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The US Manufacturing Base: Four Signs of Strength

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The fate of the manufacturing base in the United States is a perennial concern in Washington and across the country. President Barack Obama is the latest in a succession of political leaders who resolve that the United States must find ways to strengthen the manufacturing sector and make it more competitive.

But any discussion of how to strengthen the US manufacturing base requires an accurate understanding of its current state. Recent studies, descriptive employment statistics, and statements by US politicians have raised concerns about the strength of US manufacturing. For example, a January 2014 *Journal of Economic Perspectives* article by Martin Baily and Barry Bosworth emphasizes falling US manufacturing employment. The article also argues that productivity growth in manufacturing can be attributed solely to the unusual performance of computer production rather than the manufacturing sector as a whole. US Sen. Bernie Sanders (I-Vt.) states on his website that "the manufacturing sector in Vermont and throughout the United States has eroded significantly in recent years and must be rebuilt to expand the middle class." As we will discuss later, President Obama has based his corporate tax reform proposals on a mistaken view of the challenges that beset US manufacturing. This Policy Brief examines data that are more recent and more detailed than data previously used to refute the claims of US manufacturing weakness and present new evidence of its strength and breadth.

The concern about the strength of US manufacturing is based in large part on labor market data. Manufacturing employment has been steadily declining as a share of total US employment for several decades, and the absolute number of US manufacturing jobs has plummeted by almost 30 percent just since 2000. In 1960 manufacturing accounted for 28.4 percent of nonfarm employment in the US economy. By 2013 the share had fallen to 8.8 percent. This Policy Brief updates a

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2013 PIIE study by Robert Lawrence and Lawrence Edwards showing that the employment data tell only part of the story. More direct measures of productivity show that the growth of the US manufacturing sector has actually been strong. This brief also introduces highly disaggregated data to show that this productivity growth is due to contributions from manufacturing subsectors and is not driven only by idiosyncrasies in the way computer production is measured, as has been argued by Baily and Bosworth (2014).

This Policy Brief also considers the impact that competition from China and other countries may have had on US manufacturing productivity. Cross-country comparisons of manufacturing productivity growth show that in the last two years, the United States has been doing much better than most of the rest of the world, including China. The distributional effects within the US labor force of increased exports from China are well-documented (see Autor, Dorn, and Hanson 2014, forthcoming for a recent example). The impacts on labor market inequality and job loss in low-skilled manufacturing are important but beyond the scope of this study. Instead, this Policy Brief takes an approach that is different than that of most studies, building

on previous work by Hufbauer, Moran, and Oldenski (2013) by showing that increased offshoring by US manufacturing multinational corporations (MNCs) is associated with overall greater investment at home. It also presents new evidence on the effects of offshoring by US manufacturers on research and development (R&D) spending in the United States.

The creation of jobs by US multinationals abroad and the expansion of sales by US multinational affiliates abroad both lead to more production and employment at home.

The results focus on four empirical investigations pointing to the growing strength of US manufacturing, and, in many cases, refuting or updating previous claims.

First, this Policy Brief updates recent work by Robert Lawrence and Lawrence Edwards (2013) to show that, despite the decline in employment, the overall size of the US industrial base—real value added in manufacturing—has been growing rapidly for more than four decades and is on track in 2014 to surpass the all-time 2006–07 high. In real terms, US manufacturing output has grown more than 60 percent from 1987 to 2013, with $6 trillion of gross output in 2013. Gross manufacturing output as a share of GDP is lower now than it was in the 1950s and 1960s, falling from 28 percent of US GDP in 1959 to 20 percent in 2013. But this is not because the overall size of the US manufacturing sector is shrinking in either nominal or real terms. Moreover, the US manufacturing sector is extremely heterogeneous. This Policy Brief introduces new evidence that subsectors other than computers and electronics—including transportation equipment, medical equipment, machinery, semiconductors, communications equipment, and motor vehicles—all grew at rates well above the manufacturing sector average. Second, despite widespread concerns about weakening competitive performance on the part of US firms and workers, productivity in the manufacturing sector has been growing, both absolutely and relative to other sectors of the US economy. Third, manufacturing value added as a share of US GDP has grown at an average annual rate of 2.2 percent from 2009 to 2011, reaching $1.9 trillion, or about 12.4 percent of GDP. This growth in manufacturing value added as a share of GDP is much faster than the world average of negative 1 percent over the same time period. And finally, this Policy Brief shows that foreign expansion by US manufacturing MNCs has helped to strengthen, rather than weaken, the US manufacturing base even though it employs fewer workers. Contemporary policy debate in Washington has been asking whether the US manufacturing sector would be even larger and more competitive domestically if US manufacturing firms did less investing abroad. To address this debate, this Policy Brief employs firm-level data on all US manufacturing multinationals over a 20-year time period to investigate what happens at home in the US economy when an individual US firm expands its operations abroad. The findings show that US multinationals that increase their investments abroad simultaneously increase the size and strength of their manufacturing activities in the United States. The creation of jobs by US multinationals abroad and the expansion of sales by US multinational affiliates abroad both lead to more production and employment at home, especially in high value-added areas such as R&D. Indeed the preponderance of net job loss in the US manufacturing sector comes within companies that stay at home and do not invest abroad.

Given the many benefits of global expansion by US MNCs, policies aimed at restricting this expansion would be misguided. Instead, this Policy Brief argues that the primary policy response should be to prepare the US workforce to perform high-value jobs associated with manufacturing productivity growth and global expansion, rather than cutting off the sources of this growth.

THE FIRST SIGN OF STRENGTH: US MANUFACTURING OUTPUT GROWTH

While the first fact presented by this Policy Brief is not new, it may come as a surprise to observers who focus on employment as the primary measure of the strength of the US manufacturing sector.

As part of their investigation of whether economic growth in emerging economies is good for the United States, Robert Lawrence and Lawrence Edwards (2013) examine the evolution of the US manufacturing sector. Like many before them, they find that manufacturing employment has been steadily declining as a share of total US employment. In 1960 manufacturing accounted for 28.4 percent of nonfarm employment in the US economy. By 2010 the share had fallen to 8.9 percent. This Policy Brief updates these findings using the most recent data to show that the manufacturing employment share has continued to decline and was 8.8 percent in 2013.

In terms of absolute number of manufacturing jobs, the downward trajectory is particularly noticeable, especially since 2000. Between 2000 and 2011 manufacturing jobs declined from 17.3 million to 11.6 million, a decline of 5.7 million, or 33 percent. Total manufacturing employment has increased slightly since 2010, with 12 million manufacturing jobs reported for 2013. This is still about a 30 percent decline, however, relative to 2000. There were 3.4 million fewer manufacturing jobs in the United States in 2013 than in 1960.

But this decline in manufacturing jobs is not because the size of the US manufacturing base is shrinking. In contrast to much popular lament, Lawrence and Edwards show that US

Table 1 Average annual growth of employment, output, and labor productivity, 1960–2013 (percent)

Indicator	1960–79	1980–99	1990–99	2000–09	2010–13
Employment					
Manufacturing	1.1	–0.5	–0.4	–3.4	0.2
Total	2.0	1.6	1.6	–0.2	1.0
Output					
Manufacturing	3.9	3.5	3.6	–1.0	4.0
Total	3.8	3.2	3.7	1.8	2.9
Output per person					
Manufacturing	2.8	4.0	4.0	3.0	3.9
Total	1.8	1.6	2.0	2.0	1.9

Source: Information for1960–79 is from Robert Z. Lawrence and Lawrence Edwards' calculations (2013) using data from the Bureau of Economic Analysis (BEA) and the World KLEMS Database. Information for all other years was compiled by the authors using data from the Bureau of Labor Statistics (BLS).

manufacturing output—real value added in manufacturing—grew by 3.1 percent per year over the entire period of 1960–2007. This Policy Brief updates these numbers in table 1 and shows that from 2010 through 2013, average output growth was 4 percent per year. This is an increase relative to the first decade of the 2000s. This growth is partially due to the fact that manufacturing output was growing from a lower base after its decline during the Great Recession. However, much of this growth is also due to factors such as investments in R&D and offshoring, which will be discussed in more detail later in this Policy Brief. Even with a growth rate no higher than 2.8 percent per year, the absolute size of the US industrial base—total value added in manufacturing—will surpass the all-time 2006–07 high before the end of 2014.

THE SECOND SIGN OF STRENGTH: US MANUFACTURING COMPETITIVE PERFORMANCE RELATIVE TO OTHER SECTORS OF THE US ECONOMY

What about the competitiveness of the US manufacturing sector? Here is where the second sign of strength emerges. Contrary to widespread hand-wringing about weakening performance on the part of US firms and workers, productivity in the manufacturing sector has been growing, both absolutely and relative to other sectors of the US economy. Drawing on a time series database developed by Dale Jorgenson, Mun Ho, and Jon Samuels (2010), Lawrence and Edwards show that output per person employed has been growing 3.3 percent per year from 1960 to 2007 in manufacturing, while the growth is 1.6 percent for the economy as a whole. The broadest measure of productivity—total factor productivity, which embodies the improvement in technical efficiency via all inputs—grew 1.18 percent faster in manufacturing than in the overall economy. Over the same period labor productivity in the manufacturing sector grew by 1.51 percent per year more rapidly than labor productivity growth in the economy as a whole.

This Policy Brief uses the most recent data to update these numbers through 2013. Table 1 shows that while employment and total output in the manufacturing sector both declined between 2000 and 2009, labor productivity (output per person) grew at an average annual rate of 3 percent. The decline in manufacturing output during the 2000-to-2009 period was primarily driven by three years: 2001, 2008, and 2009. These years coincide with the bursting of the dot.com bubble and the Great Recession, suggesting that these economic downturns were the likely driver of falling manufacturing output during this period, an observation that we return to later in this Policy Brief. From 2010 to 2013 employment, output, and output per worker all grew. Both total output and output per worker grew faster in the manufacturing sector than in the economy as a whole.

Baily and Bosworth (2014) argue that this US manufacturing output growth has been driven primarily by one subsector: computers and electronics. Computing power has increased dramatically over recent years, so every year the same amount of computing power costs much less than it did the year before. Because the measures of real output take these quality-adjusted prices into account, much of the increase in real output of computers can be attributed to this decline in the price of a given amount of computing power. Baily and Bosworth argue that computers are thus not representative of the rest of the manufacturing sector and that once computers are taken out of the picture, US manufacturing output growth looks much lower.

However, we find that this assertion about computing as the sole driver of US manufacturing productivity is incorrect. The US manufacturing sector offers diverse products. The

United States is a leader in producing some of these products, while other products are less consistent with the comparative advantage of US firms and workers. It should not be surprising that some subsectors have experienced tremendous output growth, and that some have declined drastically.

The US manufacturing base is becoming bigger than ever and the productivity of firms and workers in manufacturing leads the rest of the US economy in growing stronger.

Table 2 shows the average annual output growth for the 20 subsectors that had the highest growth from 1988 to 2011, as well as those that grew the least. First, computers are not the only manufacturing subsector exhibiting high growth during the 1990s and 2000s. Other industries, including transportation equipment, medical equipment, machinery, semiconductors, communications equipment, and motor vehicles, all grew at rates well above the manufacturing sector average. Moreover, real output of computers actually declined substantially in 2010 and 2011. In spite of this, the manufacturing sector as a whole experienced average annual output growth of 4.7 percent in 2010 and 2011, relative to the 2.9 percent growth rate for the overall economy. The Baily and Bosworth investigation of the data miss this fact for two reasons. First, it focuses on average annual growth rates from 2000 to 2011. Second, it uses a more aggregate industry classification in which computers and electronics are grouped together. Thus the decline in computer output in 2010–11 is masked by growth in semiconductors and other electronics.

Even without computers, the US manufacturing sector has shown tremendous signs of strength in recent years. The lesson for future research is to acknowledge this heterogeneity within manufacturing, as there will always be leading and lagging segments within any given sector of the economy.

It is difficult to isolate exactly what accounts for the more rapid productivity growth in the US manufacturing sector relative to the economy as a whole. Total factor productivity is designed to capture advances in efficiency by taking account of all inputs (capital, labor, and technology) used in production. Labor productivity growth meanwhile adds changes in the skills of workers to other inputs. The US manufacturing sector has been growing steadily more capital intensive, and also accounts for the bulk of spending on R&D. Overall, therefore, it appears that increases in R&D intensity, increases in capital intensity, increases in labor skills, and new technologies have led the manufacturing sector to be become more competitive in relation to other sectors of the economy. So, while manufacturing is shrinking both in terms of absolute numbers of jobs and as a share of US domestic employment, this is *not* because the growth of US manufacturing activity is declining, nor because the absolute or relative productivity of US firms and workers is faltering. On the contrary, the US manufacturing base is becoming *bigger than ever* and the productivity of firms and workers in manufacturing *leads the rest of the US economy* in growing stronger.

THE THIRD SIGN OF STRENGTH: US MANUFACTURING PRODUCTIVITY GROWTH RELATIVE TO OTHER COUNTRIES

The productivity growth in US manufacturing is strong not just relative to other sectors, but also in comparison to other countries. As shown in table 2, US manufacturing declined during the recent recession. However, in 2010 and 2011 (the most recent years for which data are available) the share of manufacturing value added in total US GDP grew by 2.19 percent. At the same time, the total global share of manufacturing value added in world income fell by 0.99 percent. Table 3 shows the growth rates for select countries. Germany was clearly the leader in manufacturing growth, with an average of almost 8 percent growth in 2010 and 2011. The increase in the importance of the US manufacturing sector for the overall US economy was comparable to that of other high income countries such as Japan and the EU. However, the overall EU and OECD numbers are misleading, as they are primarily driven by the tremendous manufacturing sector growth in Germany. US manufacturing growth was well above that of the United Kingdom and France. US growth even outpaced that of developing countries such as China, India, and Mexico.

Thus US manufacturing growth is strong not just relative to other sectors of the US economy but also relative to other countries!

But major policy questions—particularly important in contemporary Washington—remain: What is the role of outward investment by US manufacturing companies in the evolution of the US industrial base? Might US firms and employment in the manufacturing sector be even larger and more competitive in the domestic economy if US manufacturing firms did less investing abroad?

In particular—given the concentration of US R&D expenditures in the manufacturing sector—what is the role of the globalization of R&D on the part of US manufacturing multinationals? Does overseas expansion of R&D by US firms in China or India, for example, replace or undermine research and development undertaken by those same firms at home?

Table 2 Average annual output growth by subsector, 1988–2011 (percent)

		1988–2011	1990–99	2000–09	2010–11
	Total nonfarm business	2.9	3.7	1.8	2.9
	Manufacturing	1.8	3.6	–1.0	4.7
	Top 20 ouput growth industries				
1	Semiconductors	15.5	26.1	4.6	22.5
2	Computer and peripheral equipment	15.3	28.6	11.3	–27.4
3	Other transportation equipment	5.9	7.8	9.7	0.6
4	Railroad rolling stock	5.1	6.1	–0.8	4.4
5	Medical equipment and supplies	4.4	5.0	4.2	2.0
6	Agriculture, construction, and mining machinery	3.8	2.0	2.2	15.3
7	Communications equipment	3.5	12.2	–4.9	2.1
8	Coating, engraving, and heat treating	3.1	4.5	–1.1	13.2
9	Machine shops, screws, nuts, and bolts	3.1	4.6	–1.2	13.9
10	Iron and steel mills	2.6	1.6	–0.3	19.1
11	Motor vehicle parts	2.5	6.4	–4.4	17.7
12	Industrial machinery	2.2	3.3	–3.3	19.0
13	Motor vehicles	2.2	4.1	–4.9	25.8
14	Pharmaceutical and medical	2.2	3.5	1.1	–2.1
15	Meat	2.1	2.7	1.4	0.5
16	Other food	2.0	2.4	1.6	2.6
17	Soap and cleaning products	2.0	1.4	2.3	3.4
18	Animal food	2.0	2.2	2.2	–2.9
19	Navigational and measuring instruments	1.9	1.0	2.5	4.1
20	Engine, turbine, and power transmission equipment	1.9	2.6	–2.2	14.6
	Bottom 20 ouput growth industries				
1	Cut and sew apparel	–7.4	–0.7	–16.3	0.2
2	Apparel knitting	–6.8	–1.6	–14.1	–3.9
3	Apparel accessories and other	–6.1	–1.0	–14.0	1.7
4	Footware	–5.1	–4.5	–7.5	2.5
5	Hardware	–3.1	1.0	–8.6	1.7
6	Other leather products	–3.1	–2.3	–5.6	1.7
7	Tobacco	–2.8	–0.5	–5.6	–2.3
8	Textiles and fabric finishing	–2.7	0.8	–9.2	8.3
9	Fiber, yarn, and thread	–2.4	1.8	–6.8	–1.4
10	Textile furnishings	–2.3	1.3	–6.6	–1.5
11	Fabric mills	–2.3	0.7	–7.5	3.8
12	Leather and hide tanning and finishing	–1.9	2.7	–12.3	6.2
13	Clay products	–1.4	1.2	–6.5	6.5
14	Household furniture and cabinets	–1.0	2.7	–4.6	–1.2
15	Veneer, plywood, and engineered wood	–0.8	2.0	–4.6	3.3
16	Audio and video equipment	–0.8	3.5	–7.8	0.1
17	Nonferrous metal processing	–0.8	–0.1	–4.3	10.6
18	Other wood products	–0.7	2.2	–4.1	2.6
19	Lime and gypsum products	–0.6	2.0	–3.3	2.2
20	Printing	–0.6	1.2	–2.7	–0.6

Source: Authors' calculations using data from the Bureau of Labor Statistics (BLS).

Table 3 Average annual percent change in manufacturing value-added share of GDP for select countries
(2010–11)

United States	**2.19**
World average	**–0.99**
Germany	7.92
Japan	2.69
European Union	2.62
High income: OECD	2.57
Mexico	1.41
China	0.48
United Kingdom	0.12
Low income	0.10
India	–1.21
France	–1.71

Source: Authors' calculations using World Bank data. Data from China is for 2010 due to a lack of information for 2011.

THE FOURTH SIGN OF STRENGTH: NEW EVIDENCE ON OUTWARD EXPANSION BY US MNCS AND ECONOMIC ACTIVITY BY THOSE SAME FIRMS AT HOME

What is the relationship between globalization and the evolution of the US manufacturing base?[1] In this section the Policy Brief presents new empirical evidence uncovering the fourth sign of strength: Increased offshoring of manufacturing by US multinationals is associated with increases in the size and strength of the manufacturing sector in the United States.

Why might this result be surprising? Recently several studies have focused on the negative effects of imports from China on narrowly defined aspects of US manufacturing employment, either in terms of specific geographic areas or specific types of jobs. For example, Autor, Dorn, and Hanson (2014, forthcoming) find that increases in manufacturing imports from China are linked to declines in manufacturing employment in local labor markets that house import-competing manufacturing industries, relative to those that do not. Pierce and Schott (2013) find similar results using data on changes in US tariff policy toward China. However, these studies are limited in scope. Most important, the empirical effects they estimate measure relative, not absolute, changes in demand for workers. The impacts they find thus represent distributional changes across different manufacturing subsectors and local labor markets, not absolute gains or losses. These distribution effects have important consequences for inequality and for the workers who lose their jobs and find themselves with skill sets that are no longer in high demand. It is possible to make back of the envelope calculations about the potential relationship between imports from China and overall declines in the share of manufacturing employment in the United States. These calculations suggest that about 21 percent of the total decline in US manufacturing employment from 1990 to 2007 may be due to import competition. But these calculations are still primarily distributional in nature, as they don't say anything about overall productivity or employment in other sectors of the economy resulting from low-cost imports from China. Indeed, in the conclusion to their paper, Autor, Dorn, and Hanson summarize their findings by stating, "Theory suggests that trade with China yields aggregate gains for the US economy. Our study also highlights the distributional consequences of trade." The studies of manufacturing imports also have a different focus than this Policy Brief. They focus exclusively on imports rather than offshoring or exports, and thus the results do not take all forms of global engagement by US firms into account. This Policy Brief adds a new dimension by focusing on the domestic consequences of offshoring rather than the domestic impact from imports.

Hufbauer, Moran, and Oldenski (2013) use two decades of data on US multinational corporations and find that expansion abroad by US MNCs is associated with expansion, not contraction, domestically. What distinguishes these results from other studies on globalization and US labor markets? First, this approach investigates the impact of offshoring rather than the impact of imports, alleviating at least part of the problem associated with the lack of value-added information in the import data. When a good enters the United States from another country, such as China, the value of the import is recorded as the total value of the good, regardless of whether some of its components came from the United States or other countries. For example, take the case in which a US smartphone assembler in China imports the hard drive and the display from Japan, microchips from the United States, and memory from Korea, while doing design, marketing, and distribution within its own affiliates in the United States (Dedrick, Kraemer, and Linden 2010). With a retail price of $299, $163 accrues to the United States ($155 to the smartphone parent company), $26 to Japan, and $1 to Korea. The export value of the smartphone from China is recorded as $299, even though only $4 of the value added actually came from China. If the smartphone receives some finishing touches in the United States and is exported for sale in Europe, then revenue from these exports is also missing from the import data. Thus it is important to keep in mind that studies using total import values are giving gross effects in only one direction, not the total net effects of global produc-

1. For the findings presented in figure 1 and the tables in the appendix, the statistical analysis of firm-level data on US multinational corporations was conducted at the Bureau of Economic Analysis, US Department of Commerce, under arrangements that maintain legal confidentiality requirements. Views expressed in this Policy Brief are those of the authors and do not reflect official positions of the Department of Commerce.

tion. Studies focusing only on imports miss this complexity. It is especially important if the imports from China contain value added from other parts of the United States: for example, US-produced intermediate inputs that have been assembled in China. This attributes US manufacturing production to the wrong country! The data employed by this Policy Brief clearly identify which activities (such as R&D spending, capital investment, and employment) take place in the United States and which activities take place in other countries.

Increased offshoring of manufacturing by US multinationals is associated with increases in the size and strength of the manufacturing sector in the United States.

Hufbauer, Moran, and Oldenski (2013) also look at outcomes for all firms—including service producers—and do not focus solely on manufacturing employment. Once again evidence on the growing productivity of the US manufacturing sector suggests that the dire picture painted by those who look narrowly at manufacturing employment may not tell the whole story. Offshoring a specific job or task is likely to reduce the demand for that task. But it may also lead to efficiency gains and greater specialization that result in the creation of new or different jobs. In this section this Policy Brief expands on previous work by presenting new results that separate the relationship between offshoring and domestic employment based on the sector of both the firm doing the offshoring and the activities that are being offshored.

As in Hufbauer, Moran, and Oldenski (2013), this Policy Brief uses comprehensive firm-level data collected by the BEA to empirically identify what happens when an individual firm expands its operations abroad. We employ panel regression methods with data on all US MNCs over a 20-year period. We include firm fixed effects that hold constant everything unique about a given firm, isolating how its employment in the United States and other variables change when it increases its outward foreign direct investment. Thus all the characteristics that define a given firm—such as the industry it operates in, its size, its relative market power, etc.—are controlled for and do not confound the results. We also include year fixed effects, which hold constant everything external to the firm that was going on in a given year, thus removing any potential impact of recessions and booms. The only way to truly identify a causal effect between foreign and domestic activity would be to randomly assign some firms to become multinationals, while forcing others to remain purely domestic. This type of pure experiment is neither possible nor desirable. However, using the fixed effects methodology is the next best option, as this approach controls for everything that is unique about a given firm and looks at changes within each firm over time, rather than drawing conclusions based on observed behaviors across very different firms.

It is difficult to observe which workers' jobs are being offshored and even harder to draw a direct causal relationship to the creation of a specific new job when someone else gets hired. The US labor market experiences a tremendous amount of churning as hundreds of thousands of jobs are being created and destroyed every day. For example, BLS reports that in December 2013, 4.4 million Americans were laid off, fired, or voluntarily left their jobs. But these lost jobs were offset by 4.4 million new hires in the same month (BLS 2014). This churning happens for reasons having nothing to do with globalization, such as evolution in consumer demand, emergence of new technologies, and changes in the competitive position of individual firms. This churning raises many questions related to adjustment assistance and retraining that are beyond the scope of this Policy Brief. But the churning points to the complexity of the US labor market, the difficulties associated with understanding the specific sources of employment gains and losses, and the need for careful analysis to identify what is driving the gains and the losses.

What we can do is observe what happens to certain outcome measures in the United States as firms expand their foreign operations. We can track the changes in employment, sales, capital investment, and R&D in the United States that are associated with offshoring and other types of foreign expansion by United States firms. We can also compare these outcomes between manufacturing and service firms.

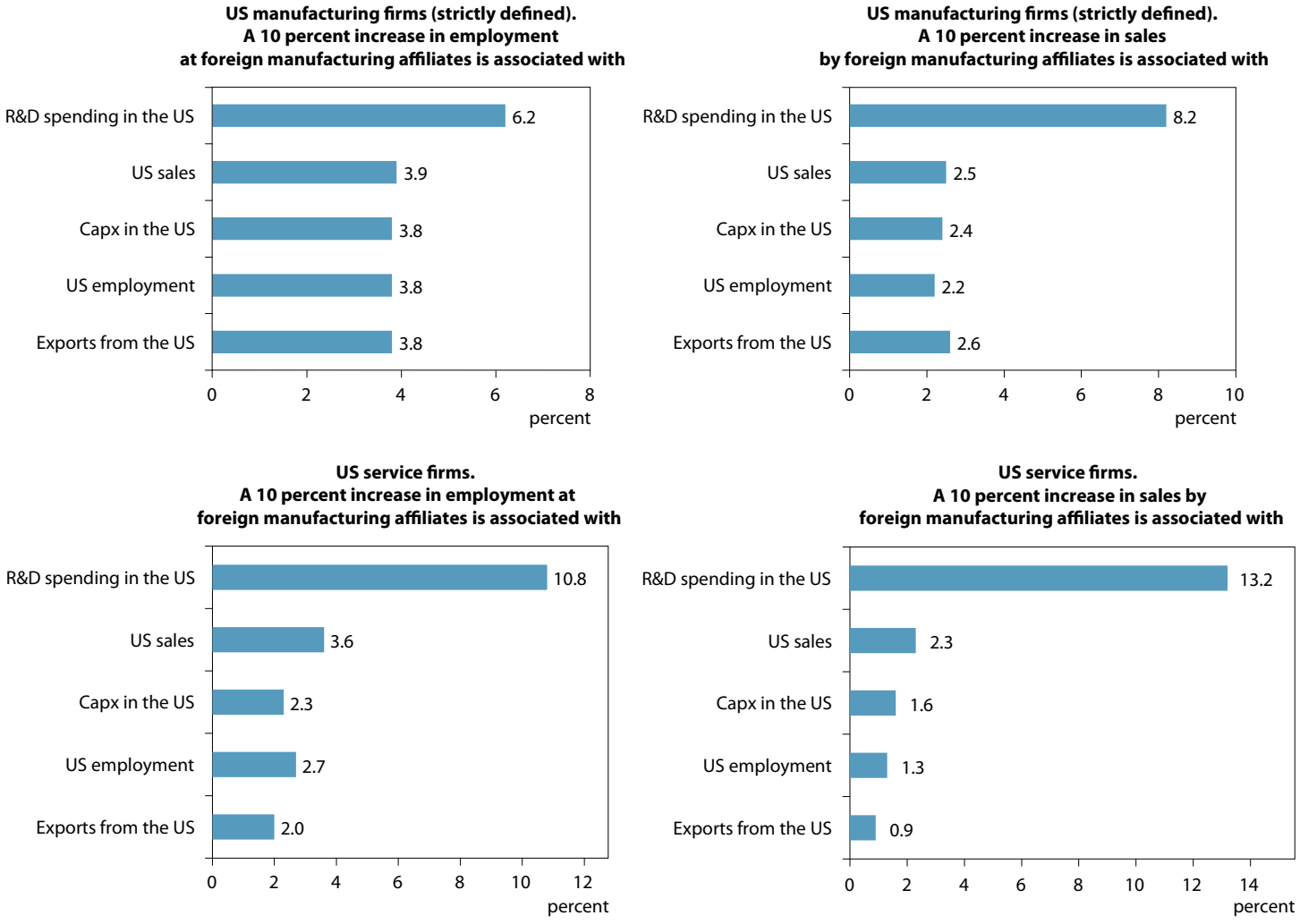
Figure 1 shows the results broken down by the primary industry of operations in the United States and in the foreign affiliates of the US firms. The top panel of figure 1 shows the results only for strictly defined manufacturing firms, that is, firms that primarily focus on manufacturing both in their US headquarters and at their foreign affiliates. The bottom panel looks at firms that primarily focus on services (such as research, legal, management, engineering, professional and technical services) at their US headquarters but that also perform manufacturing activities abroad. The data show what happens to these firms when they expand manufacturing sales or employment at their foreign affiliates.

The first thing to note about these results is that they are all positive. Thus, by any measure, expansion abroad by a US-based MNC is associated with domestic US expansion by the same firm. The foreign operations of these firms are complements to—not substitutes for—domestic US operations.[2]

While all types of offshoring are associated with increased activity in the United States, some particularly important patterns emerge. First, the overseas expansion of US manufac-

2. These results are consistent with those of Desai, Foley, and Hines (2009). However these authors focus only on manufacturing and use data from 1982 to 2004.

Figure 1 Relationship between foreign manufacturing expansion and domestic manufacturing and service activities of US MNCs



Capx = capital expenditures; R&D = research and development

Notes: The numbers in this table are regression coefficients that isolate the relationship between each variable listed and either domestic employment or sales, controlling for firm characteristics, industry characteristics, and business cycle macroeconomic conditions as described in the text. The analysis was conducted using BEA firm-level data from 1990–2009. All results are statistically significant at the 1 percent level. See appendix A for more detailed regression tables.

turing firms is accompanied by a positive and significant increase in employment at home in the United States. To be sure, this positive relationship does not emerge in each and every case. Some plants may close, other plants may open, and the composition of jobs within plants may change. But our results show that the creation of jobs by US multinationals abroad and the expansion of sales by US multinationals abroad are both associated with more jobs at home overall. Indeed the preponderance of net job loss in the US manufacturing sector comes within companies that stay at home and do not invest abroad.

Second, the largest benefits from offshoring manufacturing tasks accrue to US R&D. For example, a 10 percent increase in manufacturing employment at foreign affiliates of US firms is associated with a 6.2 percent increase in the amount of US R&D spending at the firms doing the offshoring. When the US site is primarily focused on R&D and other services, increasing manufacturing offshoring by 10 percent leads to a 10.8 percent increase in the amount of US R&D spending at that firm. When manufacturing offshoring is measured using sales by foreign affiliates rather than employment, the increases in domestic R&D spending associated with a 10 percent increase abroad are 8.2 percent overall and 13.2 percent for service-focused US facilities. In other words, international expansion by US firms does not reduce their domestic activities. Instead, it is accompanied by increases in investment at home, and these increases are the largest for R&D spending.

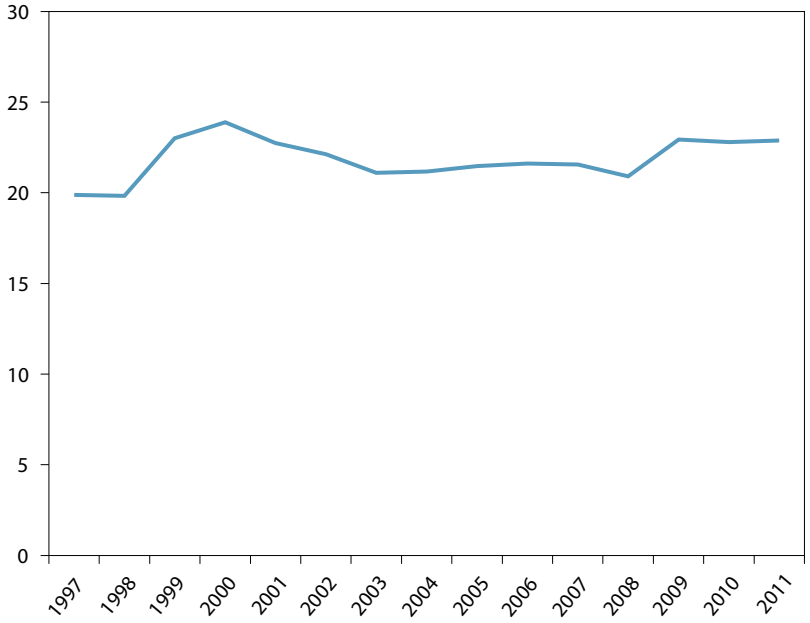
Finally, our results reveal that when manufacturing tasks are offshored, much of the gain for the United States shows up back in the domestic service sector. One limitation of many of the previous studies on the US employment effects of offshoring is that they have only considered the relationship between manufacturing offshoring and manufacturing employment (strictly defined) at home. However, the offshoring of manufacturing assembly tasks to other countries is often associated with an increased focus on other higher value tasks in the United States. Oldenski (2012) has shown that US MNCs offshore their relatively more routine tasks but keep the most complex and nonroutine tasks in the United States. This specialization is not surprising based on the strong US comparative advantage in more highly skilled and nonroutine tasks such as innovation, engineering, and management, rather than routine tasks such as basic assembly. Further work by Oldenski (2014, forthcoming) demonstrates that this specialization according to comparative advantage results in the creation of more highly skilled, high wage jobs in the United States.

The findings reported here by no means imply that there are only winners and no losers from outward investment. Changing patterns of MNC investment—like changing patterns of trade and technology—contribute to job losses and dislocations for some workers as well as to new opportunities for others. Our results do not negate those of others who have found a link between manufacturing imports and job losses for some US workers. However, we show that increased offshoring also leads to productivity gains, benefits for service workers, and greater opportunities for R&D in the United States.

The empirical analysis in this Policy Brief is crucial for understanding the relationship between offshoring by US firms and US manufacturing employment. As shown in table 1, total US manufacturing employment has been falling steadily for decades. Those who are worried about the role of US MNCs in this employment decline often cite figures from a BEA report showing that from 1999 to 2009 total employment by US MNCs in the United States fell by 864,600. But US MNCs added 2.9 million workers abroad during the same time period (Barefoot and Mataloni 2011). However, one must be cautious in making generalizations on the basis of these simple statistics. First, 1999 and 2009 are taken as the start and end points in the report simply because these happen to be years in which the BEA conducted its once-every-five-years benchmark study of MNC investment. The study collects data on a broader range of measures than the annual surveys. These more extensive benchmark studies are generally the focus of reports such as the one by Barefoot and Mataloni. But 1999 and 2009 are not the right years to use when looking for major investment trends by US firms. US domestic employment at US MNCs fluctuates with the overall macroeconomic health of the US economy, as can been seen in figure 2. If, for example, the years 2003 and 2011 had been the focus, then we see that US MNCs added 1.8 million US workers during that time frame. This section of the Policy Brief focuses on the effect that offshoring by US MNCs has on employment behavior by the same firms in the domestic economy, as well as the effect of offshoring on investments in R&D, capital spending, exports, and sales by these US firms in the domestic economy. It is not possible to make any conclusions about this external-behavior/internal-behavior relationship simply by citing the change in MNC domestic employment from one year to another.

Any economy is a messy place where a lot of things happen at the same time. Econometric analysis helps us make sense of this mess by holding some of these factors constant and allowing us to isolate the relationship between only two moving pieces: in this case MNC operations at home and abroad. Controlling for individual firm and industry characteristics is crucial, as some industries are growing and some are shrinking. It is also important to consider the impact of business-cycle and other macroeconomic factors at any point in time, which we do in our empirical analysis. The results presented in figure 1 control for business cycle and industry characteristics and show that, all else equal, when firms expand abroad they also expand domestically. This fundamental relationship between outward expansion by US MNCs and their domestic employment has not changed across time periods. The numbers presented in figure 1 use data from 1990 to 2009. But the results are the same when data from only 1999 to 2009 are included in this econometric analysis. Volumes of offshoring go up and down, but the relationship between these offshoring volumes and domestic activities by MNCs continues to hold up in the analysis of the data. The factors other than offshoring that we control for also change over time and with business cycles. These other factors could add or subtract their own effects to the 6.2 percent increase in US R&D spending or the 3.8 percent increase in domestic manufacturing employment that we can link to each 10 percent increase in manufacturing employment overseas. These other factors include the macroeconomic environment as well as industry-level changes in the manufacturing subsectors, such as greater automation replacing low-skilled workers, reduced demand for certain products, and other changes in the industry. This is an important distinction between simple data points, such as the ones often quoted from the Barefoot and Mataloni (2011) report on the one hand and econometric regression results on the other. Regression coefficients like the ones reported in figure 1 explicitly acknowledge the role of other factors, in this case the role that business cycles and industry characteristics play in influencing employment, R&D spending, and other outcomes. But these regressions use statistical techniques to control for these other factors, and thereby isolate only the relationship between two variables. The fact that US MNCs employed more workers in the United States in 1999 than in 2009 doesn't negate

Figure 2 Number of US employees at US MNCs, 1997–2011 (millions)



Source: US Bureau of Economic Analysis.

this finding about the relationship between outward investment and domestic activity; indeed, it highlights that there were many other business cycle and industry factors at play between those time periods. Based on these results, any observed fall in domestic employment is clearly not due to offshoring, because of our confirmation that offshoring is accompanied by domestic expansion by the firms that are doing the offshoring. In the case of the 1999 to 2009 comparison, the difference in US domestic employment between those two years must be traced to some combination of bubbles and recessions, not external investment. Indeed, if US MNCs had not undertaken the external investments and external job creation that they did during this period, the results in figure 1 indicate that US domestic employment at US MNCs would have shrunk even more.

Another trend that makes the counterfactual so difficult to pinpoint is that most of the foreign expansion by US MNCs has not been to offshore intermediate production. It has occurred to take advantage of opportunities to sell products made by US firms to new customers in emerging markets. The Barefoot and Mataloni report (2011) points out that "the goal of the US MNCs' expanded production was to primarily sell to local customers rather than to reduce their labor costs for goods and services destined for sale in the United States, Western Europe, and other high-income countries." So the likely alternative to MNC expansion abroad would not have been more employment at home but rather fewer new sales growth opportunities abroad. Thus it is crucial to perform an econometric analysis like the one presented in figure 1 to isolate the relationship between expansion by US MNCs at home and abroad, comparing likes with likes and not confounding the link between a single firm's domestic and foreign operations with unrelated business-cycle macroeconomic factors.

IMPLICATIONS FOR US POLICY

The expansion of operations abroad by US multinationals leads to increases in economic activity by those same firms in the US domestic economy. The expansion of operations abroad by US manufacturing multinationals leads to particularly strong increases in economic activity—including creation of greater numbers of high-paying manufacturing jobs—by those same firms in the US domestic economy. Any measures that the United States might take to hinder or disincentivize outward expansion by US firms would lead to less robust economic activity—and fewer good US jobs—at home, not more. From this perspective, President Obama is misguided when he says: "My message is simple. It's time to stop rewarding businesses that ship jobs overseas, and start rewarding companies that create jobs right here in America" (State of the Union 2013).

The policy objective for the United States should be to ensure that the US economy remains an appealing location for all multinationals to base their global operations. The key policy

ingredients include lower corporate tax rates, infrastructure renovation, and high-skilled immigration reform.

Of particular importance are measures to increase the workplace skill levels of US wage earners. Survey data from US employers consistently show—in weak economic conditions as well as strong economic conditions—more demand for skilled workers than available supply. Yet, rather than responding positively to this demand, the OECD (2013) reports that the skill level of the US workforce is actually slipping in comparison both to previous US standards and also to skill levels in peer economies around the world. Indeed, a number of studies, including Autor, Katz, and Kearney (2008), have shown that much of the increase in income inequality in the United States over the past several decades can be attributed to the fact that the demand for highly skilled workers has been growing faster than the supply of those workers in the United States. The response to declining employment in the US manufacturing sector should not be to cut off the new opportunities created by globalization, but rather to prepare the US workforce to take broader advantage of precisely those opportunities documented in the study presented here.

At the same time, adjustment assistance for workers who are laid off due to trade needs to be expanded to include service workers, fortified with more generous health care benefits, and accompanied by wage insurance to cushion accepting a new job that pays lower wages. Strengthening adjustment assistance helps keep the domestic economy operating efficiently, helps offset protectionist reactions, and provides assistance to those less able to cope with the pressures of globalization.

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APPENDIX

REGRESSION RESULTS USED TO CREATE FIGURE 1

Table A.1 The relationship between manufacturing affiliate activity and US domestic outcomes for US manufacturing firms (strictly defined)

dep var	Δln(paremp)	Δln(exports)	Δln(parrd)	Δln(parsales)	Δln(parppe)
Δln(dlnafemp)	0.376***	0.376***	0.621***	0.394***	0.382***
	(0.016)	(0.029)	(0.059)	(0.018)	(0.021)
N	25,990	16,985	9,833	26,003	24,976
R-sq	0.189	0.077	0.062	0.191	0.078
dep var	**Δln(paremp)**	**Δln(exports)**	**Δln(parrd)**	**Δln(parsales)**	**Δln(parppe)**
Δln(dlnafsales)	0.221***	0.255***	0.823***	0.254***	0.238***
	(0.015)	(0.028)	(0.051)	(0.017)	(0.017)
N	25,176	16,468	9,845	25,203	24,177
R-sq	0.116	0.057	0.101	0.134	0.055

Notes: *** denotes significance at the 1 percent level. Standard errors are reported in parentheses. *Δln(paremp)* denotes the log change in employment at the US parent firm, *Δln(exports)* denotes the log change in exports by the US parent firm, *Δln(parrd)* denotes the log change in R&D spending by the US parent firm, *Δln(parsales)* denotes the log change in sales by the US parent firm, *Δln(parppe)* denotes the log change in capital expenditures by the parent firm, *Δln(dlnafemp)* denotes the log change in employment at foreign affiliates of the parent firm, and *Δln(dlnafsls)* denotes the log change in sales by foreign affiliates of the US parent firm. All regressions include both firm and year fixed effects.

Table A.2 The relationship between manufacturing affiliate activity and US domestic outcomes for services

dep var	Δln(paremp)	Δln(exports)	Δln(parrd)	Δln(parsales)	Δln(parppe)
Δln(dlnafemp)	0.273***	0.196**	1.075***	0.362***	0.233***
	(0.056)	(0.097)	(0.263)	(0.088)	(0.06)
N	996	316	303	937	926
R-sq	0.134	0.062	0.212	0.136	0.063
dep var	**Δln(paremp)**	**Δln(exports)**	**Δln(parrd)**	**Δln(parsales)**	**Δln(parppe)**
Δln(dlnafsales)	0.130***	0.092	1.319***	0.225***	0.161***
	(0.037)	(0.112)	(0.183)	(0.058)	(0.043)
N	917	307	303	874	848
r-sq	0.086	0.037	0.403	0.111	0.07

Notes: ** and *** denote significance at the 5 and 1 percent levels, respectively. Standard errors are reported in parentheses. *Δln(paremp)* denotes the log change in employment at the US parent firm, *Δln(exports)* denotes the log change in exports by the US parent firm, *Δln(parrd)* denotes the log change in R&D spending by the US parent firm, *Δln(parsales)* denotes the log change in sales by the US parent firm, *Δln(parppe)* denotes the log change in capital expenditures by the parent firm, *Δln(dlnafemp)* denotes the log change in employment at foreign affiliates of the parent firm, and *Δln(dlnafsls)* denotes the log change in sales by foreign affiliates of the US parent firm. All regressions include both firm and year fixed effects.