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September 2019

DEFENSE SUPPLIER BASE

Challenges and Policy Considerations Regarding Offshoring and Foreign Investment Risks

Accessible Version

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GAO Highlights

Highlights of GAO-19-516, a report to congressional requesters

September 2019

DEFENSE SUPPLIER BASE

Challenges and Policy Considerations Regarding Offshoring and Foreign Investment Risks

Why This Matters

DOD relies on a globalized network of suppliers for the components and technologies involved in its weapons systems. Domestic companies that offshore their operations or accept foreign investment can help DOD save money and access more technology. But a globalized supply chain can also make it harder for DOD to get what it needs if, for example, other countries cut off U.S. access to critical supplies.

Key Takeaways

Foreign investments in U.S. companies vary annually, but the extent of offshoring is largely unknown. We convened a panel of experts to talk about the benefits and risks of both.

Panelists noted that offshoring can lower costs and provide better access to foreign workers and markets. When companies that offshore contract with DOD, they can pass those benefits along. Foreign investment can help U.S. companies grow.

The panelists also outlined some of the risks of relying on a globalized supply chain. Specifically:

Intellectual property—Foreign investors in U.S. companies can get access to the sensitive technologies those companies develop. When those investors are from the nation's strategic competitors (such as China or Russia), technology transfer is a concern.

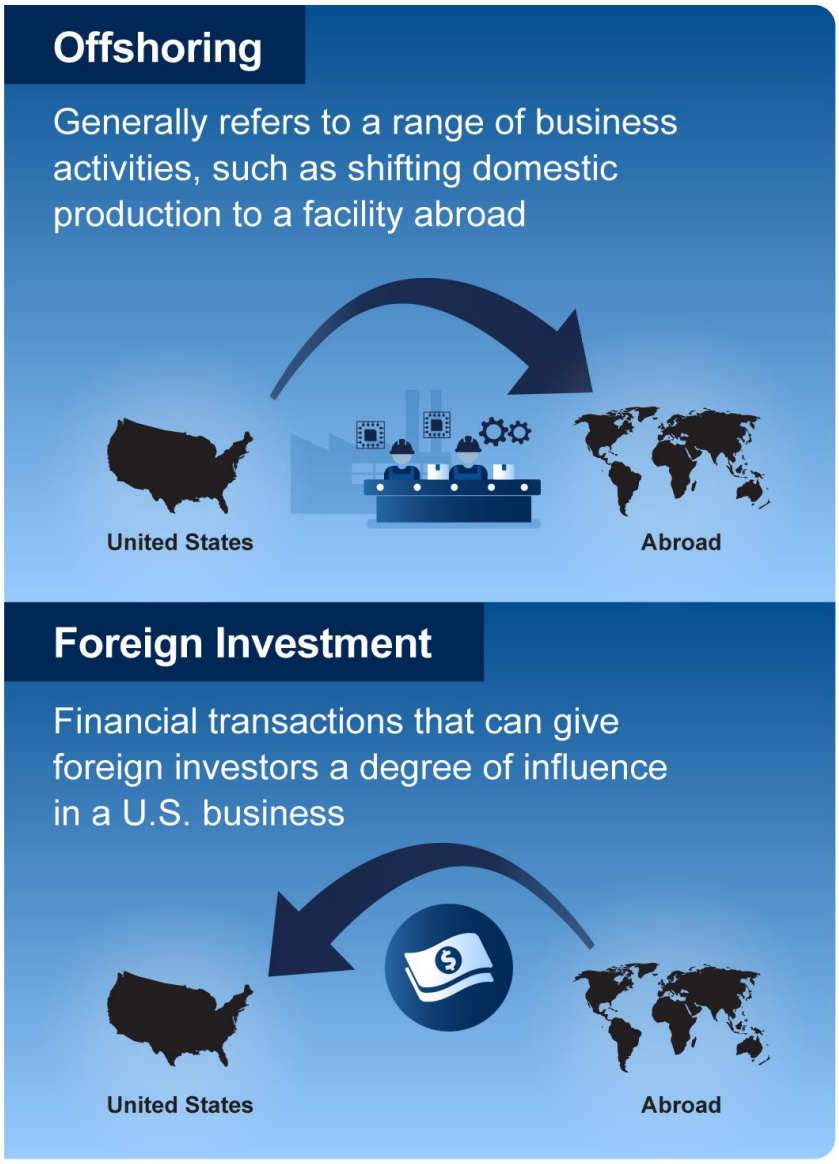
Domestic production—If the United States sends too much production abroad, the skills of the nation's own workforce can erode.

Source materials—DOD relies on foreign suppliers for parts and materials such as rare earth metals that are crucial to many weapon systems. Geopolitical conflicts can compromise access to foreign supplies to meet current and future needs.

Panelists highlighted ways to reduce these risks, such as by sharing information with U.S. companies on specific risks related to foreign suppliers.

View GAO-19-516. For more information, contact William T. Woods at (202) 512-4841 or woodsw@gao.gov.

Offshoring and Foreign Investment



Source: GAO. | GAO-19-516

How GAO Did This Study

We convened a panel of 13 experts from academia, industry groups, think tanks, and federal agencies representing diverse viewpoints. We selected these panelists based on reviews of professional publications, congressional testimonies, other reference material, and interviews.

Contents

Figures

Abbreviations

BEA	Bureau of Economic Analysis
BIS	Bureau of Industry and Security
CFIUS	Committee on Foreign Investment in the United States
Commerce	Department of Commerce
DIU	Defense Innovation Unit
DOD	Department of Defense
FIRRMA	Foreign Investment Risk Review Modernization Act of 2018
STEM	science, technology, engineering, and math
USTR	United States Trade Representative

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Congressional Committees

The Department of Defense (DOD) has a wide range of needs for products and services to provide U.S. warfighters with advanced capability to maintain military superiority. To meet its needs, DOD relies on an extensive and often globalized network of suppliers, ranging from some of the largest companies to many medium-and small-sized businesses. While relying on a globalized supplier base can yield benefits, such as lower costs and access to technology innovation, it could also adversely affect DOD's ability to obtain goods and services to meet current and future mission requirements. For example, DOD depends on rare earth materials to provide functionality in weapon system components, such as lasers. Many steps in the rare earths supply chain, such as mining, are conducted in China, a situation that may pose risks to the continued availability of these materials. In addition, some foreign investments, particularly from individuals or firms in countries that are considered strategic competitors, can create the potential for disclosure of sensitive intellectual property and military technologies.

DOD and other federal agencies have identified offshoring and foreign investment in U.S. companies as risks to maintaining a sufficient domestic defense supplier base and U.S. leadership in emerging technologies such as hypersonics and 5G communications. The 2018 National Defense Strategy highlighted the challenges posed by strategic competitors, such as China and Russia, or terrorist organizations that seek to undermine U.S. military advantage. DOD has also identified the potential risk of eroding U.S. military readiness and superiority when the defense supplier base offshores certain business activities or receives foreign investment from adversaries seeking access to the same technologies as DOD.

House and Senate Armed Services Committees' reports related to the fiscal year 2018 National Defense Authorization Act included provisions for GAO to examine the effects of offshoring and foreign investment on DOD's supplier base. This report describes (1) the factors that affect analysis of foreign direct investment and offshoring related to DOD's supplier base, and (2) the benefits and risks to the U.S. defense supplier base associated with foreign direct investment and offshoring and policy considerations to address those risks.

To address our objectives, we convened a panel of experts from academia, industry groups, think tanks, and federal agencies. Our methodology included: (1) inviting participants who have a wide range of expertise and views, (2) convening and recording the panel discussion, and (3) conducting a content analysis of the transcript of the panel discussion. We also reviewed various studies by federal agencies, universities, and the private sector to identify how the terms offshoring and foreign investment are defined. We analyzed publicly available data from the Department of Commerce's (Commerce) Bureau of Economic Analysis (BEA) on new foreign direct investment for calendar years 2014 through 2018—the most recent data available.[1] BEA does not publish or release all data collected through its surveys if the data of an individual company can be identified. For the purposes of this report, we limited our analysis to BEA data that could be publicly reported. We assessed the reliability of the BEA data by reviewing the agency's information quality guidelines and technical notes for the data we used. We found the data sufficiently reliable for describing aggregate-level information on foreign direct investments. However, we found limitations with the BEA data that limit analysis of the industry sectors and subsectors that comprise DOD's supplier base. These challenges are discussed later in this report.

We also obtained information from officials in BEA and the International Trade Administration within Commerce on available data and issues pertaining to foreign investment and offshoring. We reviewed previous GAO reports as well as additional material from a literature review to supplement information provided by panel participants on issues related to industrial policy, foreign investment, offshoring, and protection of intellectual property, among other topics. Additional information on our methodology is found in appendix I. The list of experts on our panel is at appendix II.

We conducted this performance audit from March 2018 to September 2019 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

[1]New foreign direct investment data provide information on the acquisition, establishment, and expansion of U.S. business enterprises by foreign direct investors. We used BEA's definitions for all terms related to foreign investment unless otherwise indicated.

Background

Offshoring

Though no commonly accepted definition of offshoring exists, the term broadly refers to a range of business activities related to international trade and foreign investment such as shifting production to a facility overseas.[2] Since the term can include a range of business activities, several types of economic data collected by federal agencies can provide some insights into what might indicate offshoring for a particular industry sector or subsector. See, for example, the following:

- **Bureau of Census** collects data on imports into the United States.
- **Bureau of Labor Statistics** collects data on domestic employment.
- **BEA** collects data on direct investment in the United States and abroad, as well as the activities of U.S. multinational companies and U.S. affiliates of foreign multinationals.

Foreign Investment

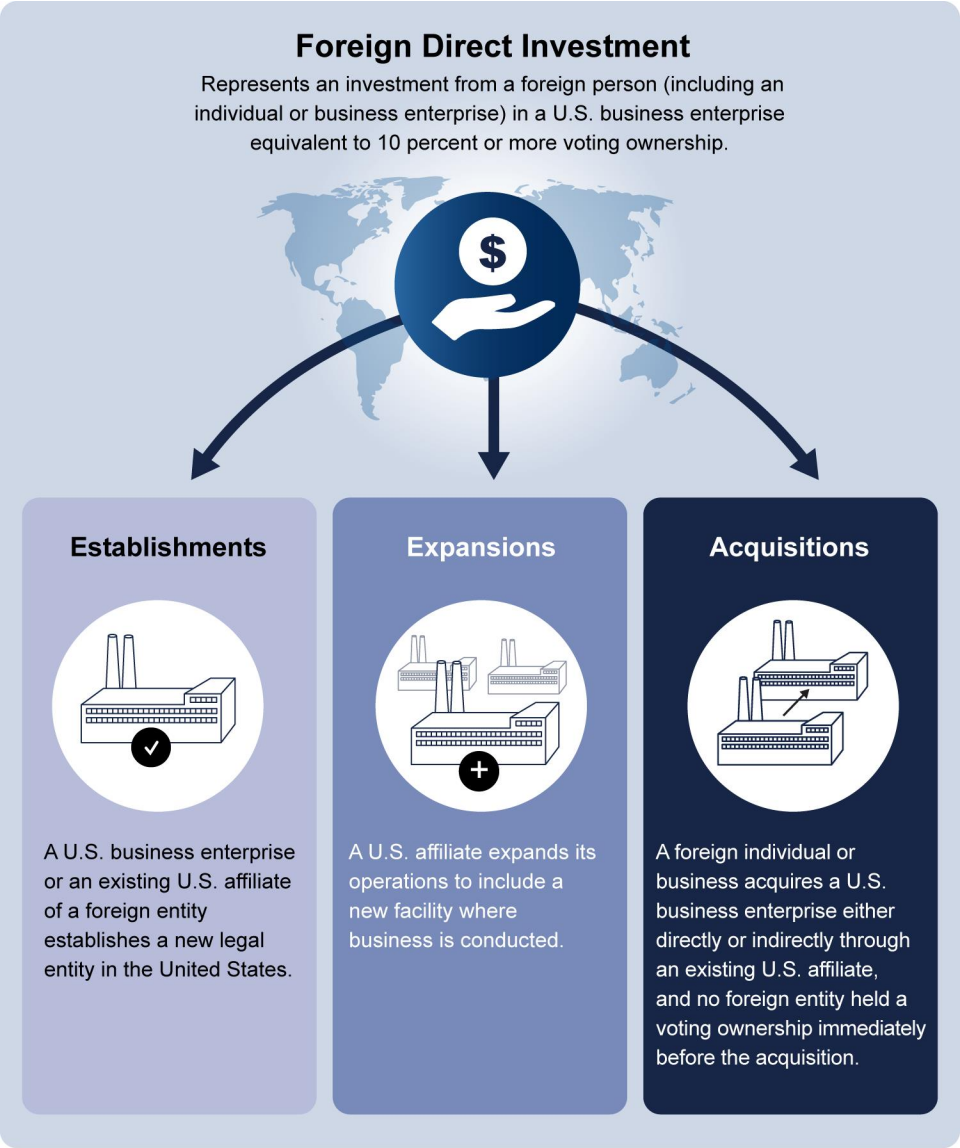
Foreign investment refers to a variety of financial transactions involving persons or entities from foreign countries. Foreign direct investment, one element of overall foreign investment, involves an investment transaction by a foreign entity (including an individual or business enterprise) with a U.S. company equivalent to 10 percent or more of voting ownership, according to BEA.[3] At this investment level, a foreign investor can gain a degree of influence over a U.S. business enterprise.[4] Figure 1 provides examples of three types of foreign direct investment in the United States. These include a foreign entity (1) establishing a U.S. company, (2) expanding a U.S. company, and (3) acquiring an interest in a U.S. company.

[2]GAO, *International Trade: Current Government Data Provide Limited Insight*. GAO-04-932 (Washington D.C.: Sept. 22, 2004)

[3]BEA defines other types of foreign investments to include investments in stocks, bonds, and Treasury securities which are outside the scope of this review.

[4]BEA defines a business enterprise as an organization, association, branch, or venture which exists for profit making purposes or to otherwise secure economic advantage, and any ownership of real estate that is not held for personal use.

Figure 1: Examples of Foreign Direct Investment



Source: GAO analysis of Bureau of Economic Analysis documentation. | GAO-19-516

Key Federal Agencies Involved in Data Collection, Oversight of Foreign Investment, and Defense Industrial Base Issues

Several federal agencies have responsibilities in various initiatives involving offshoring and foreign investment on the U.S. industrial base.

- BEA publishes a variety of statistics on foreign direct investment. These include statistics on: (1) international transactions and direct investment positions, (2) the activities of multinational corporations and U.S. affiliates of foreign multinational corporations, and (3) new foreign investment in the United States.[5] BEA collects these data through several mandatory surveys of U.S. affiliates or U.S. parent companies.[6] BEA surveys these companies quarterly and annually, and also conducts a benchmark survey every 5 years.[7] In addition, BEA conducts a separate survey of new foreign direct investments in the United States on a continuous basis, with reports due from entities within 45 days of an investment transaction taking place.[8] Information from the survey of new foreign direct investment is published annually and captures data on investments that exceed $3 million by foreign investors in newly acquired, established, or expanded U.S. business enterprises.

[5]A multinational enterprise operates in several countries but is managed from one (home) country.

[6]BEA defines a U.S. parent as a U.S. individual or corporation that owns or controls 10 percent or more of an incorporated or unincorporated foreign business enterprise. A U.S. affiliate is a U.S. business enterprise in which a foreign investor—person or entity—owns or controls at least 10 percent of an incorporated or unincorporated U.S. business enterprise. BEA's direct investment surveys are required by the Investment and Trade in Services Survey Act, codified at 22 U.S.C. § 3101-3108, as amended.

[7]Benchmark surveys provide the most comprehensive coverage of business entities, transactions, and data items. Quarterly and annual surveys are largely cutoff sample surveys of U.S. parents and their foreign affiliates and of U.S. affiliates of foreign parents above size-exemption levels.

[8]The BE-13 Survey is conducted by BEA under the Investment and Trade in Services Survey Act, codified at 22 U.S.C. § 3101-3108, as amended, and is required to be filed by each U.S. business enterprise when a foreign entity acquires a direct or indirect voting interest of at least 10 percent, and for each U.S. business enterprise when a foreign entity establishes a new legal entity in the Unites States or expands its operations to include a new facility.

- The Committee on Foreign Investment in the United States (CFIUS), a multi-agency committee, is responsible for reviewing the national security implications of covered transactions, including foreign investments, such as mergers and acquisitions that could result in foreign control of a U.S. company.[9] This multi-agency committee is chaired by the Secretary of the Treasury, with several other required voting members to include the Secretary of Commerce, Secretary of State, and Secretary of Defense. When reviewing covered transactions, CFIUS considers, among other things, (1) the potential national security effects on U.S. critical technologies, (2) whether the foreign investor is controlled by a foreign government or by an entity controlled by or acting on behalf of a foreign government, and (3) the potential effects of the transaction on the capability and capacity of domestic industries and commercial activity to meet national security requirements. In 2018, Congress passed the Foreign Investment Risk Review Modernization Act of 2018 (FIRRMA) to amend the CFIUS statute.[10] The Department of the Treasury established a pilot program implementing portions of FIRRMA which expanded the types of transactions CFIUS reviews, including certain U.S. businesses activities involving critical technologies, certain investments involving foreign persons and critical technologies, and other activities with national security implications.[11]

[9]"Covered transaction" means any transaction that is proposed or pending after August 23, 1988, by or with any foreign person that could result in foreign control of any U.S. business, including such a transaction carried out through a joint venture. See 50 U.S.C. § 4565(a)(4) and implementing regulations at 31 C.F.R. § 800.101, et seq. "Transactions" include acquisition of an ownership interest in an entity, a merger or consolidation, or a long-term lease under which a lessee makes substantially all business decisions concerning the operation of a leased entity, as if it were the owner. See 31 C.F.R. § 800.224 for a full definition of "transaction". For related GAO work about CFIUS, see GAO, *Committee on Foreign Investment in the United States: Treasury Should Coordinate Assessments of Resources Needed to Address Increased Workload*, GAO-18-249 (Washington D.C.: Feb. 14, 2018) and *Committee on Foreign Investment in the United States: Action Needed to Address Evolving National Security Concerns Facing the Department of Defense*, GAO-18-494 (Washington D.C.: July 10, 2018)

[10]H.R. 5515-538, Foreign Investment Risk Review Modernization Act of 2018, amending 50 U.S.C. § 4565 (a)(4)(b)(i)

[11]The pilot program implemented the authorities provided in two sections of FIRRMA that did not take effect upon the statute's enactment. First, the pilot program expands the scope of transactions subject to review by CFIUS to include certain investments involving foreign persons and critical technologies. Second, the pilot program makes effective FIRRMA's mandatory declarations provision for all transactions that fall within the specific scope of the pilot program. The pilot program is temporary and will end no later than March 5, 2020. See 83 FR 51322.

- The Office of Industrial Policy within DOD is the department's focal point for defense industrial base issues and is responsible for assessing industrial base risks and developing related policies, conducting industry outreach, and reviewing foreign investment transactions on behalf of DOD.[12] The office was responsible for DOD's most recent annual report to Congress on industrial capabilities, which highlighted that certain segments of the electronics industry were being driven offshore due, in part, to the high level of capital needed to stay competitive.[13] More recently, the Office of Industrial Policy led a cross-governmental assessment of the defense industrial base in response to a July 2017 executive order.[14] The resulting report issued in September 2018 identified 300 risks across 16 industry sectors—highlighting some risks stemming from offshoring and a globalized supply chain.[15] For example, the report addresses the reliance on sole foreign sources for specialized carbon fibers used in the manufacturing of DOD weapons systems.
- The Bureau of Industry and Security (BIS) within Commerce has responsibility for advancing U.S. national security, foreign policy, and economic objectives by ensuring an effective export control system, promoting U.S. technology leadership and helping to ensure a healthy defense industrial base.[16] BIS conducts industrial base assessments of defense-related technologies, which have included those in the rocket propulsion and the circuit board industries.[17] BIS administers export controls of dual-use items which have both military and

[12]This office was formerly known as Manufacturing and Industrial Base Policy.

[13]The Fiscal Year 2017 Annual Industrial Capabilities Report to Congress was issued by the Office of Manufacturing and Industrial Base Policy—a predecessor to the current Industrial Policy office.

[14]Executive Order 13806, Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States, July 21, 2017.

[15]DOD, *Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States: Report to President Donald J. Trump by the Interagency Task Force of Fulfillment of Executive Order 13806* (September 2018). We refer to this report as the "Defense Industrial Base Report".

[16]The BIS mission is to advance U.S. national security, foreign policy, and economic objectives by ensuring an effective export control and treaty compliance system and promoting continued U.S. strategic technology leadership.

[17]BIS conducts these assessments under Section 232 of the Trade Expansion Act of 1962, 19 U.S.C. § 1862, Pub. L. No. 87–794, title II, § 232, Oct. 11, 1962, as amended. The purpose of a Section 232 investigation is to determine the effect of imports on national security.

commercial applications.[18] BIS is also responsible for implementing the recently passed Export Control Reform Act of 2018, which required, in part, certain updates to the U.S. export control system, including requirements to identify and control the export of emerging and foundational technologies.[19]

The U.S. Defense Industrial Base

The U.S. defense supplier base is the combination of people, technology, institutions, technological know-how, and facilities used to design, develop, manufacture, and maintain the weapons needed to meet national security objectives. The supplier base for DOD can be divided into several tiers: prime contractors, major subcontractors, and the lower tiers that include suppliers of parts, electronic components, and raw materials. Industries and companies that comprise the U.S. defense industrial base often supply both military and commercial markets.

DOD's most recent assessment of the defense industrial base, the Annual Industrial Capabilities Report for Fiscal Year 2018, highlighted the outlook for various industry sectors including aircraft, electronics, ground vehicles, materials, and munitions and missiles.[20] While some of the sectors such as munitions and missiles operate almost entirely to provide defense-unique capabilities, others such as the aircraft and electronics

[18]Commerce shares responsibility with the Department of State (State), as well as several other agencies for administering U.S. export controls. Export Administration Regulations (EAR) are issued by the Department of Commerce, Bureau of Industry and Security, under the laws relating to the control of certain exports, reexports, and activities. See EAR, 15 C.F.R. § 730.1. EAR requires certain "dual-use" technologies to have licenses for transfer to foreign nationals and are subject to one or more control regimes, such as National Security, Nuclear Proliferation, Missile Technology, or Chemical and Biological Warfare. See EAR, 15 C.F.R. § 730, et seq. Specifically, "[I]tems subject to the EAR include purely civilian items, items with both civil and military, terrorism or potential WMD-related applications, and items that are exclusively used for military applications but that do not warrant control under the International Traffic in Arms Regulations (ITAR) (22 CFR parts 120 et seq.)." See EAR, 15 C.F.R. § 730.3. The Department of State, under the International Traffic in Arms Regulations (ITAR) has authority to control the export and import of defense-related articles and services to safeguard U.S. national security. See 22 C.F.R. § 120, et seq. State is generally responsible for military items such as tanks, firearms and ammunition.

[19]See Export Control Reform Act, Pub. L. No. 115–232, div. A, title XVII, §1741, Aug. 13, 2018, 132 Stat. 2208, amending, 50 U.S.C. § 4811, cited as the "Export Control Reform Act of 2018."

[20]DOD, *Fiscal Year 2018 Annual Industrial Capabilities Report to Congress* (May, 2019)

sector have both a defense and commercial market. Research and development are also of vital importance to the U.S. industrial base in order to support DOD weapon systems, enhance national security, and ensure U.S. military superiority.

Various Factors Limit Analysis of the Extent of Foreign Investment and Offshoring Affecting the U.S. Defense Supplier Base

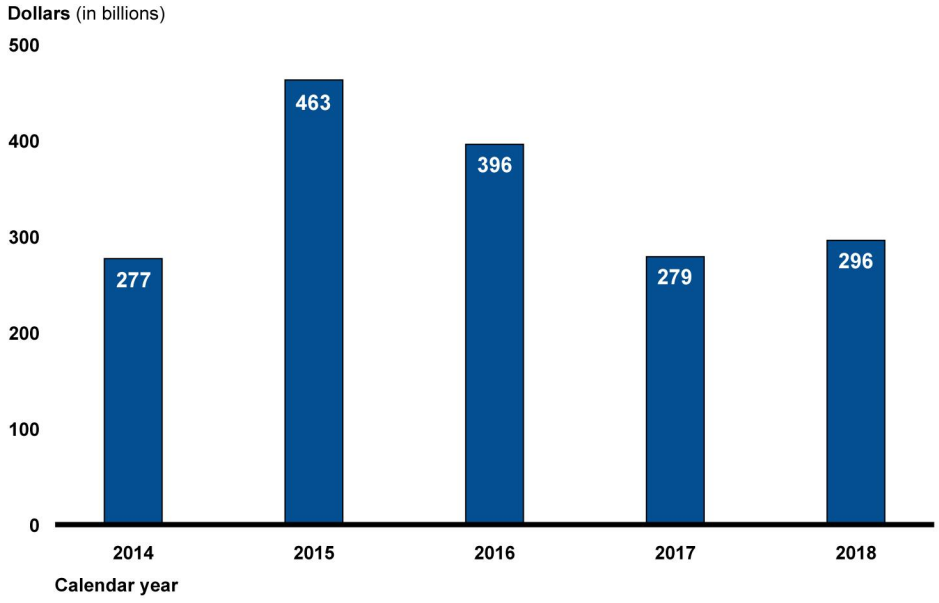
Several factors limit analysis of the extent to which foreign direct investment and offshoring are occurring. For example, publicly available data do not provide granularity to analyze foreign direct investments in industry subsectors that comprise the defense supplier base. Additionally, the absence of a common definition of offshoring makes it difficult to analyze the extent to which offshoring is occurring in general as well as its effect on the defense supplier base. As such, the extent of offshoring and its effects are largely unknown.

Available Data Provide Some Insights on Foreign Direct Investment in U.S. Companies, but Defense Sector Analysis is Limited

BEA's publicly available data allow for high-level analyses of new foreign investments in the United States. For example, BEA data on new foreign direct investment show that annual investments from foreign entities in U.S. companies ranged from $277 billion to more than $460 billion for calendar years 2014 through 2018.[21] See figure 2.

[21]We used data on new foreign direct investment expenditures from calendar years 2014 through 2018—the most recent data available. New foreign direct investments provide information on the acquisition, establishment, and expansion of U.S. business enterprises by foreign direct investors. We used data for first year expenditures, which are expenditures in the year in which the investment was initiated and exclude expenditures planned for subsequent years for multiyear investments. BEA new foreign direct investment statistics were inflated to calendar year 2018 dollars using the Gross Domestic Product Price Index.

Figure 2: New Foreign Direct Investment Expenditures in U.S. Companies, Calendar Years 2014-2018 (in calendar year 2018 dollars)



Source: GAO analysis of Bureau of Economic Analysis data on new foreign direct investment, first year expenditures. | GAO-19-516

Note: Dollars were adjusted for inflation using the Gross Domestic Product Price Index.

However, DOD industrial policy officials told us that BEA's publicly available data are not complete enough to assess foreign investments in U.S. defense industrial subsectors. We also found that BEA does not disclose certain data for industry subsectors if the data would disclose the identity of individual companies, as these data are considered confidential.[22] For example, BEA data on new foreign direct investment from China in the U.S. industry subsector "electrical equipment, appliances and component manufacturing" are not publicly available for 3 of the 5 years we reviewed. In contrast, data on foreign direct investment

[22]BEA reports on various foreign direct investment characteristics using the North American Industry Classification System (NAICS) that classifies business by industry sector and subsector. Pursuant to the provisions of the International Investment and Trade Services Survey Act, 22 U.S.C. § 3144(a)(1)-(3), as amended, BEA cannot publish or otherwise release the data collected on its surveys in a form that would allow the data of an individual company to be identified. Access to microdata on multinational companies and international service transactions is under strict guidelines and procedures that protect the confidentiality of company-specific data. See the E-Government Act, Confidential Information Protection and Statistical Efficiency Act of 2002 (CIPSEA), Publ. L. No. 107-347, 44 U.S.C. § 3501 note 1; 72 Fed. Reg. 33362, 33372 (June 15, 2007)(OPM Implementing Regulation).

from China in the major industry sector “manufacturing” are available for all 5 years.

In addition, according to BEA, new foreign direct investment data do not capture foreign investment transactions that involve less than 10 percent voting ownership in a U.S. enterprise. This may include data on venture capital investments in U.S. start-ups.[23] According to a report by the Defense Innovation Unit (DIU) within DOD, there are an increasing number of investments in U.S. venture-backed startups from China-based investors that are not tracked by the U.S. government. This limits full visibility into foreign investors and the technologies they are investing in, as well as any increase or decrease in investment flows.[24] DIU reported that China-based investments in early-stage U.S. technology ventures were prominent in areas such as artificial intelligence, robotics, augmented reality, virtual reality, and financial technology. These technologies are primarily developed for commercial application but can be adapted to meet military requirements.

DOD industrial policy officials also stated that they do not use BEA data because they require additional granularity—including at the subsector level—than what is provided by BEA data. As such, they primarily rely on data from private research firms that provide information on individual transactions. DIU’s report on China’s technology transfer strategy echoed concerns about the limitations of U.S. government data and stated that the U.S. government does not comprehensively track all available data on investments, including those from private sources to assemble a complete picture of the level of foreign investment in U.S. companies.

[23]According to BEA, foreign investments of less than 10 percent are covered by the Treasury International Capital Surveys and included as part of the U.S. International Transactions Accounts and the U.S. International Investment Position statistics. The U.S. International Transactions includes transactions in goods, services, income, and investment between U.S. residents and residents of other countries each quarter. The transactions reflect U.S. trade; income on stocks, bonds, and loans and related investment; foreign aid; and more. The U.S. International Investment Position statistics covers the accumulated value of U.S.-owned financial assets in other countries and U.S. liabilities to residents of other countries at the end of each quarter. The difference between assets and liabilities is the U.S. net international investment position. These statistics are also presented at the aggregate level, and do not include information by industry subsector.

[24]Defense Innovation Unit Experimental, *China’s Transfer Strategy: How Chinese Investments in Emerging Technology Enable a Strategic Competitor to Access the Crown Jewels of U.S. Innovation* (January 2018). The name of Defense Innovation Unit Experimental was changed to Defense Innovation Unit since publishing this report.

Adding to the difficulty of analyzing foreign direct investments that could affect the U.S. defense supplier base is that many of the industries that comprise the defense supplier base contribute to both the defense and commercial markets. Hence, it is difficult to isolate products used specifically by DOD. For example, as we have previously reported while microelectronics represents a critical component of DOD weapons systems, the vast majority of the microelectronics industry supports the commercial market.[25] Thus, while BEA subsector data would allow for more granular analyses of industries that comprise the defense industrial base, subsector data would not necessarily provide insight into foreign direct investments for defense-related products.

Lack of a Commonly Accepted Definition and Data Issues Limit Analysis of Offshoring

The absence of a common definition of offshoring makes it difficult to analyze the extent to which offshoring is occurring in general as well as its effect on the defense supplier base. Panelists we spoke with expressed disagreement as to what business activities offshoring includes and presented different views. Some panelists viewed offshoring as a fairly narrow concept where a production facility located in the United States is moved overseas. Others described offshoring more broadly, where a company expands overseas, but does so without any changes to its domestic production. In addition, others said they considered offshoring to include sourcing products, components, materials and research and development from overseas.

Certain economic data can be used to provide insights into business activities that have been described as offshoring. While there is no consensus on what constitutes offshoring, publicly available employment and import data from government sources can potentially provide some insights on industries where offshoring could be taking place. However, these data are only indicators that provide a partial or mixed picture of potential offshoring. For instance, assume that the Bureau of Census data for computers and electronics products show a marked increase in imports over the past decade and that the Bureau of Labor Statistics data show a decline in domestic employment in this industry. These changes could be a result of offshoring by U.S. companies of some of their

[25]GAO, *Trusted Defense Microelectronics: Future Access and Capabilities Are Uncertain,* GAO-16-185T (Washington, D.C.: Oct. 28, 2015).

production of computers and electronics products to their manufacturing affiliates in other countries. On the other hand, BEA data could, at the same time, show an increase in the value of domestic production of computers and electronic products. In this hypothetical example, the data may not, in fact, indicate that offshoring has taken place in the industry. Other explanations could include, instead,

- technological advances, resulting in higher domestic production with fewer workers; and
- demand growing faster than domestic production, resulting in more imports.

This example illustrates how aggregated data are of limited use in drawing definitive conclusions on whether offshoring is occurring in a particular sector of industry, or on its effect on the defense supplier base.

At the panel and during interviews, experts discussed the limitations of data regarding offshoring. For example, one panelist said that it is a challenge to understand the extent and nature of offshoring due to a lack of publicly available data, and that much of what is understood is anecdotal. Additionally, the National Academy of Public Administration, in its 2006 report to Congress on offshoring, noted that determining the extent of offshoring is difficult given available data.[26] The report adds that to produce definitive findings on the employment effects of offshoring one would need to look more closely at additional data including data for specific occupations, professions, or geographical areas rather than the highly aggregated industry totals that are publicly available.

Similarly, a 2009 white paper issued by the W.E. Upjohn Institute of Employment Research described the challenges of measuring offshoring. The paper stated that, at the time, the apparent growth of offshoring had spurred a heated debate over offshoring and its effect on the U.S. economy and workers. It added, however, that the U.S. government's ability to assess impacts at the time was hampered by the limitations of government data.[27]

[26]A Report of the Panel of the National Academy of Public Administration, for the U.S. Congress and the Bureau of Economic Analysis, Off-shoring: An Elusive Phenomenon (January 2006)

[27]Susan N. Houseman, "Measuring Offshore Outsourcing and Offshoring: Problems for Economic Statistics," *Employment Research,* vol. 16, no. 1: [1]–3.

Panelists Identified Benefits, Risks, and Policy Considerations Regarding Foreign Investment and Offshoring

The 13 expert panelists identified various benefits for companies that choose to offshore business activities and accept foreign investments. These benefits, in turn, can be passed on to DOD. Panelists also discussed the risks which we categorized into three areas: (1) transferring U.S. intellectual property to strategic competitors or adversaries, (2) reliance on foreign sourcing and decreased visibility into the defense supply chain, and (3) potential erosion of the DOD supplier base capability and capacity. The panelists also discussed some potential strategies to mitigate the risks that they identified.

Panelists Highlighted the Benefits of Offshoring and Foreign Investment

Panelists said that offshoring business operations can be a rational decision for U.S. businesses and cited various potential benefits for the business.[28] Companies that make up the defense supplier base can, in turn, pass on the benefits to DOD. According to the panelists, the benefits of offshoring include

- lower business expenses due, in part, to cheaper labor and less regulatory compliance,
- access to a new customer base in foreign markets, and
- access to skilled workforce in other countries.

Foreign investment allows U.S. companies access to critical resources to grow their businesses. One panelist noted that the relatively free flow of investment and business activities across international boundaries has been an economic benefit to the United States and that this open investment policy has enabled the United States to be the largest

[28]For purposes of quantifying panel experts' remarks, we refer to a statement from an individual panelist as being from one panelist, and unless there is disagreement in the transcript of the meeting, we refer to statements from two or more panelists as being from panelists. In cases of conflicting opinions in the transcript, we refer to the specific number of panelists making a statement. We did not ask panelists to reach consensus or agreement on the topics discussed.

recipient of foreign direct investment in the world. Another panelist also said that offshoring can strengthen diplomatic ties to key allies.

Panelists Shared Perspectives on Technology Transfer Risks and Potential Strategies to Address Concerns

Foreign Investments and Offshoring Can Lead to Transferring U.S. Intellectual Property for Critical Technologies to Potential Adversaries

Panelists discussed how foreign investments or offshoring business activities can, under certain circumstances, lead to a risk of transferring intellectual property or sensitive information related to critical technologies from the United States to strategic competitors and potential adversaries. This transfer of technology may, in turn, negatively affect the U.S. defense industrial base and technological superiority. According to DOD, one of the foundations of the U.S. defense industrial base is developing and maintaining military technological superiority over strategic competitors such as China and Russia. The key to U.S. technological superiority is the development of critical and emerging technologies that are, or have the potential to be, used to support DOD weapons systems that are critical to national security.

According to DOD, foreign investment into the United States is used as a tool for strategic competitors and adversaries to obtain sensitive intellectual property in order to boost their own technological capabilities. Many of the emerging technologies critical to maintaining U.S. military superiority are dual-use technologies—with applications for both commercial and military use. Further, panelists we spoke with stated that commercial companies and universities are increasingly working on dual-use technologies that are of interest to DOD. We have previously reported that DOD has acknowledged the need to further leverage technological innovations that can be used to bolster military technology from companies that have not worked regularly with DOD.[29]

According to panelists, the development of such critical technologies outside the traditional defense-contracting environment can increase the risk of technology transfer to strategic competitors and adversaries.

[29]GAO, *Military Acquisitions: DOD Is Taking Steps to Address Challenges Faced by Certain Companies*, GAO-17-644. (Washington D.C.: July 20, 2017)

Panelists said that companies developing these technologies typically operate in the commercial sector and may not be fully aware of the risks that their intellectual property could be targeted.[30] Examples of dual-use technologies and their potential military applications are described in figure 3.

Figure 3: Examples of Dual-Use Technologies and Their Potential Military Applications

Dual-Use Technology	Examples of Potential Military Applications
Autonomous and Unmanned Systems	Multiple autonomous and unmanned systems are currently being developed and produced by the Department of Defense. It has fielded unmanned systems such as the Air Force's MQ-1 Predator and RQ-4 Global Hawk to perform surveillance and in the case of the MQ-1 Predator, also target enemies.
Artificial Intelligence (AI)	AI can be used to support many military applications including intelligence, surveillance, logistics, cybersecurity, command and control, and autonomous vehicles.
Quantum Information Science	Quantum technology has the potential to support encryption and stealth technologies as well as enhance radar and other detection systems.
Biotechnology	Biotechnology has the potential to be used to enhance the performance of military personnel. It also has the potential to be used to develop chemical and biological weapons by adversaries.

Source: Summary of GAO reports and Congressional Research Service and Department of Defense documents. | GAO-19-516

[30]GAO has included the protection of technologies critical to U.S national security as one of 35 high risk areas for the federal government. See GAO, *High-Risk Series, Substantial Efforts Needed to Achieve Greater Progress on High-Risk Areas,* GAO-19-157SP (Washington D.C.: Mar. 6, 2019).

During the panel and in interviews, panelists addressed the threat that China poses regarding the transfer of critical technologies through foreign investments in the United States. One panelist said that Chinese interests have been increasingly focused on investing in U.S. technology companies in recent years to facilitate technology transfer of high-end technology capabilities. Another panelist commented that China's effort to obtain U.S. information through foreign investments and offshoring represents an effort to build its own economy and military at the expense of the United States. To achieve this goal, the panelist added that China is targeting information related to not only the most advanced critical technologies such as artificial intelligence, but also manufacturing technology and materials.

Relatedly, DIU's 2018 report on China's Technology Transfer Strategy stated that China has been strategically investing in U.S. companies that develop or produce critical dual-use technologies as part of China's plans to develop its own technology base. The report noted that these investments represent a broader threat of China boosting its own military technology capability at the expense of the United States. The report also identified various ways that China seeks access to key technologies, including: (1) Chinese companies investing directly in established U.S. companies, (2) Chinese companies directly acquiring U.S companies, and (3) Chinese private equity firms investing in U.S.-based startups. For example, the DIU report stated that Chinese entities have invested more than $200 million in U.S. robotics start-ups from 2010 to 2017. According to the report, Chinese investments in U.S. companies can facilitate China's ability to obtain sensitive intellectual property related to the development of dual-use critical technologies from U.S. companies. Further, the report noted that the Chinese government is often directly connected to the activities of Chinese companies, which are often state-owned enterprises or enterprises with strong government connections.

Panelists also discussed the importance of knowing the foreign entities that invest in U.S. companies developing critical technologies. They added that U.S. companies receiving foreign investments should consider whether an investment partner can gain access to sensitive information for critical technologies with national security implications. According to DIU's report on China's Technology Transfer Strategy, Chinese investors have made efforts to obscure their investments in U.S. companies for the

purposes of accessing critical technologies with potential military applications.[31]

In February 2018, we reported on the increasing number of foreign investment transactions that have been reviewed and investigated by CFIUS in recent years.[32] The growing number of reviewed transactions reflects increased concern about the national security threats associated with foreign investments.

- From 2011 to 2016, the number of national security reviews for covered transactions by CFIUS has generally been increasing on an annual basis, from 111 in 2011 to 172 in 2016.[33] At the same time, the number of national security reviews that were elevated to national security investigations almost doubled during the same 6-year period, increasing from 40 transactions in 2011 to 79 transactions in 2016. In 2016, 46 percent of reviews were elevated to investigations.
- The CFIUS annual reports provided additional data about CFIUS reviews through 2015 regarding the countries that are investing into U.S. companies. The reports also highlighted the industries receiving foreign investment.
    - Among the covered transactions reviewed by CFIUS from 2011 to 2015, China was the most frequent source of investment among the 41 countries and economies that invested into U.S.

[31]We currently have an ongoing review related to the risks of the opaque ownership structure of some DOD contractors and expect to issue a report in late 2019.

[32]GAO-18-249.

[33]These data are based on the CFIUS statute in effect in 2016, which predated the FIRRMA revisions of 2018. See 50 U.S.C. § 4565(a)(3), as amended; See also 31 C.F.R §§ 800.101 – 301, implementing 50 U.S.C. § 4565(a)(3), as amended, which authorizes the President to suspend or prohibit any "covered transaction" when there is credible evidence to believe that a foreign person exercising control over a U.S. business might take action that threatens to impair the national security of the U.S. Prior to the 2018 amendments, the term "covered transaction" included any merger, acquisition, or takeover that is proposed or pending after August 23, 1988, by or with any foreign person that could result in foreign control of any person engaged in interstate commerce in the United States. See FN9 for the current definitions of "covered transaction" and "transaction" resulting from the 2018 FIRRMA amendments. Foreign Investment Risk Review Modernization Act of 2018, Pub. L. No. 115–232, div. A, title XVII, §1701, Aug. 13, 2018, 132 Stat. 2174, amending 50 U.S.C. § 4565(a)(4)(b)(i).

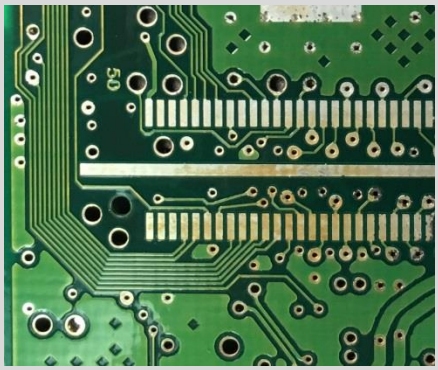
companies, accounting for 107 of 612 covered transactions reviewed during this period, or about 17 percent.[34]

- In 2015, investments in the Semiconductor and Other Electronic Component Manufacturing subsector were among the most prevalent covered transactions reviewed by CFIUS, accounting for 18 of 143 reviews.[35]

[34]Committee on Foreign Investment in the United States, Annual Reports to Congress. Public/Unclassified Version (February 2015 and September 2017).

[35]Committee on Foreign Investment in the United States, Annual Reports to Congress. Public/Unclassified Version (September 2017).

The United States Blocks Acquisition of Two U.S. Microelectronics Companies



The two most recent administrations blocked two attempted acquisitions of U.S. microelectronic companies by foreign companies with Chinese interests in the interest of national security. In December 2016, the administration blocked the purchase of Aixtron, Inc. by Grand Chip Investment GmbH—a limited liability company established in Germany but owned by Chinese investors with ties to the Chinese government. The following year, the new administration blocked a proposed $1.3 billion acquisition of a U.S. company— Lattice Semiconductor, by Canyon Bridge Capital Partners, which also has ties to Chinese state-owned enterprises.

Source: U.S. Department of the Treasury, Executive Office of the President, U.S-China Economic and Security Review Commission. GAO (image). | GAO-19-516

In addition to foreign investments, the practice of offshoring business activities to foreign countries can also provide a method for foreign interests to obtain sensitive information about critical technologies. In March 2018, the Office of the United States Trade Representative (USTR) issued a report on China's technology transfer efforts.[36] Panelists noted that China is a very attractive place for U.S. companies to expand business because it represents access to a large market. The USTR report, however, concluded that the environment for U.S. companies that do business in China increases the risk of technology transfer. The USTR report indicated that while there are generally no explicit agreements for foreign companies to transfer technology as a condition of doing business in China, technology transfer can often occur indirectly through foreign investment restrictions and requirements imposed differently across various industries. For example, the report stated that U.S. commercial aircraft and automobile manufacturers interested in moving business activities to China are met with equity restrictions and local partner requirements, such as entering into joint ventures with Chinese entities as a controlling or substantial shareholder. The USTR report noted that such arrangements are conducive to transferring control of sensitive technology information to Chinese entities.

Panelists also discussed the risks associated with offshoring resulting from offset agreements that are often a part of defense trade with other countries. In the context of defense trade, offsets refer to benefits provided to foreign governments or companies as inducements or conditions for the purchase of military goods and services. Commerce has reported that defense contractors have stated that offset agreements are often necessary in a U.S. foreign military sale to another country. For example, a foreign military sale could require that final production take place in the country that is purchasing the weapon system rather than in the United States.

[36]Office of the United States Trade Representative (USTR), Executive Office of the President, *Findings of the Investigation Into China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation Under Section 301 of the Trade Act of 1974* (March 2018) Section 301 refers to a section in the Trade Act of 1974, as amended, that provides the United States with the authority to enforce trade agreements, resolve trade disputes, and open foreign markets to U.S. goods and services, and it functions as an enforcement tool that may be used to address unfair acts, policies, and practices of U.S. Trading partners. See Trade Act of 1974, 19 U.S.C. § 2101, as amended through Pub. L. No. 115-141, enacted March 23, 2018. The President initiated the report through a Memorandum to the Trade Representative instructing USTR issued on August 14, 2017.

In its most recent annual report to Congress on 2017 offset agreements, BIS noted that offset agreements resulting in offshoring production or other business activities can diminish the potential benefits of defense exports for the United States, such as sustaining U.S. production facilities and workforce expertise.[37] Panelists noted that offset agreements can increase the possibility of increasing technological capabilities of other countries at the expense of the United States. Offsets can also increase the risk of transferring technological information, particularly for agreements that require U.S. companies conduct research and development activities in another country. One panelist noted that export licenses are required as part of offset agreements involving the transfer of technology. As previously noted, however, the U.S. government is in the process of updating its export controls policy for licensing the transfer of technologies. This process includes identifying emerging technologies that would be subject to protection when exported. The panelist also observed that some foreign governments are increasingly requesting more technical data as part of offset agreements.

Strategies to Mitigate Technology Transfer Concerns

Panelists suggested various strategies to address technology transfer risks including (1) implementing recent legislative reforms for foreign investment and export controls, (2) increasing public awareness, and (3) harmonizing efforts with U.S. allies to minimize risks of technology transfer.

Implementing foreign investment and export control reforms. Panelists expressed support for FIRRMA and the Export Control Reform Act of 2018. FIRRMA, among other things, increases the type of transactions eligible for CFIUS review by expanding the definition of critical technologies. The Export Control Reform Act expands the definition of what would be subject to export control to include "foundational and emerging technologies." Panelists also noted that the implementation of the legislation through the rulemaking process was critical to ensure U.S technologies were sufficiently protected. They added that as further rulemaking processes for implementing foreign investment and export control reforms unfold, the U.S. government should take into account the increasing complexity of foreign investments in order to more fully target technology transfer risks. One panelist stated

[37]U.S. Department of Commerce, Bureau of Industry and Security, Offsets in Defense Trade: Twenty-Third Study (April 2019).

that the federal government will coordinate with industry through the rulemaking process to ensure that regulations designed to protect sensitive information about emerging and critical technologies are not overly burdensome to industry. The panelist said that it will be important to strike a balance in protecting critical technologies while at the same time avoiding practices that could inhibit the flow of foreign investment in U.S. companies or the investments of U.S. companies in other countries.

Panelists noted that adequate resources in terms of the number of personnel with the right expertise will be needed to address the expected workload increases stemming from the expansion of the types of transactions now subject to CFIUS review.[38] One panelist noted that, once these laws are fully implemented, it will be a challenge to maintain the capability to continually identify what technologies need protection as they rapidly evolve. As a result, the U.S. government will need to periodically reassess which technologies should be subject to export controls as they become more widely available, according to panelists. DOD Industrial Policy officials added that it is also important that the export control system be flexible enough to differentiate the risk levels between allies and potential adversaries.

Increasing awareness of technology transfer risks. Panelists suggested that the U.S. government increase efforts to educate U.S. companies and the general public about the risks of technology transfer and compromised intellectual property associated with offshoring and foreign investment. One panelist acknowledged that DOD is already taking steps to reach out to the investor community to communicate about technology transfer risks. However, they stated that many DOD suppliers, particularly those at lower tiers of the supply chain or those that do not regularly work with DOD but have products of interest to the department, may have limited knowledge about the potential risks of technology transfer that can result from engaging in offshoring or accepting foreign investment. DOD Industrial Policy officials added that efforts to raise awareness of technology transfer risks should extend internationally and include other federal agencies such as the Departments of Commerce

[38]GAO made similar recommendations regarding CFIUS prior to the passage of FIRRMA legislation. See GAO-18-249 and GAO-18-494. FIRRMA includes provisions that provide for additional staff and funding through authorization of a $20 million annual appropriation and a filing fee for firms of 1 percent of the value of the transaction, not to exceed $300,000. FIRMMA, codified at 50 U.S.C. § 4565 (b)(i)(I)(aa) and (bb).

and State. One panelist commented that these education efforts should also include laboratories and universities.

Harmonizing efforts with international allies. Panelists discussed the importance of international cooperation in protecting critical technologies from being transferred to potential adversaries. Further, panelists stated that it is essential to work with allies to harmonize efforts to minimize illicit technology transfer—particularly because countries have adopted varying levels of protection for critical technologies. Panelists added that some countries are taking steps to address technology transfer risks. One panelist noted that while some technologies are being developed exclusively in the United States, others are not. If a technology is developed and protected in the United States, a strategic competitor or adversary can seek access to that technology in other countries that may not have or enforce policies to protect that technology. Further, another panelist said that while the recent CFIUS reforms address the issue of sharing information with other countries, the United States needs to make further efforts to inform other countries about the threat to critical technologies.[39]

Panelists Shared Perspectives on Supply Chain Risks and Potential Mitigation Strategies

Foreign Sourcing and Offshoring Can Reduce Supply Chain Visibility

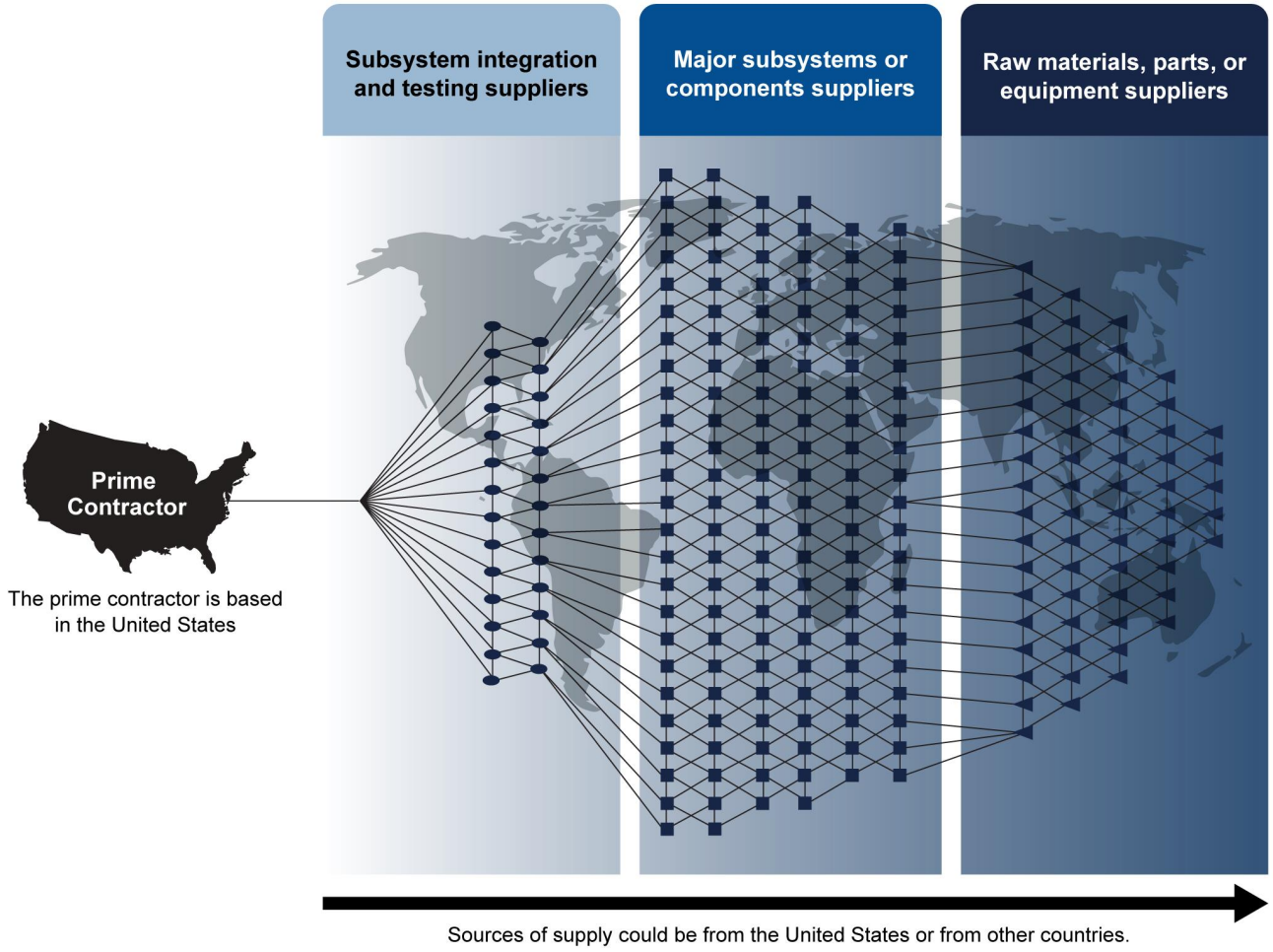
Panelists discussed how DOD's increased reliance on foreign parts and materials for DOD weapon systems have reduced visibility into the supply chain, which can inhibit DOD's ability to identify risks to the defense supplier base. During the panel discussions, panelists did not differentiate between what activities can be considered offshoring and foreign sourcing in general. Instead, they spoke generally about the effects of a globalized supply chain—which can be attributed, in part to offshoring or foreign sourcing. According to panelists, DOD contractors and suppliers can benefit from a globalized supply chain through lower costs and access to skilled workforces in foreign countries. However, the reduced visibility that can be associated with certain foreign sourcing and

[39]FIRRMA required the establishment of a formal process for the exchange of certain information with governments of countries that are allies or partners of the US to protect the national security of the United States and those countries.

offshoring can inhibit the ability to identify high-risk suppliers that could introduce counterfeit or compromised parts, which could ultimately affect DOD's ability to deliver secure weapons systems. These systems have become technologically complex and more reliant on parts and materials sources from overseas. In 2018, we reported that this complex and globalized supply chain has made it more difficult to identify sources that may present a risk, particularly at the lower levels of the supply chain, which includes materials and small electronic components.[40] Figure 4 depicts a notional supply chain of a ground vehicle procured by DOD from a U.S. contractor with an international supply base.

[40]GAO, *Defense Industrial Base: Integrating Existing Supplier Data and Addressing Workforce Challenges Could Improve Risk Analysis*, GAO-18-435 (Washington D.C.: June 13, 2018)

Figure 4: Notional Illustration of a Ground Vehicle Supply Chain with an International Supplier Base



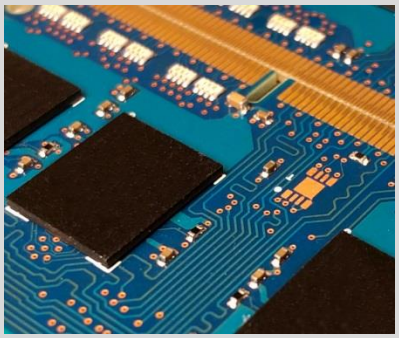
Source: Adopted from prior GAO work. | GAO-19-516

The Defense Industrial Base Report issued in September 2018 identified risk areas that can be associated with foreign sourcing and offshoring and could compromise the defense supply chain, such as foreign dependency and reliance on one source. For example, the report noted an overreliance on China for materials critical to the U.S. defense industrial base such as specialized metals, alloys and other materials, including rare earths—a critical element in many weapons systems including missile guidance, jet engines, radar, and sonar systems. The risks associated with reliance on foreign parts and materials can increase when a part is sole-sourced by a strategic competitor such as China, which can control and possibly limit access to critical components.

Panelists noted that a lack of visibility into the source of components or material used to manufacture components hinders DOD's ability to sufficiently identify the risks of reliance on sole sources from foreign countries. We have previously reported on DOD's heavy reliance on rare earths from China and noted the risk of supply disruption due to the concentration of production outside the United States.[41]

[41]GAO, *Rare Earth Materials: Developing a Comprehensive Approach Could Help DOD Better Manage National Security Risks in the Supply Chain*, GAO-16-161 (Washington, D.C.: Feb. 11, 2016)

Foreign Dependence for Printed Circuit Boards



The 2018 Defense Industrial Base Report cited the state of printed circuit board manufacturing in the United States as an example of the risks of foreign dependency, which can occur when domestic companies struggle to compete in the global marketplace. Printed circuit boards are used in both military and commercial systems, but U.S production of printed circuit boards has diminished while manufacturing has moved to Asia over the last few decades. According to the report, U.S. printed circuit board manufacturers have seen their share of the global market decline by 70 percent since 2000 while Asian manufacturers now make up 90 percent of the market—with China accounting for half of the market. Today, only one of the top 20 global printed circuit board manufacturers is U.S.-based. As such, DOD risks full visibility into the supply chain and must also contend with the possibility that products from offshore facilities may not meet or comply with DOD quality and security requirements.

Source: Department of Defense, GAO (image) | GAO-19-516

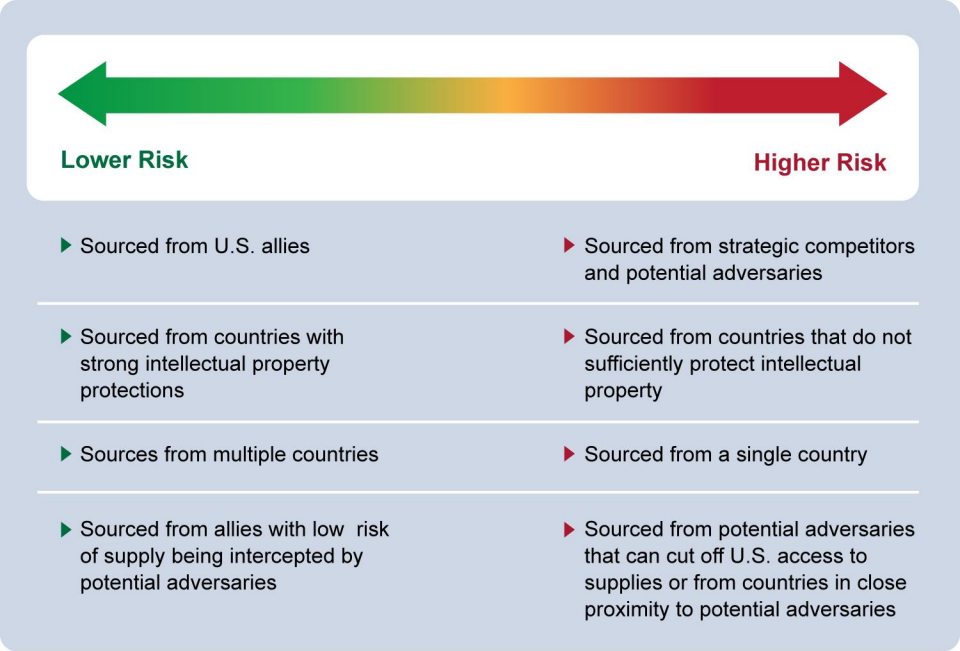
Panelists also discussed threats to security of products entering the supply chain, such as the introduction of counterfeit parts or compromised parts, which can go unnoticed as a result of reduced visibility into foreign suppliers. DOD's Fiscal Year 2017 Annual Industrial Capability Report to Congress acknowledged that a globalized electronics industry has increased the risk of counterfeit parts entering weapons systems' supply chain, which can compromise system performance and even risk the lives of the warfighter.[42] Reduced knowledge about the source of parts can also increase the risk of cyberattacks to defense systems. In 2017, the Defense Science Board Task Force on the Cyber Supply Chain issued a report about potential cybersecurity vulnerabilities associated with microelectronics, and noted DOD's reliance on a globalized supplier base for microelectronics.[43] At points along the supply chain, weapons systems risk the malicious insertion of defects into microelectronic components or malware into their embedded software that could allow systems to be compromised. The report noted that the usefulness of DOD's acquisition guidance to address cyber security risks is limited, in part, due to insufficient visibility into the supply chain. Panelists also noted that reduced visibility into DOD supply chains can also increase the risk of technology transfer by sourcing from countries where intellectual property may not be sufficiently protected.

At the panel and during interviews, panelists discussed some factors to consider when determining the risk when sourcing foreign products and materials. These considerations are summarized in figure 5.

[42]GAO has issued previous reports about the risk of DOD counterfeit parts in the supply chain. See GAO, *Counterfeit Parts: DOD Needs to Improve Reporting and Oversight to Reduce Supply Chain Risk,* GAO-16-236 (Washington, D.C.: Feb. 16, 2016) and *DOD Supply Chain: Suspect Counterfeit Parts Can Be Found on Electronic Purchasing Platforms*, GAO-12-375 (Washington, D.C.: Feb. 21, 2012).

[43]Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, Defense Science Board Task Force on the Cyber Supply Chain (Washington D.C., Feb. 2017)

Figure 5: Panelists Identified Risk Factors Related to Sourcing Foreign Products and Materials



Source: GAO analysis of expert panel discussion. | GAO-19-516

Strategies to Address Supply Chain Visibility

Panelists suggested various strategies to address risks stemming from reduced visibility into the supply chain including (1) weighing supply chain risks in the acquisition process, (2) having the private sector bear some of the risk, and (3) increasing information sharing with contractors.

Addressing supply chain risks during acquisition process. Panelists noted that DOD should consider potential contractors' supply chain and cyber security in the various phases of the acquisition process, including in acquisition planning, source selection, and when soliciting contracts. For example, when drafting a solicitation, DOD could develop evaluation factors that consider a potential contractor's supply chain security as much as other factors such as cost, price, and performance. However, a panelist noted that this approach requires a highly skilled and well-trained acquisition workforce. DOD Industrial Policy officials added that acquisition reforms are needed to provide DOD more visibility into a contractors' supply chain, instead of relying primarily on prime contractors to monitor their subcontractors and suppliers.

Having the private sector bear some of the risk. To enhance visibility into defense supply chains, panelists suggested shifting more of the responsibility for securing the supply chain from the government to the private sector. Doing so, could result in a more thorough review and assessment of supply chain decisions because a private firm may be better positioned to identify risks within its own supply chain. One possible mechanism suggested by panelists is to develop a supply chain insurance system. Under such a system, DOD contractors would be required to purchase insurance covering financial damages resulting from supply chain vulnerabilities, while the cost of the insurance would be based on the company's supply chain risk.[44] If a company's supplier base is not sufficiently secure, the risk would be reflected in a higher insurance cost. As a result, the company would be incentivized to identify and remove high-risk suppliers from its supply chain. One panelist compared this potential system to the cyber insurance market in which companies are covered for financial damages associated with cybersecurity breaches. Another panelist noted that, while implementing such a system could raise firms' costs of doing business in the short run, and thus lead firms to increase their prices to DOD, it could possibly save the U.S. government in the long run by preventing the cost of replacing high-risk components.

Promoting information sharing with the private sector. Panelists noted that information about specific risks is often not shared and that the government often has more information about supply chain risk than contractors, particularly those contractors that are below the prime-contract level or that are not traditional DOD suppliers. Panelists suggested that the U.S. government could increase visibility into defense supply chains by coordinating with contractors to identify and better understand potential risks introduced by foreign suppliers.

[44]For more information, see MITRE, Delivery Uncompromised: A Strategy for Supply Chain Security and Resilience in Response to the Changing Character of War. (August 2018)

Panelists Shared Perspectives on Strengthening Capability and Capacity of the Defense Supplier Base

Reduced Capability and Capacity in the Defense Supplier Base

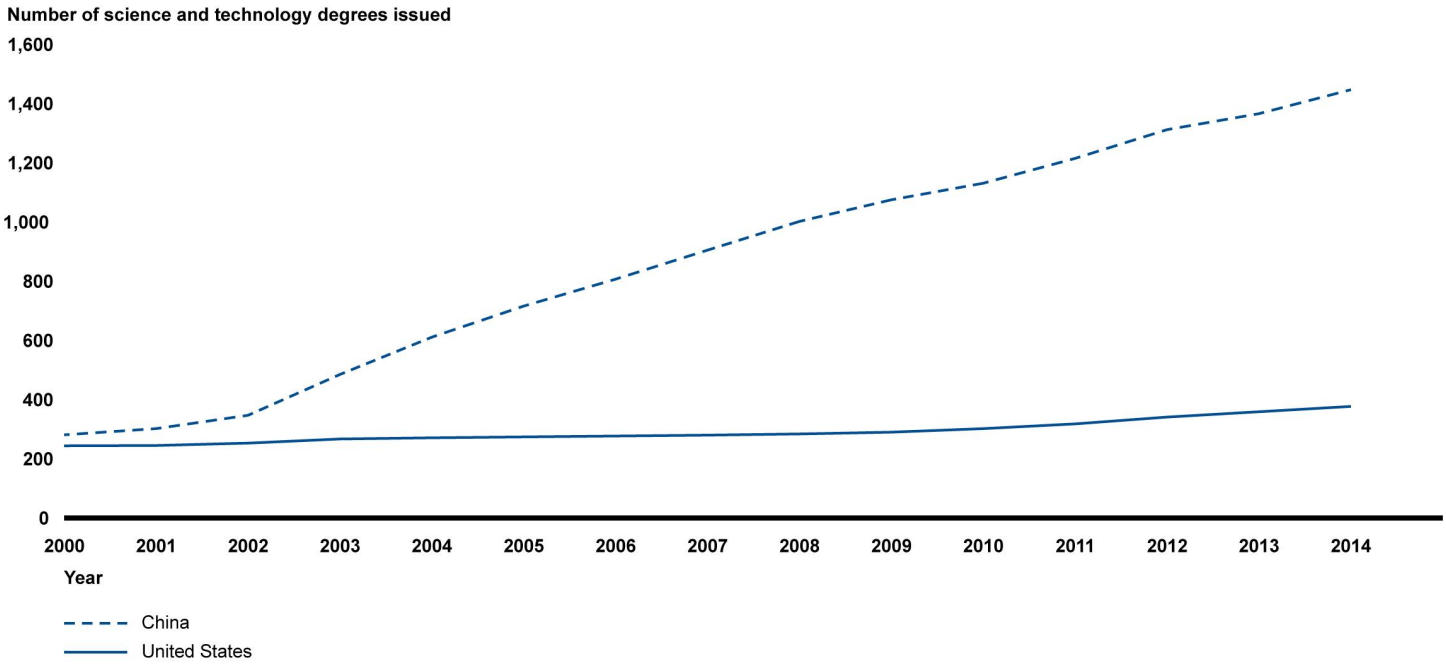
Panelists noted that offshoring can increase the risk that the defense supplier base may not have sufficient capability and capacity to address current and emerging threats to U.S. national security. For the purposes of the panel discussion, panelists defined capability as the know-how and facilities necessary for production to address a threat, and they defined capacity as the ability to provide sufficient production quantities to address a threat. A sufficient U.S. defense industrial base would have both the capability and capacity to not only address current threats, but also to ramp up production in response to emerging threats.

More specifically, panelists discussed the threat of not having a sufficient domestic workforce educated in science, technology, engineering, and math (STEM), as well as technical manufacturing workers such as welders and machinists, to meet future capacity and capability demands of the defense supplier base. In its reports assessing the defense industrial base, DOD has identified U.S. workforce shortages in STEM talent as well as trade skills gaps for occupations such as industrial machinery mechanics and welders. Such workforce shortages pose challenges for the industrial base to ensure it has the human capital needed to meet current and future mission requirements.

DOD and the panelists noted that the skills gap is related to the increased globalization of the defense supply chains and offshoring. For example, one panelist we interviewed observed that U.S. companies are increasingly likely to consider offshoring research and development business activities to emerging markets such as Israel and India because the United States does not have enough engineers with specialized skills. The 2018 Defense Industrial Base Report cited demographic trends indicating that the U.S. manufacturing workforce is aging and that there are not enough younger workers replacing experienced workers, creating a risk of a knowledge gap for future manufacturing. It also cited an increase in STEM graduates in other countries that can compete with the domestic STEM workforce. According to the National Science Board, colleges and universities in China issued more than three times as many

bachelors' level science and engineering degrees than those in the United States in 2014, the latest available data reported (see figure 6).[45]

Figure 6: Comparison of First University and Bachelor's Science and Engineering Degrees, Issued by Universities in China and the United States 2000-2014 (in thousands)



Source: National Science Board: Science and Engineering Indicators 2018 (January 2018). | GAO-19-516

Panelists identified some industries in which they observed that offshoring has contributed to significant risks to the production capability or capacity for textiles, microelectronics, and specialized chemicals used in munitions and missiles, among other things. One panelist cited the erosion of the U.S. textiles industry as an example of a threat to DOD's production capability. According to the Defense Industrial Base Report, the domestic textile manufacturing base contracted from 1996 to 2009, due largely to most U.S. textile and clothing suppliers that DOD relies on moving offshore. The report stated that there is currently no U.S.-based manufacturer with the capability to produce the specialized polyester fibers that meet certain military specifications of manufactured tents. DOD Industrial Policy officials added that while the U.S. government can require that U.S. companies prioritize contracts and orders to meet urgent

[45]The National Science Board is a policy and advisory body that is part of the National Science Foundation.

military or homeland security requirements under the Defense Priorities and Allocations System, this authority does not apply to suppliers outside the United States.[46] As such, panelists said that DOD's heavy reliance on foreign suppliers can hinder its ability to quickly obtain goods and services to meet emerging threats or surge production requirements.

Panelists discussed other challenges that the U.S. supplier base faces to maintain sufficient capability and capacity. For example, panelists noted that because DOD purchasing is often unpredictable, it makes it is difficult for potential suppliers to continue investing in defense portfolios or remain financially viable. As a result, companies may forego working with DOD. One panelist noted that uncertainty in DOD's spending has created unfavorable economic conditions for U.S. companies, which could potentially result in some exiting the market to focus on commercial business opportunities or some companies going out of business. In turn, DOD is forced to rely on foreign sources for various components and raw materials such as chemicals for munitions.

Strategies to Strengthen Capability and Capacity

Panelists discussed various approaches for strengthening the capability and capacity of the defense industrial base to meet current and future requirements including (1) increasing the domestic STEM workforce, (2) leveraging foreign talent to close the skills gap, and (3) enabling DOD to become a better customer.

Increasing support for domestic STEM and technical skills. Panelists suggested that the U.S. government expand programs that incentivize students to pursue STEM and technical education programs in the United States. According to the panelists, such programs could help develop a more robust domestic STEM-educated and technically skilled workforce to support the capability and capacity of the defense supplier base. This could include federal government initiatives that help pay for educational programs or forgive student loan debt. We have previously reported that federal investment in STEM education programs was $2.9 billion in 2016 and has remained relatively stable since 2006, though the number of

[46]Defense Production Act, Title 50 U.S.C. § 4511(a) E.O. 13603, CFR Part 700

federal STEM education programs declined from 209 to 163 across the federal government during the same period.[47]

Leveraging foreign workers and students to meet skill gaps. Panelists stated that the United States could consider opportunities to further leverage foreign workers and students with temporary visas in STEM or technical fields in order to meet short-term needs to sustain the capability and capacity of the defense supplier base. Another panelist, however, noted that the United States needs to balance its need for foreign workers with security, because some countries represent a higher risk of providing workers who may transfer sensitive technology information back to their home country. In response, one panelist suggested this risk could be reduced by allowing skilled foreign workers to stay longer in the United States with their families.

Incentivizing domestic companies to do business with DOD. Panelists noted that contractors and DOD suppliers are ultimately businesses that are motivated to make a profit. To grow the capability and capacity of the defense supplier base, panelists said that the United States should continue to encourage U.S. companies to do business with DOD by making work with the agency more attractive. This includes stabilizing funding, mitigating perceived challenges associated with government contracting such as burdensome DOD contracting requirements, and providing incentives for domestic companies to support the defense supplier base. For example, panelists noted that more consistent funding to DOD on an annual basis could provide financial stability and further encourage companies to do business with DOD. We have previously reported that representatives from selected companies that do not traditionally contract with DOD identified the expense of implementing government-specific contract terms and conditions, as well as an unstable budget environment, as challenges to contracting with DOD.[48]

Two panelists agreed that ramping up production to meet DOD's needs can be a matter of providing sufficient incentives to entice businesses to maintain defense production. One panelist added that DOD should further incentivize contractors to spend on research and development through

[47]GAO, *Science, Technology, Engineering, and Mathematics Education: Actions Needed to Better Assess the Federal Investment,*GAO-18-290 (Washington D.C.: Mar. 23, 2018)

[48]GAO-17-644

more tax incentives and other measures since these business activities may not be seen as immediately profitable to shareholders. Another panelist noted, however, that there are limitations to this approach. Because DOD represents a small proportion of the market in industries such as building materials and microelectronics, it is difficult to provide sufficient incentives to stay in the United States when a company can save money by offshoring.

Agency Comments

We provided a draft of this report to DOD for comment. DOD provided technical comments, which we incorporated as appropriate.

We are sending copies of this report to the appropriate congressional committees and the Secretary of Defense. In addition, the report is available at no charge on the GAO website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-4841 or woodsw@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix III.

William T. Woods
Director
Contracting and National Security Acquisitions

List of Committees

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The Honorable Jack Reed
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Richard Shelby
Chairman
The Honorable Dick Durbin
Ranking Member
Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable Adam Smith
Chairman
The Honorable Mac Thornberry
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable Pete Visclosky
Chairman
The Honorable Ken Calvert
Ranking Member
Subcommittee on Defense
Committee on Appropriations
House of Representatives

Appendix I: Objectives, Scope, and Methodology

This report describes (1) the factors that affect analysis of foreign direct investment and offshoring related to the Department of Defense's (DOD) supplier base, and (2) the benefits and risks to the U.S. defense supplier base associated with foreign investment and offshoring and policy considerations to address those risks.

For our first objective, we reviewed various studies by federal agencies, universities, and the private sector to identify how the terms offshoring and foreign direct investment are defined as well as publicly available data collected by federal agencies. To describe foreign direct investment in the United States, we analyzed data on new foreign direct investment from the Bureau of Economic Analysis (BEA) within the Department of Commerce (Commerce) for calendar years 2014 through 2018—the most recent data available at the time of our review.[1] BEA collects data on foreign direct investments in the United States and has defined foreign direct investment as an investment from a foreign individual or business enterprise in a U.S. company that is 10 percent or more voting ownership. We adjusted BEA data for inflation to calendar year 2018 dollars using the Calendar Year Gross Domestic Product Price Index. To assess the reliability of BEA's new foreign direct investment data, we reviewed the technical notes for the statistics we used and reviewed the agency's information quality guidelines. Based on these reviews, we determined the data to be sufficiently reliable for describing aggregate-level information and some insights on new foreign direct investments. With regard to offshoring, we reviewed federal agency reports to determine that federal agencies including BEA, the Bureau of Census, and the Bureau of Labor Statistics do not collect data on offshoring.

For our second objective, we convened a panel of 13 panelists for a 1-day meeting in December 2018. The expert panel was selected with the goal of obtaining broad and diverse points of view across several sectors,

[1]New foreign direct investment data provide information on the acquisition, establishment, and expansion of U.S. business enterprises by foreign investors. First year expenditures are expenditures in the year in which the investment was initiated and exclude expenditures planned for multiyear investments.

including academia, industry groups, think tanks and federal agencies. We identified subject matter areas relevant to the defense supplier base by consulting with internal subject matter experts, interviews with DOD and Commerce officials, and through reviewing related academic, government, and GAO reports. Topics discussed during the panel included trends in offshoring and foreign investment, the benefits and risks of offshoring and foreign investment on the global supply chain, and maintaining domestic capability and technological superiority for critical technologies.

To identify experts from academia, industry, think tanks, and federal agencies who are knowledgeable about matters involving foreign investment, offshoring and the U.S. defense supplier base we reviewed various sources of information including professional and government publications, participant lists of knowledge sharing events such as symposia, conferences, and recent congressional testimonies related to U.S. defense supplier base issues. In addition, we identified a number of potential experts based on our interviews with federal agencies and other knowledgeable stakeholders. We identified more than 100 potential experts based on their expertise across the range of subject matter areas and sectors. Next, we reviewed available relevant information about the potential experts and selected 29 experts for further consideration based on factors such as current and past employment positions, seniority in their industry, professional affiliations, and published work, among others. Special consideration was also given to panelists with multiple areas of expertise.

Once the 29 experts were selected, we reached out to conduct interviews with potential panelists with whom we had not already met during background interviews in order to further gauge their expertise in our panel topic areas. We extended an invitation to 18 experts, of which 13 accepted our invitation to participate. The breakdown of experts across different sectors is as follows: three experts from academia, two from industry groups, three from think tanks, four from federal agencies, and one from the consultant/legal sector.[2] For the list of panelist participants see appendix II.

[2]In order to identify circumstances that could be viewed by others as affecting the objectivity or points of view of the expert panelists—such as investments, earned income and close friendships—panelists completed and signed a questionnaire providing this information. Panelists did not identify any circumstances or information that raised concerns for GAO.

Following the panel, we conducted content analyses of the expert panel transcripts to capture different views of definitions and concepts, as well as to identify themes related to benefits and risks of foreign investment and offshoring. We provided panel participants with a draft of our report and solicited their feedback in order to clarify information and confirm the accuracy of our assessment of the panel discussion, which we incorporated as appropriate.

In addition, we supplemented expert panel information through the following:

- Reviewing various reports on industrial policy, foreign investment, protection of intellectual property and foreign trade authored by DOD, GAO, Department of Commerce, the Committee on Foreign Investment in the United States and the U.S. Trade Representative.[3]
- Reviewing the existing support framework for addressing issues within DOD's supplier base. Specifically we reviewed the roles and responsibilities for offices within the departments of Defense and Commerce.
- Interviewing officials from various federal agencies and commissions, including:
  - DOD: Office of the Assistant Secretary of Defense for Industrial Policy, Defense Innovation Unit;
  - Department of Commerce: Bureau of Industry and Security, Bureau of Economic Analysis, Office of International Trade Administration: and
  - U.S.-China Economic and Security Review Commission.

[3] For example, see GAO, *International Trade: Current Government Data Provide Limited Insight*, GAO-04-932 (Washington D.C.: Sept. 22, 2004); DOD, *Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States: Report to President Donald J. Trump by the Interagency Task Force of Fulfillment of Executive Order 13806* (September 2018); Committee on Foreign Investment in the United States, Annual Reports to Congress. Public/Unclassified Version (February 2015 to September 2017), Office of the United States Trade Representative (USTR); Executive Office of the President, Findings of the Investigation Into China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation Under Section 301 of the Trade Act of 1974(March 2018);and U.S. Department of Commerce, Bureau of Industry and Security, Offsets in Defense Trade: Twenty-Second Study (June 2018).

- Interviewing experts that were unable to attend our panel to obtain their insights on the effects of foreign direct investment, offshoring on DOD's supplier base.

For purposes of quantifying panelist remarks, we refer to a statement from an individual panelist as being from one panelist, and unless there is disagreement in the transcript of the meeting, we refer to statements from two or more panelists as being from panelists. In cases of conflicting opinions, we refer to the specific number of panelists making a statement. We did not ask panelists to reach consensus or agreement on the topics discussed.

We conducted this performance audit from March 2018 to September 2019 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Attending Panelists

Participant	Organization
Lee Branstetter Professor of Economics and Public Policy Director, Center for the Future of Work	Carnegie Mellon University
Richard Ellings Executive Director President	Commission on the Theft of American Intellectual Property National Bureau of Asian Research
Erin Ennis Senior Vice President	U.S.-China Business Council
Corbin Evans Director of Regulatory Policy	National Defense Industrial Association
Brennan Hogan Grignon Director, Policy and Industry Outreach	Office of the Deputy Assistant Secretary of Defense for Industrial Policy, Department of Defense
Mario Mancuso Partner and Leader, International Trade & National Security Practice Group	Kirkland & Ellis LLP
John G. (Jerry) McGinn Executive Director, Center for Government Contracting	George Mason University
Chris Nissen Director, Asymmetric Threat Response & Supply Chain Security, Special Concepts Group	MITRE Corporation
Chad J. R. Ohlandt Senior Engineer	RAND Corporation
Oliver Richard Chief Economist Director, Center for Economics	U.S. Government Accountability Office
David Stapleton Director, Global Markets and Investments	Office of the Deputy Assistant Secretary of Defense for Industrial Policy, Department of Defense
Timothy J. Sturgeon Senior Research Affiliate Industrial Performance Center	Massachusetts Institute of Technology
Michael Vaccaro Director, Office of Strategic Industries and Economic Security	Bureau of Industry and Security, U.S. Department of Commerce

Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

William T. Woods, (202) 512-4841 or woodsw@gao.gov

Staff Acknowledgments

In addition to the contact named above, Candice Wright, Assistant Director; Mary Diop and Matthew Shaffer, Analysts-in-Charge; Lorraine Ettaro; Philip Farah; Kurt Gurka; Stephanie Gustafson; Maria McMullen; Christine Pecora; Guisseli Reyes-Turnell; and Alyssa Weir made key contributions to this report.

Appendix IV: Accessible Data

Data Tables

Accessible Data for Offshoring and Foreign Investment

Offshoring Generally refers to a range of business activities, such as shifting domestic production to a facility abroad
Foreign Investment Financial transactions that can give foreign investors a degree of influence in a U.S. business

Accessible Data for Figure 1: Examples of Foreign Direct Investment

Foreign Direct Investment
Represents an investment from a foreign person (including an individual or business enterprise) in a U.S. business enterprise equivalent to 10 percent or more voting ownership.

Establishments	Expansions	Acquisitions
A U.S. business enterprise or an existing U.S. affiliate of a foreign entity establishes a new legal entity in the United States.	A U.S. affiliate expands its operations to include a new facility where business is conducted.	A foreign individual or business acquires a U.S. business enterprise either directly or indirectly through an existing U.S. affiliate, and no foreign entity held a voting ownership immediately before the acquisition.

Accessible Data for Figure 2: New Foreign Direct Investment Expenditures in U.S. Companies, Calendar Years 2014-2018 (in calendar year 2018 dollars)

Year	Dollars (in billions)
2014	277
2015	463
2016	396
2017	279
2018	296

Accessible Data for Figure 3: Examples of Dual-Use Technologies and Their Potential Military Applications

Dual-Use Technology	Examples of Potential Military Applications
Autonomous and Unmanned Systems	Multiple autonomous and unmanned systems are currently being developed and produced by the Department of Defense. It has fielded unmanned systems such as the Air Force's MQ-1 Predator and RQ-4 Global Hawk to perform surveillance and in the case of the MQ-1 Predator, also target enemies and perform surveillance.
Artificial Intelligence (AI)	AI can be used to support many military applications including intelligence, surveillance, logistics, cybersecurity, command and control, and autonomous vehicles.
Quantum Information Science	Quantum technology has the potential to support encryption and stealth technologies as well as enhance radar and other detection systems.
Biotechnology	Biotechnology has the potential to be used to enhance the performance of military personnel. It also has the potential to be used to develop chemical and biological weapons by adversaries.

Accessible Data for Figure 4: Notional Illustration of a Ground Vehicle Supply Chain with an International Supplier Base

	Subsystem integration and testing suppliers	Major subsystems or components suppliers	Raw materials, parts, or equipment suppliers
Prime Contractor The prime contractor is based in the United States	Source of supply could be from the United States or from other countries.		

Accessible Data for Figure 5: Panelists Identified Risk Factors Related to Sourcing Foreign Products and Materials

Lower Risk	Higher Risk

Lower Risk	Higher Risk
• Sourced from U.S. allies • Sourced from countries with strong intellectual property protections • Sources from multiple countries • Sourced from allies with low risk of supply being intercepted by potential adversaries	• Sourced from strategic competitors and potential adversaries • Sourced from countries that do not sufficiently protect intellectual property • Sourced from a single country • Sourced from potential adversaries that can cut off U.S. access to supplies or from countries in close proximity to potential adversaries

Accessible Data for Figure 6: Comparison of First University and Bachelor's Science and Engineering Degrees, Issued by Universities in China and the United States 2000-2014 (in thousands)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
China	281	302	347	485	611	716	807	905	1,002	1,075	1,131	1,215	1,312	1,366	1,447
United States	244	245	253	267	271	274	277	280	284	290	302	318	341	359	377

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