



Ten Principles to Guide the Trump Administration's Manufacturing Strategy

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The question of what an intelligent U.S. manufacturing strategy should entail is central to the future of the U.S. economy, so getting it right is critical.

If one thing should be clear in the wake of the election, it is that President Trump is serious about growing U.S. manufacturing. But while he has dominated the economic news with his comments warning companies about offshoring jobs and his involvement in the deal that led Carrier to retain about 800 manufacturing jobs that were previously headed to Mexico, his words and actions have largely elicited derision from economic commentators and analysts. Their dismissive responses have ranged from “this is totally trivial” to “it will never work,” “picking winners only reduces economic welfare,” and “we shouldn’t care about manufacturing, anyway.” Emblematic of this widespread pundit opinion that the president’s pronouncements have been nonsense, or worse, business school professor Stephen Kobrin writes, “What happens when people realize they’ve been taken?”¹ In other words, the consensus among elites is that the president is pulling a fast one on ignorant and gullible voters.

But the carping has provided little substantive guidance for the incoming administration on what a practical and effective U.S. manufacturing strategy should look like. On one level this shouldn’t be surprising; the Washington establishment and the broader community of neoclassical economists have no real idea what to do other than fall back on general framework measures such as reforming the tax code, training workers, and building physical infrastructure. Nor do they even offer an analysis of what has happened to U.S.

manufacturing and why. Asking conventional economists to shape a national manufacturing policy would be like asking lawyers to design a bridge. This lack of sector-specific knowledge explains why they scoff at Trump's efforts and at anyone supporting them.

But the question of what an intelligent U.S. manufacturing strategy should entail is central to the future of the U.S. economy, so getting it right is critical. The Trump administration has a real opportunity to do that by ignoring both supercilious criticism and tired laissez-faire thinking, but it also runs the risk of overreacting and thereby making things worse, not better. Therefore, to help guide the new administration's manufacturing policy efforts, this briefing paper first unpacks four key policy debates on manufacturing (why jobs were lost; why jobs went offshore; what's the right amount of manufacturing for America; and whether manufacturing can return) and shows how the conventional economics position that the media reflectively recycles is wrong on each of them. The paper then presents 10 strategic principles that should guide the administration's efforts to restore U.S. manufacturing:

1. Focus on traded sectors, not just manufacturing;
2. Focus on high-value-added, defensible sectors and segments;
3. Focus on the trade deficit, not jobs per se;
4. Recognize what should stay and what shouldn't;
5. Understand that when U.S. companies succeed in overseas markets it can help U.S. employment;
6. Focus on attraction rather than compulsion;
7. Move beyond one-off deals and a low-cost business climate;
8. Change the playing field through technology;
9. Support the defense industrial base; and
10. Pay attention to where advanced production is located in the United States.

UNDERSTANDING KEY DEBATES ON MANUFACTURING POLICY

Before reaching agreement on the details of what a new U.S. manufacturing strategy should look like, it's important to first come to an agreement on the underlying realities of U.S. manufacturing performance. There are four key areas of debate.

Why has the United States lost one-third of its manufacturing jobs since 2000?

At the heart of the debate over whether America needs a concerted manufacturing strategy is the question of job loss. Between 2000 and 2016, the United States lost 29 percent of its manufacturing jobs, while total U.S. employment grew almost 10 percent. That's a delta of almost 40 percentage points. If the majority of these losses were due to automation, as is commonly stated, then enacting incentives to limit offshoring and getting tougher with America's trading partners would be a response in search of a problem.

The reason the Washington trade establishment and its supporters have argued so vociferously that these job losses must have been due to technology and automation is that

it takes the onus off trade, thereby making it more politically palatable to support continued trade expansion. With very little effort online, one can easily find hundreds of “expert” claims to the effect that trade has played, at best, a de minimis role in the unprecedented loss of U.S. manufacturing jobs. Emblematic of this view is a *New York Times* article titled “The Long Term Jobs Killer Is Not China: It’s Automation.”² Likewise, an academic blog notes:

The biggest reason Trump—or anyone else—can’t bring back jobs is because there is nowhere to bring them back from. They have been lost in large part to the success of efficiency. Manufacturing output in the U.S. was at an all-time high in 2015. Over the past three-and-a-half decades, manufacturers have shed more than seven million jobs while producing more stuff than ever.³

It is simply wrong to deny that lagging U.S. competitiveness played no role in manufacturing job loss or that the right policies could help grow U.S. manufacturing output and jobs.

The details about why this is wrong have been provided elsewhere: The Information Technology and Innovation Foundation (ITIF) has covered this in multiple reports, as have scholars such as Susan Houseman.⁴ But a short summary is as follows: From 1999 to 2015, real GDP grew by 37 percent, but real manufacturing output grew by 27 percent. If tech destroyed all the jobs, you would expect real manufacturing output to grow as fast as GDP. But it didn’t. And it gets worse. The Commerce Department’s Bureau of Economic Analysis (BEA) systematically overstates manufacturing output growth in the computer and electronic products industry (NAICS 334) as computers get faster, and the overstatement is so enormous that it distorts overall manufacturing output numbers. As both ITIF and Houseman have shown, this massive increase in output is not because more computers are being made in the United States, as most people would expect; in fact, with the offshoring of computer assembly, the United States produces significantly fewer computers and electronic products today than it did 15 years ago. No, this increase in measured output growth is a result of computers getting remarkably faster, following Moore’s Law, which leads BEA to record these improvements as actual increases in output (i.e., more computers actually being assembled in the United States). As a result, BEA reports that real output in the NAICS 334 sector grew 222 percent from 2000 to 2015, while the rest of manufacturing grew by just 7 percent. In fact, from 2005 to 2015, the growth in NAICS 334 output exceeded total U.S. manufacturing output growth. That’s because the rest of manufacturing output actually fell due to an increase in the trade deficit. Indeed, 10 of 19 manufacturing sectors were producing less in 2015 than they were in 1999. And since 2007, inflation-adjusted U.S. manufacturing output fell by 7 percent. Thus, when Pollyannaish defenders of U.S. manufacturing performance point to healthy output growth as evidence that all is well, they are making a major error in analysis.

To be clear, neither ITIF nor, frankly, the majority of those who are skeptical of the conventional narrative, claim that trade and loss of U.S. competitiveness cost all or even most of the manufacturing jobs loss. Most credible estimates suggest that declining U.S. competitiveness has accounted for approximately half of manufacturing job losses since the turn of the century. So, yes, technology played some role—and that was a good thing,

because it raised productivity and made U.S. manufacturers more competitive than they would have been otherwise.

But it is simply wrong to deny that lagging U.S. competitiveness played no role in manufacturing job loss or that the right policies could help grow U.S. manufacturing output and jobs. Despite compelling evidence to the contrary, most pro-trade economists and pundits continue to hold that line. But they obviously have failed to persuade most people that automation is the culprit, because tens of millions of voters have just expressed extreme anger about trade and globalization. Rather than engaging in an objective debate about the causes of manufacturing job loss, so policymakers could have reacted appropriately over the last 15 years, the experts' denialism has made things worse, limiting support for needed policy changes and fueling a populist anger that could, in fact, now result in an unproductive policy overreaction.

Why did manufacturing jobs go overseas?

Even though few members of the Washington economic consensus will acknowledge that a significant share of manufacturing job loss has been due to trade, most will concede that at least a few manufacturing establishments closed because they went overseas. Still, they deny that this had any effect on manufacturing jobs, because they fear that admitting it would encourage voters to turn protectionist. Either way, the question remains: Why did these jobs go overseas?

Under the conventional view, it was simply the result of the free market and the dispassionate process of globalization creating a new global "division of labor." As such, any effort to slow or reverse the process would harm consumers and damage the economy. According to one academic blog, "No one 'stole' America's jobs, of course. Many companies moved them overseas, simultaneously increasing profits and reducing the price of products for the American consumer."⁵

Similar to the Washington economic consensus that ascribes all net manufacturing job loss to technology, here the experts and pundits likewise claim that *all* the jobs that moved offshore did so voluntarily. For Washington consensus economists, offshoring of manufacturing is all welfare-maximizing, because it benefits consumers through lower prices and it frees up resources that enable America to concentrate on its "true" competitive advantage. But the consensus economists equate economic welfare only with short-term consumer benefits (e.g., cheaper TVs, toys), and they ignore any negative impacts from reduced production capabilities, especially losses of high-value-added production.

Moreover, their definition of competitive advantage is tautological—whatever we lose, we should have lost because we didn't have comparative advantage in it. But this isn't true. In some cases, U.S. companies have moved production to other nations because foreign governments required it or because of U.S. policy failures, such as the very high U.S. corporate tax rate, limited funding of industrially relevant R&D, poor workforce training programs, and limits on export credit financing all of which makes production in America less competitive. As ITIF has documented, a growing number of nations engage in

Good manufacturing policy makes a distinction between whether manufacturing output is lost due to market or nonmarket based factors, and neither blindly favors nor resists all offshoring.

egregious “innovation mercantilist” practices that lead to more offshoring of production than natural “market forces” alone would produce.⁶ Some countries U.S. manufacturers to relocate their production and/or transfer valuable technology if they want market access. Some manipulate their currencies so their imports are more expensive and their exports are cheaper.⁷ Some steal valuable intellectual property (IP) from American manufacturers and then export products with this IP back to the United States. Some provide generous subsidies for their exporters, as Europe has done with Airbus. And some limit U.S. imports with an array of tariff and nontariff barriers. So the movement and loss of at least some U.S. manufacturing has had nothing to do with the natural evolution of a new global division of labor and everything to do with unfair trade practices.

As we discuss below, this should be not taken as support for an almost utopian view that America could have prevented all manufacturing from moving offshore or that actions to bring back all these jobs would be welfare enhancing. Even in the absence of foreign mercantilism, America surely would have lost some manufacturing output, especially in more routine, commoditized, lower-skill production—whether the assembly of electronic products like iPhones or the sewing of T-shirts and athletic shoes. Therefore, an argument that we should have done more to retain and grow U.S. manufacturing does not mean that we should have tried to keep it all.

In other words, it’s one thing if a manufacturer in the United States cuts production because it loses market share to a more formidable competitor that operates fairly, or because it relocates to a nation with naturally cheaper factor inputs (e.g., wages, energy). It’s quite another if the firm’s U.S. output declines because foreign competitors are backed by their states using an array of unfair, mercantilist practices (e.g., currency manipulation, export subsidies, state-supported intellectual property theft). Good manufacturing policy makes this distinction, and neither blindly favors nor resists offshoring.

How much manufacturing should the United States have?

At the heart of the debate about manufacturing policy is a core question: Just how big should U.S. manufacturing be? Is it too small? If so, then how much does it need to grow? Those who adhere to the Washington consensus flinch with discomfort whenever such questions are raised, for they suggest that government might have a role in determining the economy’s industrial structure. How could government bureaucrats possibly know the right number, they ask?

For these Panglossians, the right number is whatever the number happens to be. If manufacturing has declined, it’s because it was supposed to. This view also happens to allow an easy justification for manufacturing output loss. Larry Summers reflects this idea when arguing about the loss of U.S. manufacturing jobs: “America’s role is to feed a global economy that’s increasingly based on knowledge and services rather than on making stuff.”⁸ American Enterprise Institute scholar Kenneth Green goes even further, writing: “As long as China is selling us the products we need, the location of manufacturing isn’t really that critical for the economy.”⁹ Columbia University’s Jagdish Bhagwati dismisses

anyone who says manufacturing is important as suffering from a “manufacturing fetish.”¹⁰ And when asked how much manufacturing the United States could really lose and still be economically healthy, the head of one Washington, D.C.–based economics think tank replied: “Really? Really we could lose it all and be fine.”¹¹

To be fair, some on the other side may not fetishize manufacturing, but they appear to undervalue the role other sectors play. For example, the liberal Roosevelt Institute writes that “services are dependent on manufacturing goods. Services are mostly the act of using manufactured goods. You can’t export the experience of using something.”¹² Likewise, in his book *In Praise of Hard Industries*, Eamonn Fingleton writes that manufacturing is clearly superior to services. But this line of thinking ignores the important role of services exports (where the United States runs a trade surplus) and the benefits of increased productivity in non-goods industries.

The United States should have a manufacturing sector large enough to enable it to pay for its imports without running a trade deficit.

Again, reality is more nuanced. The number of manufacturing jobs should be determined only by the relative productivity of American manufacturing versus its output. If manufacturing productivity grows more quickly than nonmanufacturing productivity, then employment should decline (assuming output stays constant), because fewer workers are required to make the output and the rest move to nonmanufacturing jobs. The amount of manufacturing output relative to GDP is the real question. And here the answer should be that the United States should have a manufacturing sector large enough to enable it to pay for its imports without running a trade deficit. (Service exports are currently too small to overcome the overall trade deficit.) The trade deficit represents a debt that future generations of Americans must pay by consuming less than they produce so net exports can increase. On that measure, the United States has not had enough manufacturing since the 1970s, the last time it ran a trade surplus.

Can manufacturing return to U.S. shores?

Even assuming that America needs to grow its manufacturing, the key question is whether it can be done. And if it can, then which is the better path: reshoring production or expanding exports faster than imports? For those who hold to the Washington economic consensus, the answer is that bringing back any manufacturing is a fool’s errand. National Public Radio reports that “the plain truth is that, legally speaking, there’s not a lot that Trump or any other president could do to bring those jobs back.”¹³ Andrew McGill writes in *The Atlantic* that, “A presidential candidate who promises to claw back the careers of 1979 is probably making a promise they can’t keep. They would do better to find jobs that fit this decade’s economy instead.”¹⁴ *FiveThirtyEight* economist Ben Casselman is even blunter: “A plea to presidential candidates: Stop talking about bringing manufacturing jobs back from China. In fact, talk a lot less about manufacturing, period. ... Whether or not those manufacturing jobs could have been saved, they aren’t coming back.”¹⁵

But there is a difference between saying that all offshored work can come back and saying that some can. Clearly some of it can’t come back, nor should we want it to. As mentioned above, low-wage, low-skill, commodity production is not the kind of work where the

United States has a comparative advantage. But as Harry Moser of the Reshoring Initiative has argued, with the right management decisions, particularly to take into account what he terms total cost of ownership, and with the right policies (e.g., a lower effective tax rate on firms in traded-sector industries, support for pre-competitive, cooperative research and development), at least 1 to 2 million manufacturing jobs could be reshored.¹⁶ Likewise, the Boston Consulting Group has shown that a weaker dollar and other factors could reduce or even close the cost gap with China, allowing U.S. production of many products now sold in America but produced in China.¹⁷

Even if some manufacturing jobs can return, those who hold to the Washington economic consensus claim that it will just lead to higher prices. As one academic asks, “what would be the real cost of bringing them back? And I think the answer is that it’s going to be very high.”¹⁸ But that’s not right. As the work of Harry Moser, the Boston Consulting Group, and others have shown, some work can be brought back with no increase in prices if companies use more accurate total-cost accounting (which includes things such as down time, scrap rates, rework, shipping costs, and other costs that are not always included in the analysis of producing in a low-wage nation) and focus more on using technology and a skilled workforce to boost productivity.

Second, even if it costs more to produce in the United States, the real question about whether it boosts economic welfare is why it costs less overseas. If the reason is because of natural competitive advantages (for example, because Chinese wages are a lot lower to assemble electronics, and that work cannot be done here in a way that is productive enough to offset the cost differential), then that’s one thing. But if the cause is foreign mercantilism, such as export subsidies or currency manipulation, then eliminating those policies to bring back the work would lead to higher prices in the short run, but in the long run it would lead to lower relative prices as the dollar would not have to fall as far in order for the United States to finally run a trade surplus. (No nation will run a trade surplus with the United States forever, since by definition that means it would be giving Americans goods and services for an IOU in return.) Finally, looking at the issue solely from a consumer-welfare perspective misses the fact that most consumers are also workers, and higher wages from bringing some work back offsets at least some of the cost to consumers.

So, again, the key is the right analysis and balance. Not all jobs will or should be brought back. Why would we want to have companies bring back jobs such as assembling iPhones, absent some breakthroughs in automation that makes it economical to produce them in the United States? Even many Chinese workers don’t want to be doing that kind of repetitive work.

Likewise, it would be difficult and expensive for pharmaceutical companies to bring back production of active pharmaceutical ingredients (APIs), as this is relatively routine work that can be and is performed with low-wage labor in nations like India and China.

But we can and should try to bring back some kinds of manufacturing work. Often that will be work that is complex and high-value-added. For example, NCR moved production

of its automatic teller machines to Georgia from overseas.¹⁹ In other cases, it will be higher-end products where quality is crucial, as when Sleek Audio moved production of its high-end headphones from China to Florida.²⁰ And in some cases, production of specialty APIs that are more difficult to make or that have smaller-scale markets have been brought back.²¹ So the key to effective manufacturing policy is not to use a sledgehammer but a scalpel, and focus on what can and should be brought back and what production is better performed in other nations.

PRINCIPLES FOR A SMART U.S. MANUFACTURING STRATEGY

An effective U.S. manufacturing policy needs to get the tactics, policies, and programs right—including reducing the effective tax rate on traded-sector firms, rolling back foreign mercantilist practices, and expanding Export-Import Bank authorization, the MEP program, and the Manufacturing USA program. But the likelihood that individual steps will be implemented and succeed increases considerably if the overarching strategic issues are correctly identified, framed, and followed. To that end, here are 10 key principles to guide a Trump administration manufacturing policy.

The key to effective manufacturing policy is not to use a sledgehammer but a scalpel, and focus on what can and should be brought back and what production is better performed in other nations.

1. Focus on traded sectors, not just manufacturing.

There are two features of manufacturing that lead many policymakers to favor it over services. First, it offers above-average pay for workers without a college degree. Second, it is a source of exports, which helps the United States enjoy stronger terms of trade with the rest of the world and import goods and services at a lower relative price than we would otherwise.

But it would be a mistake to focus only on manufacturing for these two goals. Rather, the administration should focus on traded sectors overall—industries and establishments that compete in international marketplaces and whose output is sold at least in part to nonresidents. Traded sectors include almost all of a nation's manufacturing activity, some services (such as software, Internet, and engineering services), most content (such as music, movies, and video games), and most natural resource sectors (e.g., farming, fishing, mining). Increasingly, technological innovation allows more services to be traded. Services that once could be offered exclusively or for the most part locally (such as retail, travel services, newspaper publishing, radio broadcasting, higher education, banking, and even some health-care services) can now be accessed across borders thanks to information technology.²²

Because firms in traded-sector industries face global market competition in a way that non-traded, local-serving industries (e.g., retail trade or personal services) do not, their success is by no means assured. For example, while we may not know whether Kroger or Safeway is going to gain market share, we do know that the U.S. grocery store industry will be healthy, dependent largely on the income and purchasing habits of American consumers. On the other hand, while we may not know whether Boeing or Airbus is going to gain market share in the global aircraft industry, we also do not know how much of that production will take place in the United States, since this depends on the United States

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winning in global competition by gaining an increasing share of global production in-country. Put differently, if a grocer goes out of business, then another will gain market share to serve local demand. But if a traded-sector enterprise such as a manufacturer or software company closes, then the company that fulfills that demand may well be located in another country. Unfortunately, a number of federal policies and programs are poorly focused to respond to this challenge. For example, in FY2016, less than 11 percent of Small Business Administration loans went to firms in the traded manufacturing or information sectors, with almost one-quarter going to firms in the non-traded retail trade and restaurant industries.²³

With regard to the first point—wages and education levels—manufacturing does have an advantage in that it employs a larger share of workers with less than a college degree. However, other traded sectors also employ middle-skill workers. For example, while 30 percent of manufacturing workers have at least some college but no bachelor's degree, this number is even higher in the film industry (32 percent) and music-recording industry (34 percent), and is still between 25 and 30 percent in the software and IT manufacturing industries.²⁴

2. Focus on high-value-added, defensible sectors and functions.

While it's important to focus on traded sectors, not all sectors and functions within sectors provide the same value. In the push to increase U.S. living standards, some industries and occupations are more important than others. For example, the annual median wage in the apparel, textile, and leather goods industries is \$24,000 to \$29,000, compared with median wages of \$63,000 and \$64,000, respectively, in the petroleum and coal products industry, and in the computer and electronics product industry.²⁵ And these higher-wage, often high-tech, traded-sector industries don't just pay their more educated workers more; they pay all their workers more. For example, the median wage for building and groundskeepers in the computer and electronic product manufacturing industry is 51 percent higher than the wages of similar workers in apparel knitting mills. Similarly, office clerks in the electronics industry make 73 percent more than office clerks in leather finishing firms.²⁶

This means that fighting to keep all industries from leaving the United States, through steps such as stiff import tariffs, would lower, not raise, U.S. living standards, because it would spur the growth not just of higher-wage industries, but also lower-wage ones.²⁷ In contrast, more targeted policies to encourage more production in middle- and higher-wage industries, which the Carrier deal in Indiana represents, would increase U.S. living standards.

Likewise, not all functions and occupations within any particular industry have the same value. Many industries have globally distributed value chains, which means that different functions are located in different countries. For example, in some industries, commodity-based, lower-skill assembly work is in low-cost regions, while higher-wage, more complex assembly, R&D, sales, design, and management is located in the United States. Ideally, federal policy would seek to maintain and grow higher-wage functions in the United States,

while allowing lower-wage functions to be distributed globally. For example, the median annual wage for electric, electronics, and electromechanical assemblers employed in the communications equipment manufacturing industry (NAICS 334200) is \$33,570. In contrast, computer occupations within that industry pay 2.8 times more (\$95,290), sales reps make 2.5 times more, and media and communications workers make twice as much. Trying to bring back millions of low-skill, low-wage jobs, such as electronics assemblers, from places such as China and Mexico by imposing tariffs or other kinds of punitive policies would lower, not raise, Americans' standard of living. In contrast, bringing back, retaining, and growing occupations that pay above median wage, such as skilled technicians and engineers, will raise U.S. living standards.

Another reason to focus on the middle- and higher-wage segments is government subsidies. Consider that one-third of manufacturing workers earn so little that they or their families are enrolled in public assistance programs such as Medicare or food stamps.²⁸ We don't need more jobs at these wage levels. We need more middle- and upper-wage manufacturing jobs.

3. Focus on the trade deficit, not jobs per se.

A natural inclination is to want job creation to be the goal of any national manufacturing initiative. After all, America lost millions of middle-wage manufacturing jobs, and many of those workers have since seen their standards of living fall. Indeed, the U.S. Department of Labor has found that U.S. wages would have grown more than twice as fast from 2002 to 2007 had the economy not lost high-paying jobs in industries such as manufacturing (a trend that was most pronounced in manufacturing swing states that Donald Trump won, including Ohio, Pennsylvania, West Virginia, and Wisconsin). Notwithstanding this, making job creation the main goal of U.S. manufacturing policy would be a mistake.

To understand why, imagine that America increases its manufacturing output by 20 percent and all of the increase is exported so that the trade deficit is eliminated. The first way to do this would be without adding workers—i.e., by having companies raise productivity. The second way would be to shift workers from services, so there are 20 percent more manufacturing workers, but no increase in manufacturing productivity. Both outcomes would reduce the trade deficit. But the latter would mean lower GDP as fewer workers are producing services and as prices for manufactured goods increase. In contrast, the former would mean no change in current standard of living (all the added output would be consumed by foreigners), but a marked improvement in future standards of living, because future generations would have less international trade debt to pay off. So, jobs for jobs' sake is not the right path. Traded-sector output for traded-sector output's sake is.

Finally, one path for increasing manufacturing is establishing permanent, high, across-the-board tariffs. Leave aside for a moment that this would increase the costs of importing inputs for manufacturing, which would make some U.S. manufacturers less competitive, and would increase the cost of capital goods, which would lead to less investment in

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machinery and equipment across all sectors, thereby lowering productivity growth. And leave aside that unless these are surgically targeted against clear mercantilist policy abuses, they would invite retaliatory tariffs, which would reduce U.S. exports. Even if policymakers were to ignore these negative effects, one result would be to regain higher-wage, higher-skill jobs as well as low-wage, low-skill jobs. Indeed, a high-enough tariff would mean that American workers would be producing McDonald's "Happy Meal" toys, low-end hand tools, cheap costume jewelry, and other low-skill manufacturing products. Indeed, the logical conclusion of this would be to develop a fully autarkic economy, where America makes everything it consumes and exports and imports nothing. But the net result would be millions of Americans employed in worse jobs than they have today.

4. Recognize what should stay and what shouldn't.

While bolstering America's traded-sector competitiveness should constitute a key objective for the Trump administration, it's important that the administration recognize that not all traded-sector jobs are created equal, and that the United States should prioritize its higher-value-added activities and activities that are "sticky"—that is, more deeply linked to other high-value-added activities in the United States and therefore less likely to move offshore.

To distinguish "sticky" manufacturing activities, policymakers should assess two factors. Harvard Business School professors Gary Pisano and Willy Shih argue in their book *Producing Prosperity* that the extent of "modularity" (the ability of R&D and manufacturing to operate independently of each other) and the maturity of the manufacturing process technology determine stickiness.²⁹

When R&D and manufacturing are highly modular, variability in the major characteristics of a product (e.g., features, functionality, performance) aren't determined by the production process. In this case, design, engineering, and production activities can be located far apart. For example, luggage can be designed in the United States but effectively and easily produced overseas. Conversely, a low degree of modularity exists when the design, development, and manufacturing of a product are deeply intertwined. For example, the production of biologic drugs—which are derived from and synthesized within living tissue—requires close collaboration among the R&D, early-stage engineering, and manufacturing phases, because a subtle change in the manufacturing process can cause the production of a different protein.³⁰

The maturity dimension refers to how extensively a manufacturing process has evolved and how dynamic it is. When manufacturing technologies are immature and still evolving, companies can excel by focusing on process innovations; when manufacturing technologies are more mature, opportunities for innovation are much more limited.³¹

Overlaying these two dimensions produces a "modularity-maturity matrix." Cases of "pure product innovation" refer to instances where manufacturing processes are mature and the value of geographically linking product design with manufacturing is low. These describe markets such as consumer electronics, desktop computers, and smartphones, and that is

why outsourcing to lower-cost locations can make sense from both the companies' and the United States' perspective.

Cases where modularity is high but maturity low are indicative of “pure process innovation,” in which process technology is subject to rapid advancement and improvement, but isn't intimately connected with product innovation. In such cases, it can make sense for the company and country to outsource production to specialized manufacturers that can provide custom production to firms that focus on design.³² The advanced semiconductor sector is such an example, because companies can design advanced integrated circuits remotely from manufacturing and without having to operate their own manufacturing plants.

Where manufacturing processes are still evolving and where it's very difficult to separate information pertaining to a product's design from the manufacturing process itself, closely integrating R&D and manufacturing is critical.

In contrast, where process technologies remain critical but product innovation is incremental, the value of keeping R&D and manufacturing organizationally and geographically proximate is important, as in industries such as fine wine or high-end fashion.

Where manufacturing processes are still evolving and where it's very difficult to separate information pertaining to a product's design from the manufacturing process itself, closely integrating R&D and manufacturing is critical. As with biologic drugs, next-generation semiconductors, or nanomaterials, even minor changes in a process can have significant implications for the final product, meaning that the value of closely integrating R&D and manufacturing is extremely high, and the risks of separating them are significant.³³ When a nation loses manufacturing competence in these cases, it loses the ability to create new, commercially viable products.

As Pisano and Shih write, the modularity-maturity matrix “can help identify when America and companies operating in America should worry that a decline in U.S. manufacturing will have negative consequences for the country's and companies' ability to innovate, and when they should not.”³⁴ In essence, the United States should focus particularly on maintaining process-embedded innovation and process-driven innovation, lest the movement of manufacturing away from the United States eventually pull R&D—and America's future ability to innovate—with it. Instances of pure product innovation are ones in which the United States should be least concerned about offshoring of production. Pisano and Shih have also produced a useful framework that policymakers can use to assess the extent of total value-add a given manufacturing activity is producing for the U.S. economy and employment.

5. Understand that when U.S. companies succeed in overseas markets it can help U.S. employment.

U.S. economic health depends considerably on the competitiveness of its traded sectors.³⁵ Such industries account for approximately 35 percent of U.S. GDP, and when they and their foreign affiliates (e.g., subsidiaries, joint ventures) compete successfully in foreign markets, in part by establishing local sales, R&D, or even production facilities, this can

It's one thing to use strong measures of trade enforcement to pressure nations to roll back their mercantilist policies; it's quite another to use them to emulate the mercantilists.

actually increase U.S. employment, both in terms of Americans being deployed in those foreign facilities and also in domestic facilities at home.

Indeed, foreign-affiliate activity can complement, not substitute for, key parent activities in the United States, such as employment, worker compensation, and capital investment.³⁶ This means that even when U.S.-headquartered companies expand operations and fill jobs abroad, whether by opening new research, production, or marketing establishments or facilities, this can support U.S. employment at home, because employment at U.S. parents is likely to increase with increases in U.S. affiliate activity.³⁷ This is true if the foreign operations give it greater global market share than the company would gain if it kept production at home, and if the foreign operations are not established as a forced response or reaction to foreign mercantilism.

This is why one study finds that an increase in U.S. affiliate employment of 1 percent is associated with an increase in parent employment of 0.2 percent.³⁸ In other words, U.S. affiliate activity abroad is often a complement to, rather than a substitute for, the activity of parent companies in the United States.³⁹

A similar pattern holds with the input purchases of U.S. affiliate operations of foreign-based multinationals.⁴⁰ In 2008, such companies purchased \$2.78 trillion in intermediate inputs, of which 79.6 percent—\$2.21 trillion—were purchased from other companies in the United States. Contrary to the common assumption that the U.S. subsidiaries of global companies have very few ties to U.S. suppliers, nearly 80 cents out of every dollar spent by these subsidiaries on intermediate inputs is paid to suppliers located in America, not to companies abroad. Likewise, contrary to the common assumption that the global engagement of U.S. multinationals has eliminated their ties to domestic suppliers, nearly 89 cents out of every dollar spent by U.S. parents on intermediate inputs is paid to other companies in the United States, not to companies abroad. And this heavy reliance on domestic suppliers has been virtually unchanged for decades: In 1977, U.S. parents purchased 91.3 percent of their inputs from other U.S. companies.⁴¹

Moreover, U.S. subsidiaries of global companies are a major source of U.S. exports. In 2008, these companies received 18.1 percent of total U.S. exports of goods, worth \$232 billion. These companies also accounted that year for 11.3 percent of U.S. private-sector capital investment and 14.3 percent of U.S. private R&D—all while employing 5.6 million Americans overseas at an average annual compensation of \$73,023, nearly one-third above the U.S. private-sector total.⁴² One study carefully analyzed all U.S. multinationals involved in manufacturing over a two-decade period and concluded, “the results do not support the popular notion that expansions abroad reduce a [multinational] firm’s domestic activity, instead suggesting the opposite.”⁴³ Again, this does not mean that working to keep some production home—either through reducing foreign mercantilism or increasing U.S. domestic competitiveness—cannot provide even greater benefits. But it does mean that a significant share of foreign activity of U.S. multinationals leads to net U.S. economic benefits.

6. Focus on attraction rather than compulsion.

Enticing American—and even foreign—manufacturers to create or maintain manufacturing production in the United States represents a laudable goal, but one that’s best pursued by following an “attraction” strategy rather than a “compulsion” strategy. As ITIF has outlined previously, the attraction strategy emphasizes implementing a coordinated set of public policies relating to taxes, high-skill talent, technology, trade, regulations and competition, finance, and digital and physical infrastructure that together aim to make the United States the world’s most attractive environment for manufacturing activity.⁴⁴ It’s these types of proactive support policies in the context of a vibrant domestic economy—coupled with an effort to roll back foreign “compulsion” policies that effectively open foreign markets to U.S. exports and reduce import subsidies—that will best restore U.S. traded-sector strength.

Unfortunately, too many countries have shifted to a “compulsion” strategy to grow high-value-added manufacturing activity.⁴⁵ For example, although China’s World Trade Organization (WTO) accession agreement forbids the country from tying foreign direct investment or market access to requirements to transfer technology or give up intellectual property (IP) rights, China often requires such things in exchange for permission to invest, operate, or sell in the country.⁴⁶ Brazil, Indonesia, India, and Nigeria (among others) have applied local content requirements across a range of industries, with the intent of compelling manufacturers to produce in-country, whether by mandating that a specific percentage of a product’s content be locally produced or by extending price preferences in government procurement only for locally produced goods.⁴⁷ But not only do these types of forced localization policies violate international trade rules and norms, they harm the global innovation economy, the countries affected by them, and even the very countries that implement them.

Accordingly, the United States should not only step up the fight against foreign mercantilist policies, but also itself eschew use of policies that forcibly compel companies (whether domestic or foreign) to operate in-country on nonmarket-based terms. That’s particularly because doing so would only bring the United States down to the level of the countries that are employing such nonmarket-based tactics, but also because, if the United States itself deploys such policies, it opens the door for still more countries to use similar policies, ultimately to the detriment of both the United States and the global trade and economic system. It’s one thing to use strong measures of trade enforcement to pressure nations to roll back their mercantilist policies; it’s quite another to use them to emulate the mercantilists. Whether they are directed at foreign—or domestic—manufacturers, government policies that threaten or force firms to make particular location decisions represent the wrong approach, as such policies are far inferior and less effectual than constructive policy initiatives that can help make America the world’s most attractive manufacturing environment—for domestic and foreign manufacturers alike.

7. Move beyond making one-off deals and focusing on a low-cost business climate.

If the Trump administration is to focus on attraction, not compulsion, that will mean two things. First, as noted above, the federal government will need to up its game when it comes to rolling back other countries' mercantilist strategies. Second, the administration will need to make the United States a more attractive place for manufacturers to locate and grow.

But for this second part of the agenda to be successful, it cannot only be about working on individual deals with particular firms, as necessary as this might be at times. What the administration does not want to emulate is a “shoot anything that flies; claim anything that falls” approach (as one leading North Carolina economic development official described his state's approach in 1980s). The extent of the challenge is too great for a piecemeal, scattershot approach.

Moreover, it can't be just about lowering costs and reducing regulations. U.S. manufacturing costs are already lower than Canada, France, Germany, Japan, and the United Kingdom, and are actually almost on par with those of Korea.⁴⁸ Yet German and Japanese manufacturing in particular have outperformed U.S. manufacturing. German manufacturing costs are almost 40 percent higher in dollar-denominated terms, yet Germany runs a consistent trade surplus with China, even as its manufacturing sectors account for about 10 percentage points more of GDP than do those of the United States. It is able to do this by boosting productivity and focusing on high-value-added and specialty products that the Chinese cannot easily make.

Domestically, low costs are also not the main driver of state economic success. A study looking at interstate location of manufacturing firms in the United States found that business-climate factors, particularly taxes, had only a very small effect on attracting manufacturing, and that was more pronounced for firms in less technology-intensive industries that tend to compete more on low costs, rather than on productivity, quality, or innovation.⁴⁹

In short, to believe that all government has to do is to get out of the way is an illusion. That said, policymakers shouldn't be oblivious to costs—after all, manufacturers in the United States pay among the highest effective corporate taxes relative to most of its competitors.⁵⁰ What we need then is a better manufacturing business climate combined with a better manufacturing-support infrastructure. As ITIF has written before, that will need to include steps such as increasing funding for the Manufacturing Extension Partnership, which raises the technical and innovation capacity of America's small- to medium-sized manufacturers; expanding Manufacturing USA, a public-private partnership consisting of a network of innovation institutes that are focused on U.S. leadership in advanced manufacturing; and standing up the newly enacted Manufacturing Universities program. Congress also should pass legislation such as the 2016 “Made In America Manufacturing Communities Act” to assist regions in thinking strategically about how they

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fit into and where they can be competitive in emerging industries and value chains. The no-cost legislation designates local regions as “Manufacturing Communities,” putting them at the front of the line to receive federal economic development funding for the purpose of investing in regional manufacturing.⁵¹ Continuing development of such policies will be particularly important if the United States is to lead in the coming “smart-manufacturing” economy, in which information and communications technologies transform every facet of modern manufacturing processes.⁵² Likewise, the Export-Import Bank is an important component of the fabric that supports American manufacturing competitiveness, and the new administration should champion it accordingly.⁵³

8. Change the playing field through technology.

As Pisano and Shih note, not all manufacturing is geographically “sticky.” Functions such as electronics assembly, cutting and sewing inexpensive clothes, and stamping commodity metal parts are anything but sticky. Retaining and growing these kinds of functions would require heroic policy efforts to overcome the centripetal forces drawing them to low-cost nations.

But other kinds of production can be stickier, and that’s what a Trump manufacturing policy should focus on. A long tradition in the discipline of regional economics has highlighted the fact that the United States is more competitive in activities earlier in the product cycle and less competitive in products that become more mature.⁵⁴ For example, when personal computers were first being introduced in the 1980s and 1990s, more of them were made in the United States, in part because the designs were constantly changing, and there needed to be close interaction among design, engineering, and production. (In Pisano and Shih terms, the industry was in the “pure process innovation” quadrant.) But as PC technology matured, still changing but in more incremental ways, with process technology relatively stable and mature, the industry moved to the “pure product innovation” quadrant, where production could be moved offshore with little impact on innovation. This means that one of the major risks to U.S. manufacturing is a slowing down of product and process innovation and an increase in maturity and commoditization. If that happens—and there is reason to believe it may for at least the next decade—then the United States would be forced to compete even more on cost. That’s a competition it is bound to lose either way. If U.S. costs go down through lower wages or a cheaper dollar, our standard of living goes down; if U.S. costs don’t go down at all we will continue to lose manufacturing.

As Pisano and Shih note, there are two kinds of industries that tend to be sticky. The first is emerging industries that are new to the world where our competitors’ production capabilities are limited. These might include products like graphene-based materials, metamaterials (a class of material engineered to produce properties that don’t occur naturally), new kinds of nuclear-energy reactors, artificial-intelligence systems, or engineering-based biology. The second is industries that are constantly innovating and moving to new product cycles with new process technologies. Aerospace is a good example, with Boeing constantly developing new innovations, such as the carbon-fiber-based 787

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Dreamliner, and where the United States ran a trade surplus of \$100 billion in the first three quarters of 2016.⁵⁵ Others include semiconductor machinery made by companies such as Applied Materials, advanced medical instruments made by companies such as Medtronic, and fiber optic cable made by companies such as Corning, where the United States is projected to run a combined trade surplus of over \$7.3 billion in 2016.⁵⁶

There is a third area of technology focus: breakthroughs in process technology. For example, it makes little sense to expect commodity-based electronics assembly to reshore to the United States unless there are breakthroughs in assembly-process technology that allow this work to be done much more efficiently. Likewise, continued support for the new National Institute for Innovation in Manufacturing Biopharmaceuticals is critical to make it more likely that production in the United States, not just R&D.

Both kinds of industries as well as new process technologies share a reliance on innovation, meaning that policies such as expanded funding for federal research and an expanded R&D tax credit are critical for their future expansion in the United States.

9. Support the defense industrial base.

Even if America did not need a robust manufacturing base for balance of payments reasons—i.e., if the United States were to run a large enough trade surplus in services to offset the goods deficit—America would still need some manufacturing to support military capabilities. Wars are neither deterred nor won with services. Moreover, America’s military advantage has since WWII been based on technological superiority, not numerical superiority. This is why Obama administration Defense Secretaries Chuck Hagel and Ash Carter pursued the “third-offset strategy,” designed in part to develop next-generation, technology-enabled warfighting capabilities.⁵⁷ This is critical because, according to Obama administration Deputy Defense Secretary Bob Work, China and Russia now “have theater-wide battle networks that are approaching parity with us.”⁵⁸

Achieving the third offset depends on a robust advanced manufacturing innovation and production base in the United States. As the 2014 Quadrennial Defense Review stated, “U.S. innovations in warfighting, which have provided key capability advantages ... are built on the continued strength of our defense industrial base.”⁵⁹ But as the U.S. industrial base moves offshore, so does the defense industrial base. As Joel Yudken explains “Continued migration of manufacturing offshore is both undercutting U.S. technology leadership while enabling foreign countries to catch-up, if not leap-frog, U.S. capabilities in critical technologies important to national security.”⁶⁰ Reliance on foreign manufacturers also increases U.S. vulnerability to receiving counterfeit goods. According to a study conducted by the Bureau of Industry and Security, in 2008 there were 9,356 incidents of counterfeit foreign products making their way into the Department of Defense supply line, a 142 percent increase over 2005.⁶¹

Therefore, if the U.S. defense industrial base is to retain its ability to develop the most technologically sophisticated defense platforms, the United States will need to be at the forefront of advanced-technology manufacturing capabilities in many areas, such as

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nanotechnology, advanced batteries, semiconductors, sensors, and autonomy. This means that any national manufacturing strategy has to pay particular attention to the current and future production and innovation needs of defense-based technologies and products, while at the same time ensuring that our potential adversaries, especially China, do not easily obtain key dual-use or military technologies. This will, of course, need to include ensuring that key weapons systems and components are made in the United States. But it will also mean that policy needs to ensure that America's advanced-technology innovation and production base is healthy, as many defense capabilities depend on commercial innovations.

10. Pay attention to where advanced production is located.

Restoring U.S. traded-sector output enough to eliminate the trade deficit is an important goal, but if the lion's share of that growth goes to technologically advanced regions already doing well, then the benefits will not be widely shared. If we have learned anything from the last two decades, it is that a rising tide doesn't automatically lift all regional boats. Many rural areas, small towns, and cities in the heartland have been hurt by the loss of U.S. competitiveness. Prior to the 1980s, political leaders and pundits understood the importance of helping distressed regions. This was the case from LBJ, who launched the Appalachian Regional Commission, to Richard Nixon's national balanced growth agenda, to Jimmy Carter's White House Conference on Balanced National Growth and Economic Development.

But with the takeover of the economics profession by the neoclassicists by the early 1980s, this bring-jobs-to-people approach was jettisoned in favor of a move-people-to-jobs approach, and funding for key federal regional development programs was slashed. Not only is this an elitist view—few economists have deep family and other ties to the communities where they grew up—it's wrong. If all these workers move to the New Yorks; Washington, DCs; and Silicon Valleys of the nation, costs there will explode, traffic will get worse, and rents will become even more unaffordable. Moreover, economists forgot they are supposed to be studying "political economy." When we ignore large swaths of America, large swaths of voters rebel, making it harder for pro-growth policies such as the Trans-Pacific Partnership trade agreement to move forward. As former White House advisor Jim Pinkerton writes, "we can't live with ... a country in which whole states and regions are left behind, in the dust."⁶² So any national traded-sector strategy has to include a regional component, including increased funding for the Economic Development Administration and the Appalachian Regional Commission, among others. It's also time to establish a Rural Development Corporation that would fund "new economy" projects in rural areas across the nation: broadband, value-added agriculture projects, and R&D focused on the rural economy (projects like those supported by the proposed Timber Innovation Act, or programs to spur the aquaculture and fishing industries, among others).⁶³ Congress also should institute a reshoring tax credit that firms can receive if they bring back overseas jobs to economically lagging counties.

CONCLUSION

In summary, the Trump administration is right to focus on manufacturing to bolster America's economy. But to be maximally effective, such a strategy will need to be guided by the right underlying principles and objectives, while seeking to build on U.S. strengths, and look to the future and not the past. This will mean stepping up the fight against foreign "innovation mercantilist" practices, improving the U.S. business climate, and investing in key manufacturing support systems. And that will require eschewing ideologically based approaches from the left and right in favor of embracing smart, effective tactics guided by the strategic vision laid out here.

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