How Applying ‘Buy America’ Provisions to IT Undermines Infrastructure Goals

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Because the cost of producing IT products is lower overseas, applying Buy America provisions to IT components of projects underwritten by the infrastructure bill will raise costs, reduce infrastructure build, and delay project completion—all without creating any net new jobs.

KEY TAKEAWAYS

- Congress included in the recent infrastructure bill stronger applications of Buy America provisions, which govern the extent to which federal government purchases must be of products substantially made in the United States.
- The U.S. share of global computer and electronics output had already fallen 8.2 percentage points between 1999 and 2009 when the Obama administration provide a blanket waiver for IT products in the American Recovery and Reinvestment Act of 2009.
- Since then, U.S. domestic IT capabilities have weakened even more, dropping another 2.3 percentage points of global market share.
- Because of this, applying Buy America provisions to IT components of federal infrastructure investment would raise IT costs approximately 25 percent, on average.
- Boosting U.S. manufacturing output is critical but applying Buy America provisions to information technology will do little to reshore IT production. It will, however, reduce the amount of U.S. infrastructure that is built.

INTRODUCTION

The Biden administration has made a commitment to revitalize America's manufacturing base.[1] One tool it and Congress have put in place is a stronger application of Buy America (BA) provisions, which govern the extent to which federal government purchases must be of products substantially made in the United States. The Build America, Buy America (BABA) provision in the recent infrastructure bill strengthens and expands these provisions to apply to most of the infrastructure spending, including potentially to information technology (IT).

However well-intentioned policymakers may be, applying increased and stricter BA provisions to IT purchases related to infrastructure (either directly to digital infrastructures such as broadband and electric vehicle charging stations, or indirectly as IT inputs to roads, bridges, and utility systems) will increase infrastructure costs, thereby reducing the scope and quality of the national infrastructure build. This is because, unlike some commodity products for infrastructure such as cement, steel, and wallboard, where U.S. production capabilities exist and can be expanded relatively easily, for many IT products, U.S. production capabilities are quite weak.[2] Indeed, the U.S. share of global computer and electronics output had already fallen 8.2 percentage points between 1999 and 2009, when the Obama administration provided a blanket BA waiver for IT products in the American Recovery and Reinvestment Act of 2009 (ARRA). Since then, U.S. domestic IT capabilities have weakened even more (dropping another 2.3 percentage points).

Because the cost of production of IT products is lower overseas, applying Buy America provisions to IT components of the infrastructure bill will raise costs, reduce infrastructure build, and delay project completion, all without creating any net new jobs.

As such, if BA is applied to IT purchases in the infrastructure spending provisions, the Information Technology and Innovation Foundation (ITIF) estimates IT costs would increase by approximately 25 percent on average. Depending on where the products are sourced, the cost increase for some would be more than 25 percent. Moreover, applying BABA provisions, even if significant case-by-case waivers are allowed, would increase regulatory complexity and costs, meaning less infrastructure would be built. Finally, because IT production is complex, it is extremely difficult to quickly create domestic production capabilities. This means that applying BABA to IT would require significantly delaying infrastructure projects until domestic production can be created, or projects would have to use older, lower-quality domestic technology.

As ITIF has argued for more than a decade, boosting U.S. manufacturing output is critical.[3] And as we have laid out, there are a number of policies that could help achieve this objective.[4] But applying BABA provisions to IT is not one of them. In summary, applying BABA provisions to IT components of the infrastructure bill will raise costs, reduce infrastructure build, and delay project completion, all without creating any net new jobs.

OVERVIEW OF BABA

The Infrastructure Investment and Jobs Act changes "Buy America" requirements for federally funded infrastructure projects. The bill expands coverage to other infrastructure projects, including transmission facilities; structures and equipment of electric utilities; broadband and buildings; and other projects such as electric vehicles and charging stations. To be considered "produced in the United States," manufactured goods must contain greater than 55 percent domestic content and be manufactured in the United States. President Biden signed an executive order that, among other things, set up a Made in America Office within The White House's Office of Management and Budget (OMB) and proposed increasing the share of domestic content to 60 percent on October 25, 2022, and 75 percent by 2029.

OMB called on federal agencies funding infrastructure projects to "err on the side of inclusiveness and consider programs for which funds may be obligated for infrastructure under any award."[5] Moreover, a recent Department of Homeland Security (DHS) report on the IT supply chain argues that the federal government should:

> Implement strong Buy America provisions used in projects financed by the Bipartisan Infrastructure Law and coordinate with the Office of Management and Budget to initiate a consultation process to identify IT products, such as printed circuit boards and fiber optic cables, eligible for such provisions. Any waivers granted from Buy America requirements should be time-limited and consistent with U.S. international trade obligations.[6]

In other words, both Congress and the Biden administration are focused on using infrastructure spending to serve a dual purpose: better and more infrastructure and more U.S. manufacturing output, including IT output. These goals are, however, contradictory.

Issues Unique to the Information Technology Industry

When most people think of infrastructure they think of steel and concrete. But over the last decade, both pure digital infrastructure and hybrid digital infrastructure have become more important. The former includes things such as broadband networks and smart city sensor networks. The latter includes physical infrastructures such as electric grids, roads, and bridges that increasingly incorporate digital technologies to make them smart.[7] As a result, a not-insignificant share of the trillion dollar plus infrastructure package will be spent on IT components. For example, a broadband network consists of multiple elements including "switching, routing, transport, access, operations systems, and customer premises/end user equipment and devices."[8] Electric vehicle charging stations contain multiple different electronics components and systems. Modern water treatment facilities contain sensors, displays, software, and other inputs.

Many other infrastructure inputs such as wallboard, cement, steel, aggregate, and lumber are essentially commodities, with significant domestic production capabilities. For example, the Congressional Research Service reports that over the last decade, production capacity of the U.S. steel industry has rarely exceeded 80 percent utilization.[9] Likewise, two-by-fours are produced in virtually every state that harvests pine trees. The commodity, nature, is more or less the same with cement and concrete and even with steel. If policymakers want more of this output by requiring domestic production, they can pretty easily get it—perhaps at a slight cost disadvantage, but supply responses should be fairly straightforward.

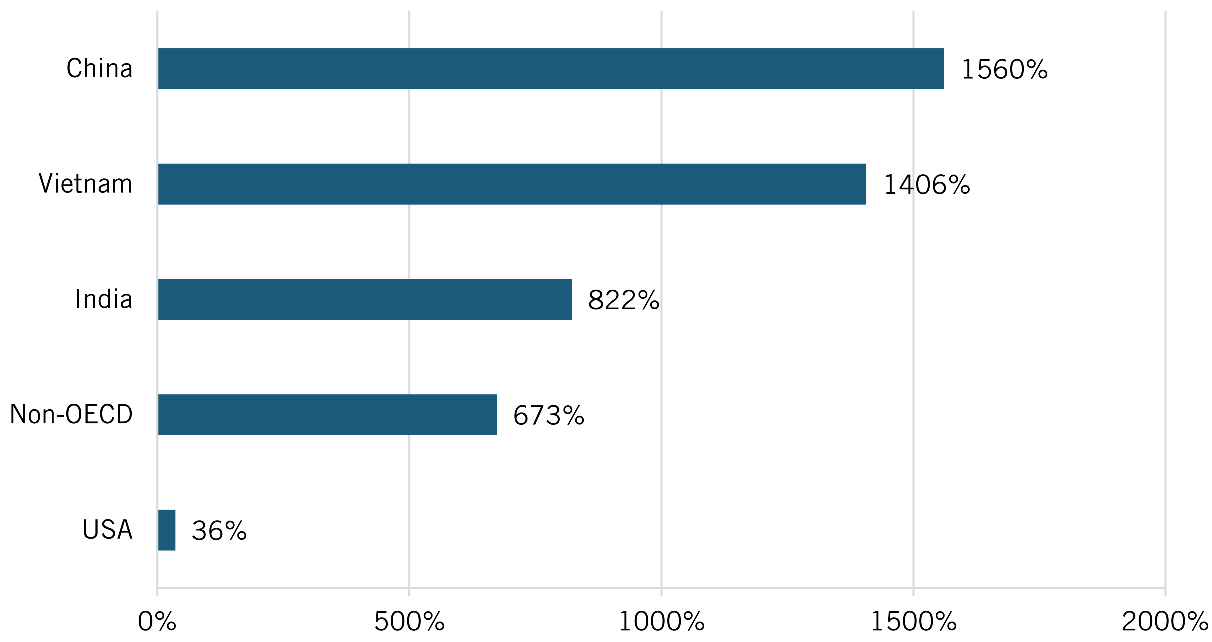
IT is different. First, significant portions of the industry are outside the United States. This means, in many cases, bringing back or creating from scratch new IT production capabilities domestically, and doing so in the short term (e.g., the next two to three years to supply the infrastructure projects) is likely to be difficult, if not impossible, especially if the only incentive is a Buy America mandate which is most cases will not be large enough to move the market, especially for products that compete in commercial markets globally. Second, innovation, specialization, and economies of scale are critical to the IT sector, making it difficult to easily relocate production. And because innovation is so important, ensuring that infrastructure projects have the most up-to-date IT technology may require purchasing products that benefit from global R&D networks and supply chains.

U.S. DOMESTIC IT PRODUCTION CAPABILITIES

It would be one thing if the United States had adequate and cost-competitive IT production capabilities across the array of products and components likely to go into infrastructure projects. Then a BA mandate would have less impact on time and cost—and would likely not even be needed. But since much of the output is derived from global supply chains, insisting on widespread domestic IT inputs for the infrastructure spend will raise costs and generate delays and bottlenecks. In this sense, applying BA is putting the cart before the horse. The demand signal will be too small to generate a needed response and the domestic supply base is too small to adequately gear up supply, especially in the short to medium term. If we assume that there is around $50 billion in IT spending from the infrastructure bill, and two-thirds of this will have to be created anew domestically in order to comply with BA provisions, this would account to just one percent of U.S. production over the next decade term.

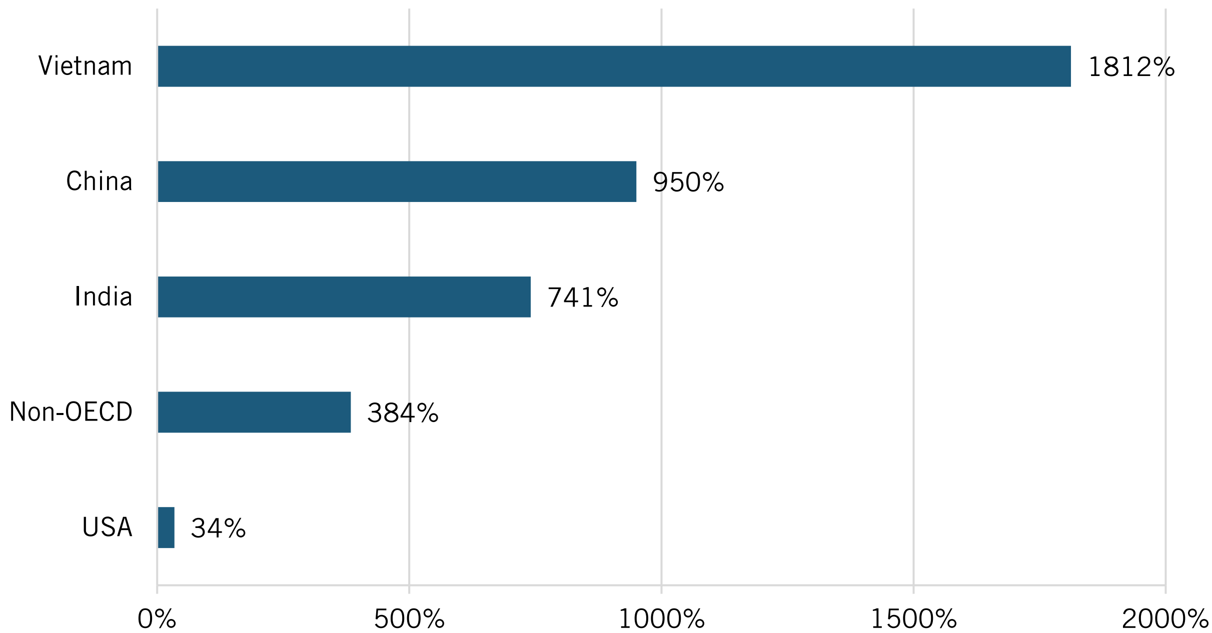
The evidence against applying Buy America to IT is significant. For example, figure 1 shows the change in value-added output in electrical equipment for the United States and select other nations from 1995 to 2018 compared with the global average change. In nominal dollars, U.S. output grew 64 percent less than the global average output in the sector (meaning output fell in inflation-adjusted terms), while output in China grew more than 15 times faster, Vietnam 14 times faster, India 8 times faster, and the non-OECD (Organization for Economic Cooperation and Development) world almost 7 times faster.

Figure 1: Relative growth in electrical equipment output, 1995–2018[10]



We see a similar dynamic when looking at change in computer, electronic, and optical products. U.S. output grew 66 percent less than the global average, while output in Vietnam increased 18 times and in China grew 9.5 times faster. (See figure 2.)

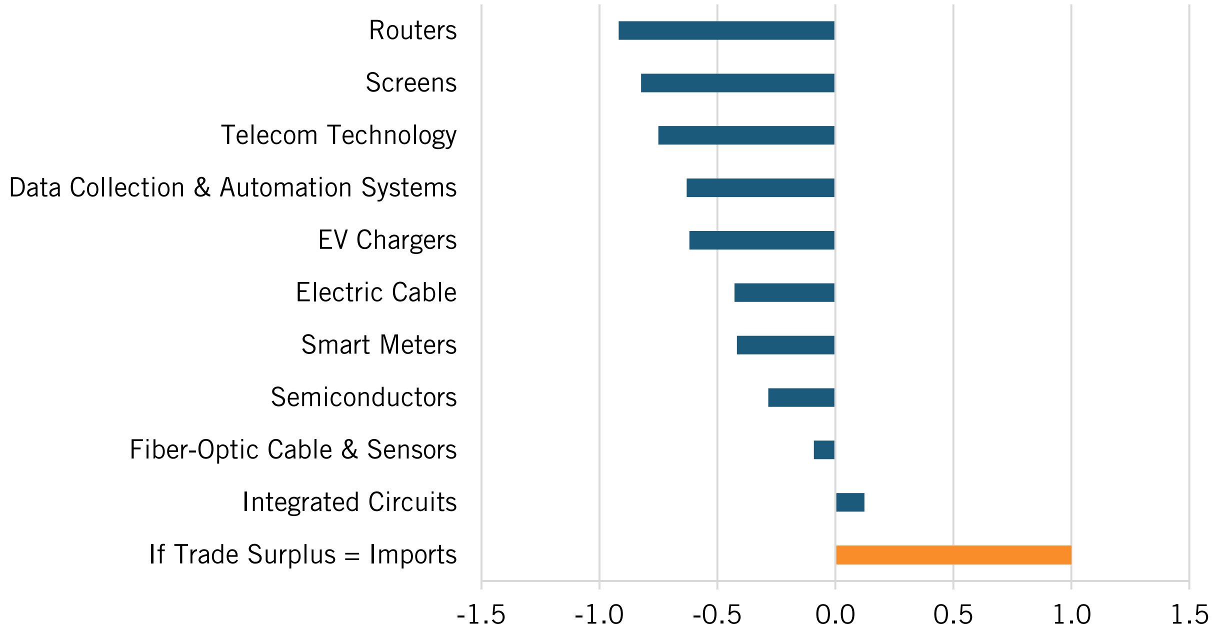
Figure 2: Relative growth in output of computer, electronic, and optical products, 1995–2018



In many cases, bringing back or creating from scratch new IT production capabilities domestically, and doing so in the short term (e.g., the next two to three years to supply the infrastructure projects) is likely to be difficult.

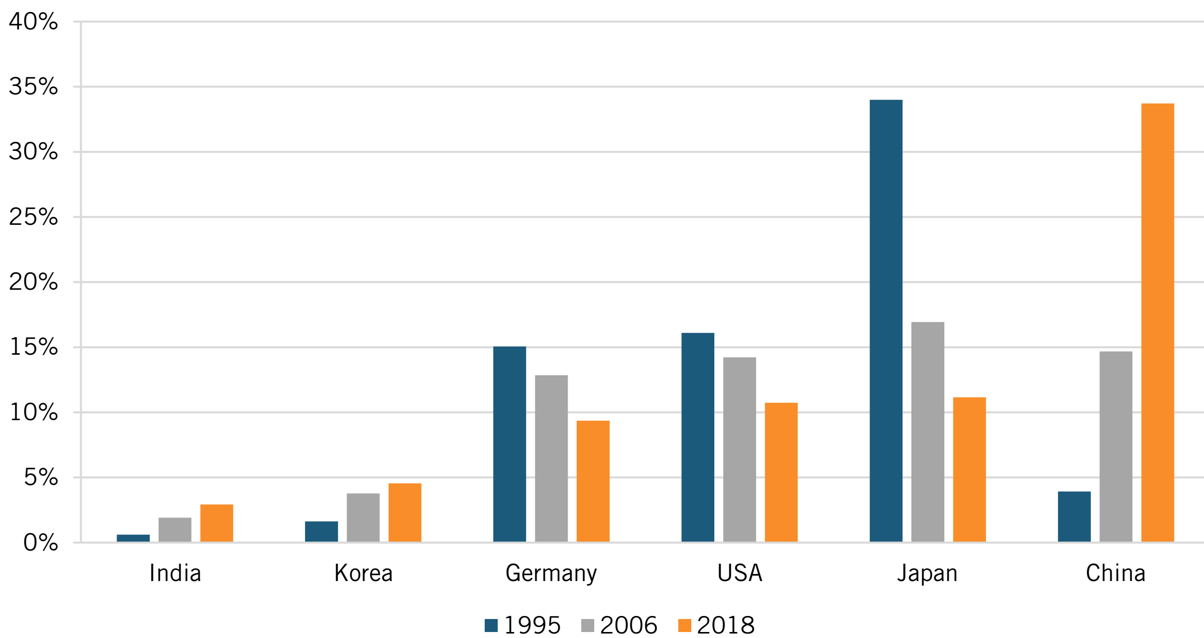
Another way to determine relative strength or weakness is to examine the ratio of IT imports to exports. For the cost analysis of BA requirements on IT products, ITIF examined 10 product codes: computer chips, integrated circuits, electrical cable, smart meters, data collection/automation systems, display screens, fiber optic cable, routers, EV chargers, and telecom technology. We looked at U.S. exports and imports for each. A score of 1 would mean the U.S. trade surplus was equal to imports. A score of 0.12 for integrated circuits means the United States exports 12 percent more than it imports. A negative number indicates that the United States runs a trade deficit. As can be seen in figure 3, the United States runs a trade deficit in 9 of the 10 products. For example, it runs a $15 billion trade deficit in smart meters (42 percent of the $34 billion in imports). The relative deficit in routers is even larger, 92 percent.

Figure 3: Ratio of U.S. imports to U.S. trade balance for select IT products



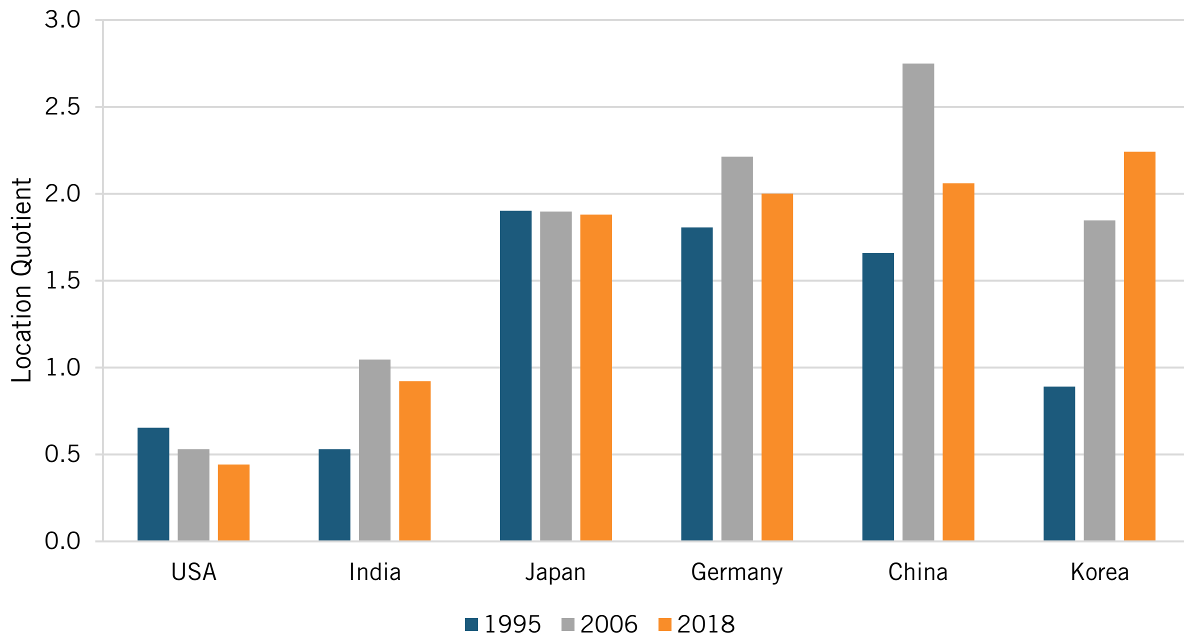
We see similar dynamics in these industries' output. Figure 4 shows the change in global share of output in the electrical equipment industry. China went from about 4 percent of global output in 1995 to over one-third in 2018. The United States declined from 16 percent to 11 percent during the same period.[11]

Figure 4: Global shares of value-added output of electrical equipment



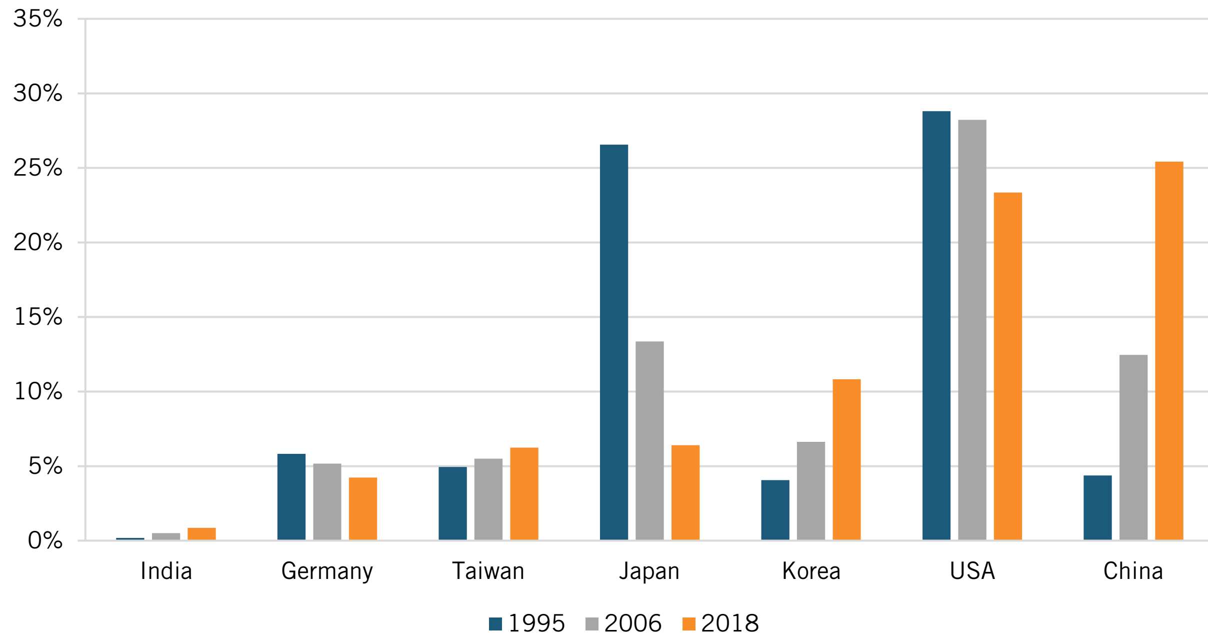
Another way to look at the relative strength in industry is to examine an industry's share of the U.S. economy relative to its share of global gross domestic product (GDP). This is termed a "location quotient," where a score greater than 1 means a country has more than the average share of an industry. By this measure, the electrical equipment industry is significantly underrepresented in the United States compared to the global average, and it has declined from 0.65 in 1995 to 0.44 as of 2018, meaning it is just 44 percent of the size-adjusted global average (see figure 5). Compare this to countries such as China, Germany, Japan, and South Korea, where the industry share of each is around twice the global average. Even India is more specialized in electrical equipment. Moreover, the U.S. share of global electrical equipment output fell from 16.1 percent in1995 to just 10.7 percent in 2018.[12]

Figure 5: Relative global shares of value-added output of electrical equipment, controlling for countries' overall shares of global GDP



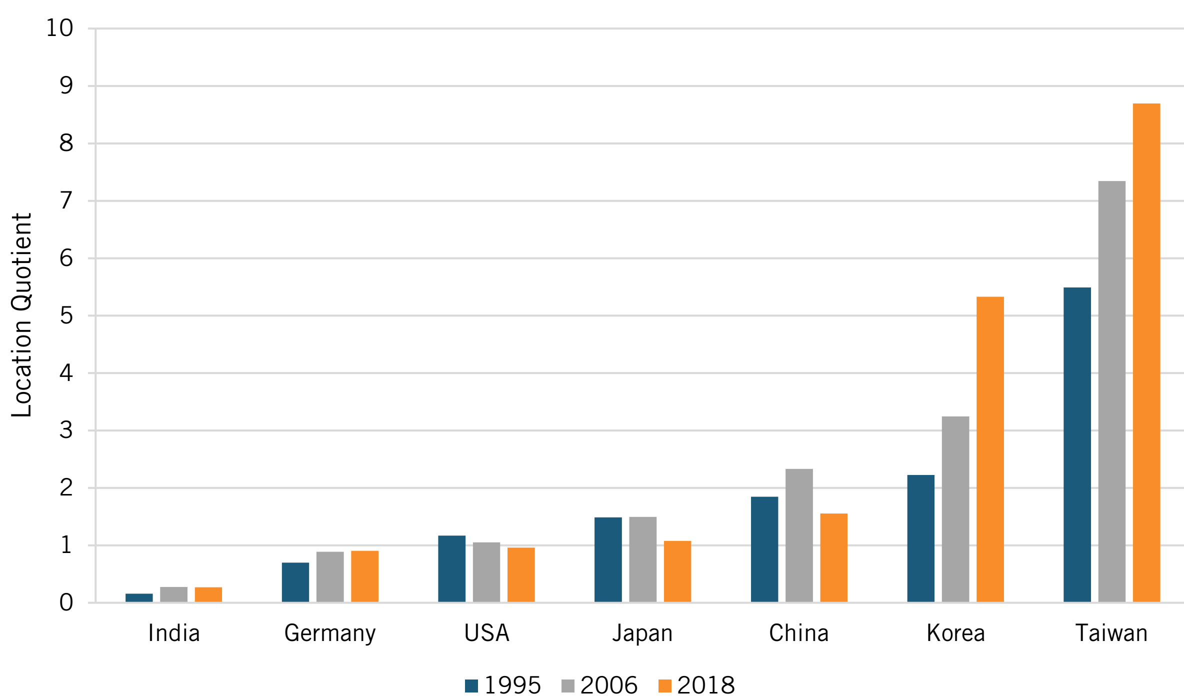
We see similar dynamics in the computer, electronic, and optical industry. China's share increased from 4 to 25 percent, while the U.S. share fell from 29 percent to 24 percent.

Figure 6: Global shares of value-added output of computer, electronic, and optical production



The U.S. location quotient in the computer, electronic, and optical industry is closer to the global average, but it fell from 1.17 in 1995 (17 percent more than the global average) to 0.96 in 2018 (4 percent below average). Many U.S. companies still lead in this industry, but much of the manufacturing is done in Asia. That is why Korea and Taiwan are significantly more specialized in this industry, as is China. (See figure 6.)

Figure 7: Relative global shares of value-added output of computer, electronic, and optical products, controlling for countries' overall shares of global GDP



The federal government acknowledges these IT production weaknesses. Both the Department of Defense's Office of Industry Policy and DHS have examined U.S. capabilities in IT production and made some of the following observations. For example:

- "The United States continues to lead in IT development and innovation in many product categories. However, the production of many products such as printed circuit boards (PCBs) and displays has become increasingly concentrated in China, along with electronics assemblies."[13]
- "The dependence on foreign sources for semiconductor products continues to represent a serious threat to the economic prosperity and national security of the U.S., as much of the critical infrastructure is dependent on microelectronic devices."[14]
- "The number of small and medium PrCB [a kind of circuit board] manufacturers supplying the DoD continued to diminish in 2020, falling by 16.3 percent and 25.6 percent in the last five years, respectively."[15]
- "U.S. value-added manufacturing has eroded over the last 20 years, threatening assured access to new optics and photonics."[16]
- "DoD has limited market influence in the ME [microelectronics] sector, holding approximately 1% of the customer base. This inhibits competition, since very few ME companies are willing to engage with low-volume customers"[17]
- "[There is a] lack of a domestic ecosystem for many segments of IT production."[18]
- "The United States is the world's leader in technology innovation, but most hardware manufacturing takes place in other countries."[19]
- "Factors such as lower labor costs, subsidies, infrastructure benefits, availability of capital and land, and a central location in Asia lured high volume consumer product EMS [electronics manufacturing services] assembly to China.[20]
- "While U.S. firms are not absent from the communications hardware market, the amount of manufacturing in the United States has decreased significantly."[21]
- "Although U.S. companies are leaders in computing and data storage, much of the manufacturing process now takes place in Asia."[22]
- "Many end-user devices are low-cost, high-volume products that use established technology, and, to the extent some of these devices were produced in the United States at one time, most of that production shifted out of the United States beginning in the 1980s."[23]
- "U.S. companies continue to lead in design innovation and represent premier, global brands for products in key end-use markets, including communications equipment, computer and data storage, and end-user devices. However, IT manufacturing has largely shifted to Asia."[24]
- "The market for 4G and 5G infrastructure suppliers is heavily concentrated in five non-U.S. firms: China-based Huawei and ZTE, Sweden-based Ericsson, Finland-based Nokia, and South Korea-based Samsung."[25]

Not only does the United States lack IT production in many product areas that would be needed to build out U.S. infrastructure, expanding or creating that domestic production capability is not easy. As DHS noted, "Making changes to the structure of the IT supply chain is challenging and costly."[26] Its report went on to note, "It is not cost efficient to move this type of production back to the United States without a change in technology."[27] And that change in technology is uncertain and is best supported not by Buy America provisions but by the kinds of R&D programs in the current Senate and House competitiveness bills.

TREATMENT OF INFORMATION TECHNOLOGY PRIOR TO BUY AMERICA

U.S. production capabilities in IT products have diminished over the last two decades. Given the unique value IT creates, it has previously been the subject of many exemptions, including an essential waiver item on commercial-item IT from the Buy American Act (BAA).[28]

In 2009, when U.S. production capabilities were stronger and it would have been easier to impose BA provisions on IT products with fewer cost, quality, and timeliness issues, the Obama administration issued broad-based IT waivers. It understood that either requiring BA for IT products or issuing case-by-case waivers would have significantly slowed the infrastructure spending included in the American Recovery and Reinvestment Act.

Not only does the United States lack IT production in many product areas that would be needed to build out U.S. infrastructure, expanding or creating that domestic production capability is not easy.

For example, the Obama administration's National Telecommunications and Information Administration (NTIA) previously provided a broad waiver of BA provisions in the Broadband Technology Opportunities Program (BTOP) that provided funding for applicants to build broadband networks, especially in unserved areas. The secretary of Commerce "determined that, as applied to certain broadband equipment used in a BTOP project, application of the Buy American provision would be inconsistent with the public interest."[29] He stated:

> The Buy American provision would prohibit NTIA from awarding a BTOP grant to a public applicant unless that applicant could certify that each element of each broadband network component containing iron, steel, and manufactured goods are produced in the United States … it would be difficult, if not impossible, for a BTOP applicant to have certain knowledge of the manufacturing origins of each component of a broadband network and the requirement to do so would be so overwhelmingly burdensome as to deter participation in the program. Requiring a BTOP applicant to request a waiver on a case-by-case basis also would be such an administrative burden on the applicant as to discourage participation in the program and would increase the agency's time and costs for processing BTOP applications.[30]

NTIA believed that it would be very difficult to meet the BA provisions in BTOP if it did not provide a broad-based waiver, although it could have provided waivers on an individual project basis using the "non-availability" exception. It believed:

> The burden placed on the Department of Commerce in sourcing and evaluating the availability of each component of broadband equipment would be significant, and the task of sourcing and evaluating would be difficult to complete given the speed with which

> Congress has told NTIA to allocate the BTOP funds. In addition, requiring public entities to document the origin of broadband equipment and their components in order to determine whether they fit within the scope of the Buy American provision would severely complicate those applicants' ability to apply for funds and would place an undue burden on State and local governments.[31]

NTIA also adopted the broad waiver because of the need to incorporate the most modern technology in networks. Sometimes, adequate—but not the best—technology might be available domestically, but the result would mean that digital or hybrid digital infrastructure builds would not be incorporating optimal technology. It would be like telling schools that buy laptops for their students to buy ones that are slower and have less memory than those produced today.

Finally, NTIA argued that waivers were critical for innovation: "The broadband industry is very dynamic and global, and equipment can change over the course of a buildout. Subjecting public applicants for BTOP funds to the Buy American provision ultimately would slow broadband deployment and undermine the broadband initiatives."[32]

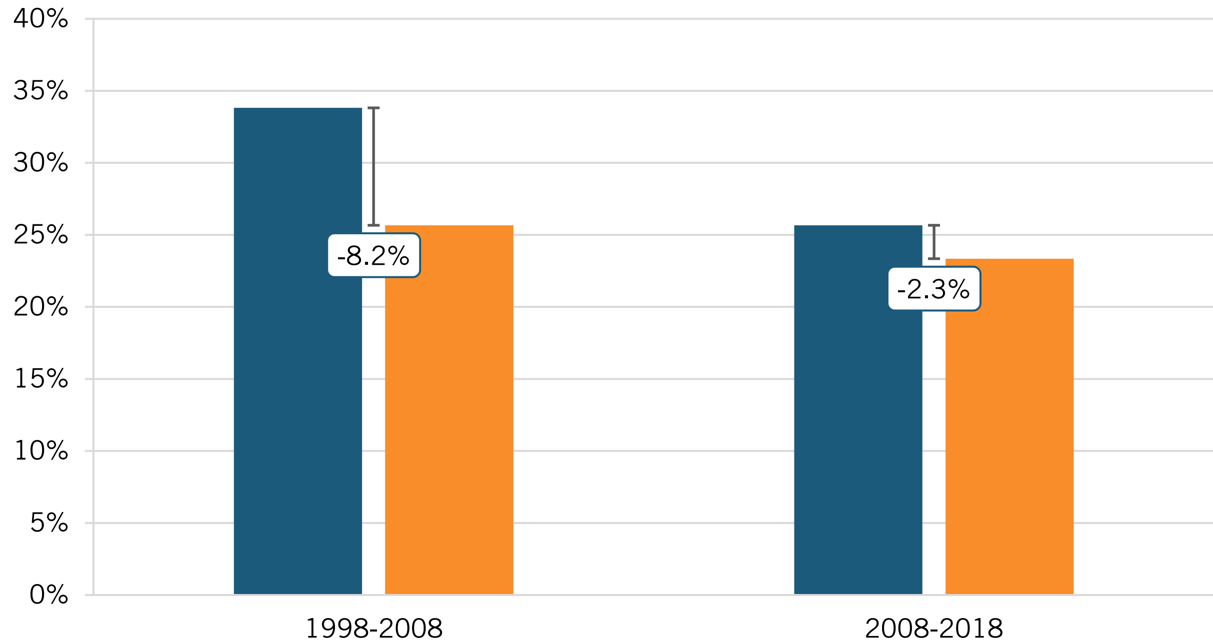
That is just as true, if not more so today, with broadband providers considering new Open Radio Access Network (O-RAN) technologies and other infrastructure providers considering products with rapidly evolving Internet of Things and artificial intelligence capabilities built in.

Similarly, the Department of Agriculture's Rural Utility Service (RUS) concluded that in contrast to items such as steel, that:

> much of the finished products used to manage and operate broadband infrastructure and offer broadband service are manufactured outside of the United States. The manufacturing supply chain varies by product and changes constantly due to the influence of global supply and demand. The result is a very competitive and complex production landscape with components and end products being manufactured and assembled in a large number of countries.[33]

Both NTIA and RUS issued broad waivers for IT products in 2009. A key reason for those waivers was that U.S. domestic production capabilities had significantly weakened by then. For example, the U.S. global share in computer and electronics declined by 8.2 percentage points between 1999 and 2008, but only 2.3 percentage points between 2008 and 2018. In other words, much of the loss had occurred before the Obama administration made these broad-based waivers (figure 8). U.S. weaknesses in domestic IT production have only grown since then, making it even harder to meet the domestic production requirements today without significant cost increases and time delays.

Figure 8: Decline in U.S. global share of computer, electronic, and optical output (percentage points)



MODELING THE COSTS OF BABA'S FORCED RESHORING OF IT IMPORTS

ITIF has designed a model to estimate reshoring costs by selecting 10 products across various four-digit harmonized system (HS) tariff codes that represent many of the essential IT goods required in the development projects associated with the IIJA. President Biden's "Build Back Better" agenda. (See Appendix A.)

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The model estimates differences in labor and capital costs associated with reshoring foreign production. It takes into account both wage levels and productivity levels in estimating cost changes from importing to sourcing production domestically. It also includes an estimate of increased capital goods costs required to ramp up production levels. Using these two factors, ITIF estimates that imposing the BA requirements onto IT products for infrastructure spending would mean infrastructure providers would pay an estimated 25 percent more for IT products.

There is another cost that is much harder to calculate. Most IT products are capital goods: They are used to make production more efficient. Think, for example, of a sensor in a bridge or router that transmit bits. While imposing BA requirements on consumer final goods such as shoes or clothing would raise prices, it would not hurt U.S. productivity. But imposing these requirements in IT capital goods would raise prices, which would mean a relatively lower IT capital stock, with resulting reduced productivity and GDP growth. A review of econometric literature by Cardona, Kretschmer, and Strobel finds that, on average, an increase in information and communications technology (ICT) capital stock of 10 percent leads to a 0.6 percentage-point increase in a country's GDP.[34] Thus, imposing BA on IT goods will mean not only higher prices but lower productivity growth, both of which will translate into higher inflation.

This analysis did not consider the time delays to ramp up domestic production in response to BA provisions, either by expanding existing domestic production or through greenfield building of new production sites. But for products whose U.S. capabilities are lacking or quite small, the likelihood of significant product delays is significant. Semiconductor plants, for example, can take up to three years just to build. Other products are likely to have less lead time, but when factors such as planning, obtaining investment capital, finding sites, obtaining regulatory and construction approval, building the site, and fine-tuning production (including training workers) are included, delays can be significant.

Given the extensive nature of the infrastructure bill and the involvement of many parties that may not have the capabilities to easily comply with BA rules, imposing BA requirements on IT in projects could raise compliance costs significantly. As a recent Congressional Research Service study points out:

> This may also extend to non-transportation infrastructure projects, such as tribal broadband deployments, where eligible entities include tribal governments, tribal colleges or universities, or native corporations not previously engaged in overseeing Buy America requirements. Some jurisdictions and nongovernmental organizations may lack the staff and legal expertise to comply with the Buy America regulations of various federal agencies.[35]

POLICY IMPLICATIONS

Supporters of BA tout several benefits. One is jobs. But in reality, the most important factor affecting jobs is the supply of workers. The second is federal macro-economic policy, particularly monetary policy. And with the U.S. economy at full employment (the unemployment rate was just 3.2 percent in March 2022), and many employers experiencing labor shortages trying to create more jobs through government spending will only create inflation, not jobs.

Imposing the BA requirements onto IT products for infrastructure spending would mean infrastructure providers would pay an estimated 25 percent more for IT products.

Another benefit, at least a political one, from BA is that its costs are off-budget. Rather than with appropriated funds to support competitiveness (i.e., direct investment or tax incentives), BA provisions are paid for by Americans in their role as consumers, not taxpayers. As such, the Biden administration can implement an industrial policy without it crowding out its social policy spending priorities. In this case, the spending, like the Trump import tariffs, is off-budget, with the money coming from higher prices entities receiving federal funds will have to pay. As they say, there is no free lunch.

This is not to say that the U.S. government should not be focused on driving greater domestic capabilities. But to do so, their policies must be strategic and targeted.BA provisions can play no role in the industrial policy toolbox. But to do so, their application must be strategic: a rifle shot, not a blunderbuss. This means focusing on provision areas where domestic production capabilities already exist or can be easily established. For example, provisions to require the use of U.S.-made steel in infrastructure projects is much less likely to slow down project delivery because U.S. steel capabilities in most kinds of steel are adequate, if not necessarily as large as they used to be. But other requirements, for example for certain types of electronics components to go into broadband or smart grid networks, can be much harder to meet, given the lack of U.S. production capabilities, leading to significant delays in project builds.

This relates to the other problem of applying BA to IT products. Unlike some industries where economies of scale and fixed costs are lower, many IT products are produced by companies that sell globally and may have only a handful of production facilities globally. This means that any efforts to support greater capabilities in the United States should focus on fostering United States' competitiveness and resiliency with regard to the technologies (e.g., semiconductors, as discussed below) that make for cutting-edge infrastructure projects and can be reasonably cost-effectively produced in the United States

The core problem with BA—and with tariffs, for that matter—is that it is a reflection of weakness, not strength.

And this relates to the other problem of applying Buy America to IT products. If the $1.2 trillion in infrastructure funding is spent in the next three years, it will account for just 0.47 percent of the global economy. If we assume, generously, that IT products will account for around 10 percent of this investment, and that the 10 products analyzed account for around half of global IT output, the boost to global IT output from the infrastructure bill will be just 1.5 percent. If we assume that one-third of these products would already be purchased in the United States without a BA provision, it will mean modest expansion of just 1 percent. These levels are not likely to induce significant reshoring, especially in the segments with larger economies of scale and tighter geographic production linkages.

Finally, it is striking that some policymakers want to impose a broad-based BA regime on a production system and supply chain that are so poorly understood. Unfortunately, there is a limited understanding of U.S. supply chains. As a result, the federal government has a very hard time answering what should be a relatively simple question: To what extent can operations in the United States produce particular electrical and electronic components needed in different infrastructures? Without this knowledge, it's like "shooting at everything that flies and hoping something falls."

CONCLUSION: A BETTER MANUFACTURING STRATEGY

The key problem with applying the BA provisions to IT products in the infrastructure packages is that doing so is putting the cart before the horse. Especially compared to the gains that could come from directly investing in stronger domestic IT manufacturing, applying BA will only boost costs and delays. The U.S. government should instead focus its energies on developing policies that target increased investments in key capabilities; the Creating Helpful Incentives to Produce Semiconductors (CHIPS) Act's authorization of $39 billion in federal matching grants for state and local incentives toward attracting semiconductor fabs and $10.5 billion for semiconductor R&D is a good example of policy that will drive U.S. leadership in the sector.

The core problem with BA—and with tariffs, for that matter—is that they are a reflection of weakness, not strength. As Paul Johnson, a historian of the British economy, wrote regarding when British manufacturing became structurally weaker:

> The English, confronted by growing evidence that they were no longer the world's leading industrial power, sought redress and relief not in an economic solution but in a political one. They did not use the State to become more efficient. They used the State to enlarge the area in which their inefficiency would matter less. In short, they invented modern imperialism. This was, or at any rate seemed to be, the easy way out. But it was a choice directed not by strength, but by weakness.[36]

The application of BA requirements (and broad-based tariffs) is an attempt to create such a protected domestic market. This strategy will fail to produce a globally competitive sector, just as the United Kingdom's strategy failed. Instead, the federal government should focus on policies to foster U.S. technology innovation and production strength so U.S. IT can compete on its own globally.

APPENDIX: IT RESHORING COST METHODOLOGY

This section describes the methodology used to estimate the cost impacts of imposing BA requirements on IT goods for infrastructure projects. It starts with a selection of 10 sample goods likely to be used in infrastructure spending.

Table 1: Select IT goods likely to be used in infrastructure spending

IT Imports Procured (by 4-digit HS code)	IT Goods Included
8528	Screens
8517	Routers, Modems, and Telecoms Technology
8537	Routers
8504	Battery Charging Technology and other EV Technology
8471	Data Collection and Automation Systems
9028	Smart Meters
8536	Fiber Optic Cable & Sensors
8544	Electric Cable
8541	Semiconductors
8542	Integrated Circuits

From this list of product codes, ITIF collected data from the International Trade Center's Trade Map Database on U.S. imports by each exporting country in 2021 for each product code.[37] From this data, this model selects the top-five exporting countries to the United States for each product code in order to derive a list of countries the United States is most reliant upon for its public procurement of IT imports. That list of countries is then separated into subsets of low-wage and high-wage countries. The top 13 exporters to the United States are shown in table 2.

Table 2: Top IT product exporting countries to the United States

From Low-Wage Exporters	From High-Wage Exporters
Mexico	Canada
China	Japan
Malaysia	Germany
Viet Nam	South Korea
Thailand	Netherlands
Dominican Republic	Taiwan
	Israel

This list of countries provides a set of nations that are emblematic of the U.S. government's IT importing needs from both high- and low-income nations. Summed across all product codes defined here as imported IT goods under the BBB agenda, the United States imports $383 billion annually from the world. These 13 nations export about 92 percent of that total.

Based on relative shares of exports among these 13 countries, ITIF estimates that the United States imports about 85 percent of these selected IT goods from low-wage countries, whereas about 15 percent comes from high-wage exporters.

For each subset of nations, this model calculates the annual manufacturing value added per worker to compare manufacturing labor productivity between the United States and its average high-wage exporter and average low-wage exporter. ITIF combines data on total manufacturing value added by country from the OECD's Trade in Value Added (TiVA) database and divides it by each country's corresponding data from the International Labor Organization's reporting of number of workers employed in the manufacturing industry for the same year of most recently available data, which is 2018.[38] This approach yields an annual value added per manufacturing worker for the average high-wage exporter of $101.7K and $18.5K for the average low-wage export. Using these estimates on manufacturing productivity, this model divides the estimated values of publicly procured U.S. imports on IT goods from both the average high-wage and low-wage exporter group by their respective estimates on per-worker manufacturing value added. This yields an estimate of the scale of employment required for each exporter group. Thereafter, data on each country's average annual per-worker production costs is calculated using data on monthly manufacturer earnings per country also via the International Labor Organization.[39] ITIF calculates an annual per-worker production cost from the high-wage group of $35.5K, and $6.8K for the low-wage group. These average earnings are weighted by their country's respective share of U.S. imports among their exporter group. Then, estimates on scale of employment required for each exporter group to produce the amount of procured goods are then multiplied by each group's estimates on per-worker production costs to assess the total production costs for both high-wage and low-wage exporter groups required to produce their respective amounts of imports procured by the U.S. government.

To compare cost estimates, the model next calculates the total production costs for the United States to domestically produce the amount of IT goods procured from low-wage exporters, based on the country's own estimates on manufacturing labor productivity and per-worker production costs calculated by the same sources and methodologies. The same is done to calculate the total production costs for the United States to domestically produce the IT imports procured from its high-wage exporters.

Estimates on total annual production costs for each exporter group are then subtracted by the corresponding estimate on total annual production costs for the United States to domestically produce that amount of IT goods otherwise exported. This difference, when divided by the total annual production costs for respective exporter groups, reports the percentage increase in annual production costs associated with the U.S. domestic production of procured IT goods when reshoring from low-wage exporters and high-wage exporters, respectively.

Lastly, this model estimates that an increase in the U.S. manufacturing industry's capital stock would be required in order to build the productive capacity of domestic manufacturing over those reshored goods. In order to estimate the total amount of fixed costs on capital stock necessary to support additional domestic production, ITIF incorporates data from the EU-KLEMS database on capital stock maintained for the manufacturing industries of each available country in the set of 13 exporting nations.[40] Among those, estimates are available on Germany, Japan, and the Netherlands. For those three countries, ITIF sums each country's total amount of select IT goods exported to the world (not just the United States) and divides that amount by their total value of all manufacturing exports in order to estimate the share of national manufacturing devoted to such IT goods. These shares are then multiplied by each nation's respective value of capital stock in the manufacturing industry reported such that the amount of manufacturing capital stock devoted to the set of procured IT goods can be estimated.

Following this calculation methodology, ITIF estimates that the average IT exporter spends approximately 23.6 cents on capital stock for every dollar of annual manufacturing exports it generates. Applying this estimate against the amount of IT goods to be reshored from high-wage and low-wage exporters, the model calculates total fixed costs of additional capital stock required by the United States' manufacturing industry in order to establish the productive capacity for the amounts of goods reshored from high-wage exporters and from low-wage exporters. In order to apply these fixed costs as variable cost estimates to be rescaled by at the firm level, the total fixed costs on capital stock afforded in each reshoring scenario is applied in the form of a loan, whereby the amount is repaid in seven years and interest accrues at a rate of 6.5 percent. From this repayment model on additional capital stock, estimates in both reshoring scenarios from high- and low-wage exporters can be provided on the annual costs firms would incur by way of capital stock due to moving production back to the United States. Combining these estimates on increased capital stock costs and increased annual production costs allows this model to generate final estimates of the total percentage increase in annual costs associated with firms reshoring their production from the average high-wage exporter into the United States and the costs associated with firms reshoring their production of IT goods for the average low-wage IT exporter into the US.

Table 3: Model results

	Low-Wage Exporters	High-Wage Exporters
Total of select IT exports to the United States	$327,819,101,177	$55,580,596,823
Share of total select U.S. IT imports	85.5%	14.5%
Estimated amount of IT exports purchased by U.S. government	$60,433,877,000	$10,246,355,200
Manufacturing value added per worker	$18,537	$101,746
Per-worker annual manufacturing worker earnings	$6,790	$35,510
Annual production costs to produce IT goods imported by the U.S. government	$22,137,663,698	$3,576,004,529
Annual production costs estimated for the United States to make goods domestically	$24,823,413,469	$4,208,724,052
Additional annual production costs due to reshoring manufacturing of U.S. government IT imports	$2,685,749,771	$632,719,523
Annual increase in firm production costs due to reshoring IT manufacturing	12.1%	17.7%
Value of additional total capital stock required to establish domestic manufacturing	$14,274,646,587	$2,420,217,046
Annual loan repayment to finance additional capital stock	$2,569,436,386	$435,639,068
Additional percentage increase in annual costs due to capital stock expense for the United States to make goods domestically	11.6%	12.2%
Total percentage increase in annual costs due to reshoring IT imports procured by U.S. government	23.7%	29.9%

Taking the share of IT imports from high-wage and low-wage imports, multiplying those shares by the respective cost increases, and summing the two numbers generates an average cost increase of 24.6 percent.

About the Author

Robert D. Atkinson (@RobAtkinsonITIF) is the founder and president of ITIF. Atkinson's books include *Big Is Beautiful: Debunking the Myth of Small Business* (MIT, 2018), *Innovation Economics: The Race for Global Advantage* (Yale, 2012), *Supply-Side Follies: Why Conservative Economics Fails, Liberal Economics Falters, and Innovation Economics Is the Answer* (Rowman Littlefield, 2007), and *The Past and Future of America's Economy: Long Waves of Innovation That Power Cycles of Growth* (Edward Elgar, 2005). Atkinson holds a Ph.D. in city and regional planning from the University of North Carolina, Chapel Hill.

About ITIF

The Information Technology and Innovation Foundation (ITIF) is an independent, nonprofit, nonpartisan research and educational institute focusing on the intersection of technological innovation and public policy. Recognized by its peers in the think tank community as the global center of excellence for science and technology policy, ITIF's mission is to formulate and promote policy solutions that accelerate innovation and boost productivity to spur growth, opportunity, and progress.

For more information, visit itif.org.

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