training/current-seminar-schedule>
- <sup>xxxv</sup> <http://export.gov/eac/index.asp>
- <sup>xxxvi</sup> [www.bis.doc.gov](http://www.bis.doc.gov)
- <sup>xxxvii</sup> Stratfor “Mexico’s Manufacturing Sector Continues to Grow” *Forbes.com*, 8 April, 2015.  
<http://www.forbes.com/sites/stratfor/2015/04/08/mexicos-manufacturing-sector-continues-to-grow/>
- <sup>xxxviii</sup> <http://www.somosindustria.com/articulo/se-pronostica-crecimiento-de-596-en-la-industria-automotriz-mexicana/>
- <sup>xxxix</sup> JelmerLuimstra “Mexico Has its First 3D Printing Shop” *3DPrinting.com*, 30 November 2013.  
<http://3dprinting.com/news/mexico-first-3d-printing-shop/>
- <sup>xl</sup> <http://trade.gov/hlrcc/>
- <sup>xli</sup> <http://standardsalliance.ansi.org/>

- 
- <sup>xlii</sup> <http://www.economia.gob.mx/standards/mexican-standards-catalog>
- <sup>xliii</sup> <https://compranet.funcionpublica.gob.mx/web/login.html>
- <sup>xliv</sup> Economist Intelligence Unit “Country Report: Canada” 10 February, 2016.  
[http://country.eiu.com/FileHandler.ashx?issue\\_id=1233903707&mode=pdf](http://country.eiu.com/FileHandler.ashx?issue_id=1233903707&mode=pdf)
- <sup>xlv</sup> Statistics Canada “Manufacturing Sales, by province and territory” *CANSIM*, tables 304-0014 and 304-0015.  
Last modified: 20 January, 2016.  
<http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/manuf28-eng.htm>
- <sup>xlvi</sup> <http://www.theglobeandmail.com/report-on-business/international-business/us-business/gm-to-end-oshawa-camaro-production-nov-20/article24186829/>
- <sup>xlvii</sup> Tim Caffrey, Terry Wohlers “Wohlers Report 2015: 3D Printing and Additive Manufacturing State of the Industry” *Wohlers Associates, Inc.*, 2015. p. 30, 180.
- <sup>xlviii</sup> Tracey Ford “Canada: the Non-Resident Importer Program” *U.S. International Trade Administration*, July 2015  
[http://files.export.gov/x\\_2425843.pdf](http://files.export.gov/x_2425843.pdf)
- <sup>xlix</sup> <http://www.tpsgc-pwgsc.gc.ca/app-acq/index-eng.html>
- <sup>i</sup> <https://srisupplier.contractsCanada.gc.ca/index-eng.cfm?af=ZnVzZWVjdGlvbj1yZWdpc3Rlci5pbnRybyZpZD03>
- <sup>ii</sup> The Economist “Debt in China: Deleveraging delayed” 24 October, 2015.  
<http://www.economist.com/news/finance-and-economics/21676837-credit-growth-still-outstripping-economic-growth-deleveraging-delayed>
- <sup>iii</sup> Tim Caffrey, Terry Wohlers “Wohlers Report 2015: 3D Printing and Additive Manufacturing State of the Industry” *Wohlers Associates, Inc.*, 2015. p. 30
- <sup>iiii</sup> Scott Kennedy “Made in China 2025” *Center for Strategic & International Studies*, 1 June 2015.  
<http://csis.org/publication/made-china-2025>
- <sup>lv</sup> Richard Van Atta et. al., “Export Controls and the U.S. Defense Industrial Base: Impact of U.S. Export Controls on the U.S. Machine Tool Industry” *Institute for Defense Analyses*, January 2007, p. C-4  
[www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA465592](http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA465592)
- <sup>lv</sup> Jennifer Watts, Jason Bolton, Ashley Miller “Critical Technology Assessment of Five Axis Simultaneous Control Machine Tools” *U.S. Department of Commerce Bureau of Industry and Security*, July 2009.  
[https://www.bis.doc.gov/index.php/forms-documents/doc\\_view/138-five-axis-simultaneous-control-machine-tools](https://www.bis.doc.gov/index.php/forms-documents/doc_view/138-five-axis-simultaneous-control-machine-tools)
- <sup>lvi</sup> <http://www.bis.doc.gov/>
- <sup>lvii</sup> Tim Caffrey, Terry Wohlers “Wohlers Report 2015: 3D Printing and Additive Manufacturing State of the Industry” *Wohlers Associates, Inc.*, 2015. p. 30, 167.
- <sup>lviii</sup> For more information on trade regulations, customs, and standards, see the “Germany Country Commercial Guide” provided by ITA.  
<http://export.gov/Germany/MarketResearchonGermany/CountryCommercialGuide/index.asp>
- <sup>lix</sup> McKinsey & Company, VDMA “The Future of German mechanical engineering: Operating successfully in a dynamic environment” July 24, pg. 28  
[http://www.mckinsey.com/client\\_service/automotive\\_and\\_assembly/latest\\_thinking/future\\_of\\_german\\_mechanical\\_engineering](http://www.mckinsey.com/client_service/automotive_and_assembly/latest_thinking/future_of_german_mechanical_engineering)
- <sup>ix</sup> Tim Caffrey, Terry Wohlers “Wohlers Report 2015: 3D Printing and Additive Manufacturing State of the Industry” *Wohlers Associates, Inc.*, 2015. p. 30.
- <sup>lxi</sup> Joe Eckelman “Samsung’s Patent for Multicolor 3D Printer and Process May Signal Larger Entry into Market” *3DPrint.com*, 9 June, 2015.  
<http://3dprint.com/57742/samsung-patent-multicolor-3dp/>
- <sup>lxii</sup> <http://www.kita.org/>

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