



US Employment Deindustrialization: Insights from History and the International Experience

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Manufacturing is a key sector of the US economy. Although value added in manufacturing represented just 11.9 percent of GDP in 2012, manufacturing activity is strongly associated with economic growth, because manufacturing serves as the fulcrum of supply chains that combine and process raw materials and services to produce goods.¹ In addition, the sector is among the most dynamic—accounting for about 70 percent of US spending on business research and development—and it regularly outstrips the rest of the economy in productivity growth. Over the long run, the contributions of US manufac-

1. The connection between employment in manufacturing and employment in producing other inputs embodied in final goods is sometimes referred to as the “manufacturing multiplier.” While it captures the interdependence between manufacturing and the rest of the economy, as we elaborate in Edwards and Lawrence (2013, 39), claims that this measure has a causal significance are often based on flawed reasoning.

turing to total output growth have been steady. Measured in 2005 dollars, for example, the share of manufacturing in US output was about the same in 2005 as in 1947.²

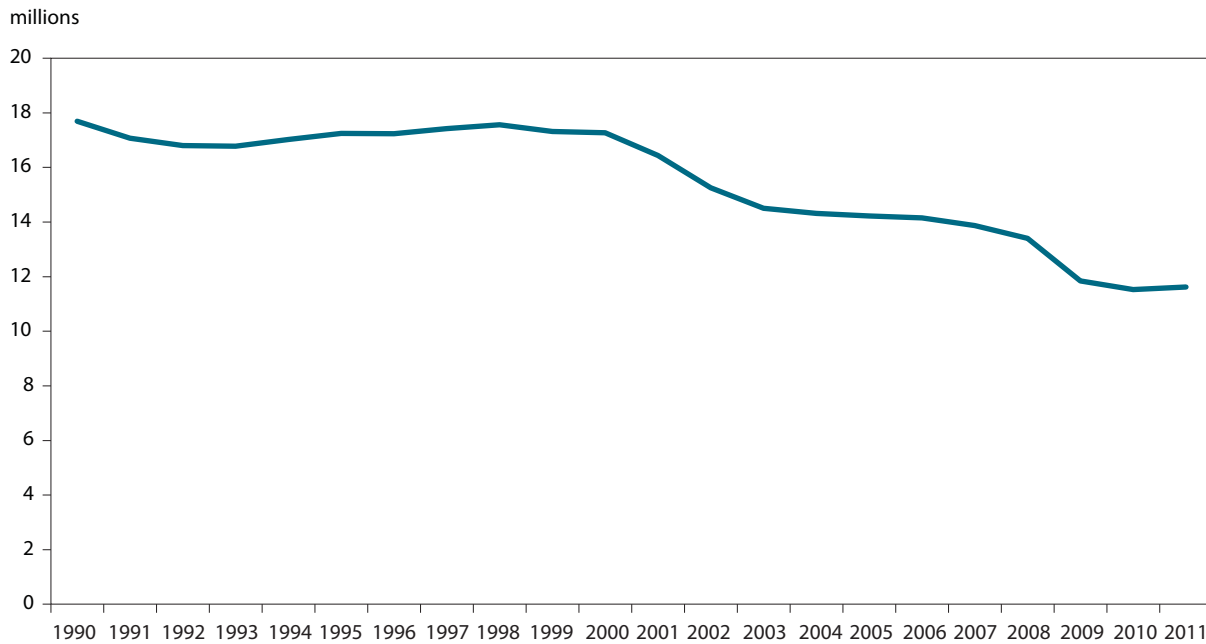
The concerns about US manufacturing are not about output or growth but relate to employment and, in particular, the ability of the sector to provide opportunities for blue-collar US workers to enter the middle class. The share of jobs available in manufacturing has been declining steadily since the mid-1950s. Between 1990 and 2000 at least the level of employment in US manufacturing actually remained fairly constant, but after 2000, it declined steeply (figure 1). The manufacturing sector lost 5.8 million jobs between 2000 and 2010—primarily during the recessions of 2001–02 and 2008–10. Many regard this decline as a surprise.³

It is generally believed that international factors have been the most important source of manufacturing employment decline (see Atkinson 2013). This explanation would seem to be plausible. After all, since 2000, the United States has also experienced a dramatic increase in imports from emerging-market economies, especially China. In addition, the trade deficit in manufactured products has more than doubled in nominal terms. Indeed, several recent studies conclude that imports have caused considerable displacement of manufacturing workers.⁴ David Autor, David Dorn, and Gordon Hanson (forthcoming) argue that some of this job loss results from improvements in Chinese manufacturing capabilities. Justin Pierce and Peter Schott (2012) ascribe an important role to China’s entry into the World Trade Organization (WTO). At the same time, some claim that various trade and industrial

2. Measured in 2005 dollars, manufacturing share of gross US output was 17.5 percent in 1947 and 17.3 percent in 2005. Between 1947 and 2005 the share averaged 17.3 percent and was essentially trendless (Groningen Growth and Development Centre, GGDC 10-Sector Database, www.rug.nl/research/ggdc/data/10-sector-database; see also Baily and Bosworth 2013).

3. The title of a recent paper by Pierce and Schott (2012) is “The Surprisingly Swift Decline of US Manufacturing Employment.”

4. See Autor, Dorn, and Hanson (forthcoming), McLaren and Hakobyan (2012), Pierce and Schott (2012), Harrison, Mcmillan, and Null (2007), and Ebenstein et al. (2009).

Figure 1 US manufacturing employment, 1990–2011

Source: Bureau of Labor Statistics.

policies have hampered US competitiveness (Edwards and Lawrence 2013, 5).

In the course of the current economic recovery, manufacturing employment in the United States has risen steadily but modestly. In addition, the sector's prospects have brightened. The United States is becoming more competitive for various reasons, including wages being held in check at home while wages are rising in China. China's currency, the renminbi, has also risen in value against the dollar, making Chinese exports more expensive and imports less expensive for Chinese consumers. US manufacturers are also taking advantage of new production technologies, such as artificial intelligence and 3-D printing (McKinsey Global Institute 2012). Meanwhile, surging US oil and natural gas production is lowering energy costs for US manufacturers (Sheets and Sockin 2013).

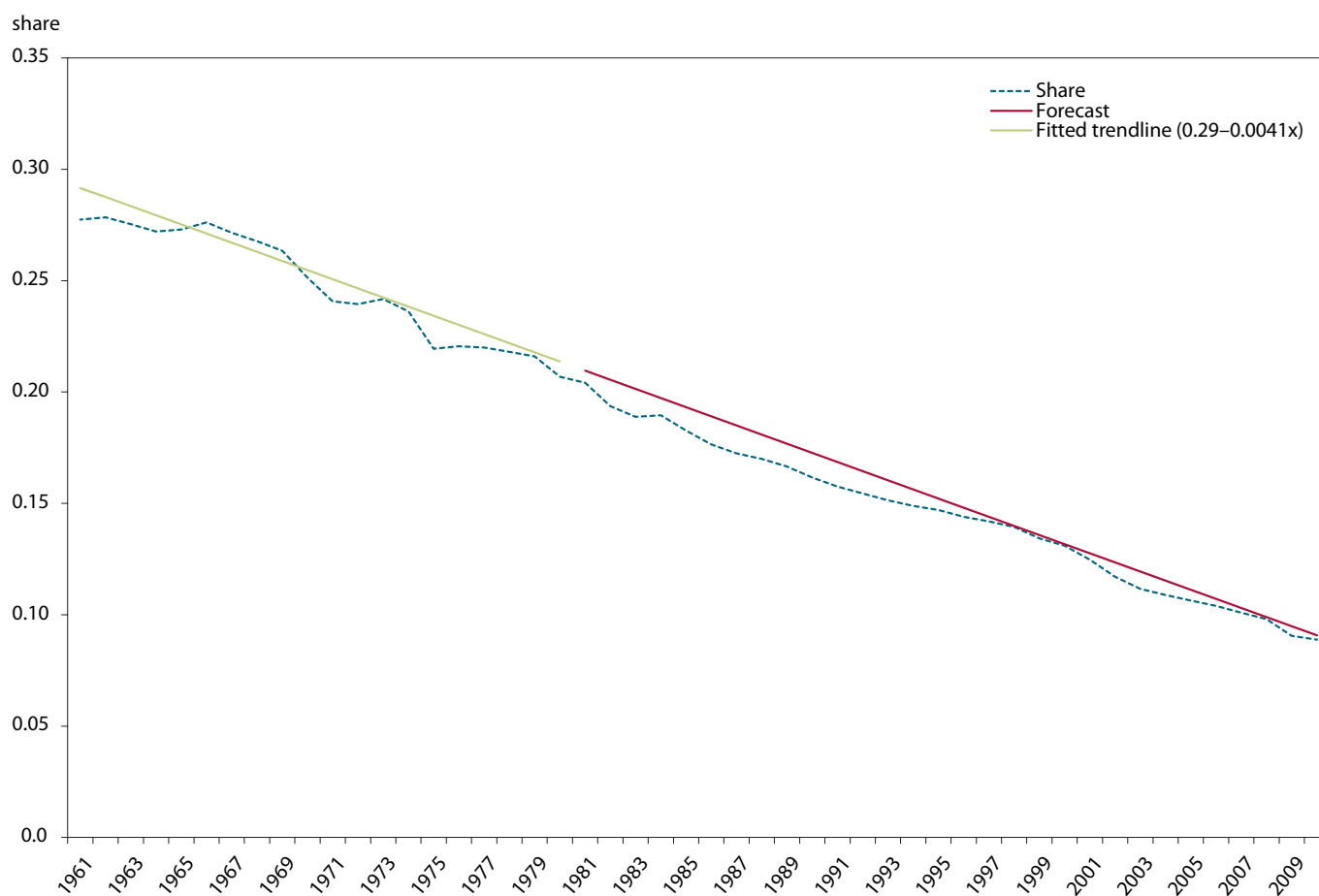
This Policy Brief expands and further explores the research we undertook for our Institute study *Rising Tide: Is Growth in Emerging Economies Good for the United States?*⁵ We argue that while trade has contributed to the decline in US manufacturing employment, many exaggerate the role of international competition. The US manufacturing employment decline results less from international factors and is instead driven by powerful historical forces that have affected all advanced

economies. These are a combination of rapid productivity growth and demand that is relatively unresponsive to income growth and lower prices.⁶

We do not claim that international factors do not affect manufacturing. Our estimates suggest that the labor content of the US manufacturing trade deficit remains significant and that despite improvements in US competitiveness, a vigorous US and global economic recovery could boost US manufacturing employment. Over the long run, however, absent new product innovations, or a shift in consumer preferences, the basic forces leading to the declining share of manufacturing in overall employment are unlikely to abate. Just as rapid farm productivity growth combined with a limited demand for food has led to ever smaller shares of employment in agriculture, the combination of relatively rapid productivity growth and limited demand growth for goods will mean that more of the jobs in the future will be in services.

5. For additional analysis on US performance in a global perspective, see Levinson (2011).

6. For a persuasive complementary analysis, see Kehoe, Ruhl, and Steinberg (2013). They find that "rapid productivity growth in goods production, rather than US (international) borrowing has been the most important driver of the decline in goods sector employment" (see abstract of their paper).

Figure 2 Share of manufacturing in total nonfarm employment, 1961–2010

Source: Bureau of Labor Statistics.

HISTORICAL TRENDS

Figure 2 plots the manufacturing share of nonfarm employment over 1961–2010. The trend decline in the share of manufacturing employment in total nonfarm employment is clear. In 1961, manufacturing accounted for 27.7 percent of US nonfarm employment; by 2010, this share had fallen to just 8.9 percent. Most remarkable is the persistence and stability of this declining relationship, irrespective of the changing developments in international trade flows, the size of the trade deficit, and other factors during this period. To illustrate this, a trend regression line has been fitted to the data from 1961 and 1980 and then extrapolated through 2010. Using the trend from 1961 to 1980, a forecaster in 1980, knowing that in 2010 total nonfarm employment would be 129 million, would have predicted manufacturing employment in 2010 to be within 25,000 of its level of 11.524 million, that is, with an error of less than 1 percent 30 years out of sample!

A simple regression can also capture the fluctuations in manufacturing employment in relationship to changes in total employment in the economy. We estimated this relationship by relating annual percentage changes in manufacturing employment ($\% \Delta M$) to annual percentage changes in total employment ($\% \Delta E$).⁷ We find that the resulting equation explains the changes in manufacturing employment growth accurately.⁸

$$\% \Delta M = -3.74 + 1.80 * \% \Delta E$$

The equation indicates that if there is no overall employment growth in the economy, manufacturing employment will

7. The regression we obtain is:
Period 1962 to 2010 (*t* statistics in parentheses)
 $\% \Delta M = -3.74 + 1.80 * \% \Delta E$
(17.5) (22.26)

8. The equation accounts for 91 percent of the variance (R-squared) and has a root mean squared error of 1.1 percent. Both coefficients are highly significant.

fall by 3.74 percent annually (the negative constant term in the regression). However, employment in manufacturing is also very sensitive to overall employment growth. For each 1 percent increase (decrease) in overall employment, manufacturing employment will increase (decrease) by 1.8 percent. The equation also indicates that it would take employment growth of roughly 2 percent per year (i.e., $3.74/1.80$) to keep manufacturing employment constant—basically what occurred in the 1990s.

The shift from stable employment prior to 2000 to the large absolute declines thereafter was thus predictable even without taking account of the growth of US imports from China or the growing trade deficit. The big story after 2000 was the weakness of overall employment growth. Given that overall employment growth between 2000 and 2010 averaged -0.16 percent annually, the regression prediction is that manufacturing employment would fall at a rate of 3.8 percent annually. This was almost precisely equal to the annual average decline of 3.9 percent that actually occurred.

This regression must be interpreted cautiously. It is obviously not a structural model and simply provides a statistical summary of the historic relationship between two endogenous variables. Causation between the variables could run both ways and both are affected by more fundamental factors (income growth, investment, etc.). It is, however, plausible that the constant term partly reflects the relatively more rapid trend in manufacturing productivity growth while the coefficient on total employment captures changes in the demand for manufacturing workers to produce cyclically sensitive products such as consumer durables, automobiles, and equipment. But a much more fully specified model is really required for a more complete understanding of the channels by which the variables interact.

Nonetheless, the regression does demonstrate the very strong association between manufacturing employment and the overall health of the economy, and it suggests that ultimately the key to more robust short-run manufacturing employment growth is strong domestic growth. While international competitiveness is important, US manufacturing employment remains highly dependent on American-based demand and production. Between 2001 and 2010, the US economy was able to average annual growth in real GDP of just 1.6 percent. This compares with annual average rates of growth of 3.2, 3.3, and 3.4 percent in the 1970s, 1980s, and 1990s, respectively.⁹ It is thus no surprise that manufacturing employment growth has been so weak.

9. US Bureau of Economic Analysis, Real GDP Growth National Income Accounts, table 1.12.

WHY DOES THE SHARE OF MANUFACTURING EMPLOYMENT DECLINE?

What has made manufacturing employment grow more slowly than employment in the overall economy? The answer reflects a combination of three major forces: productivity growth, demand for goods, and international trade. While they are interconnected, it is useful to consider each in turn.

Productivity Growth

Manufacturing has experienced relatively faster productivity growth than the rest of the economy. Over the period 1960–2007, for example, labor productivity growth in manufacturing increased 1.51 percent per year more rapidly than labor productivity growth in the economy as a whole.¹⁰ Similarly, total factor productivity growth in manufacturing—a measure of improvements in technical efficiency that takes other inputs into account—has outpaced total factor productivity growth in the economy as a whole by 1.2 percent.¹¹

Why has productivity growth generally been so much faster in manufacturing? One explanation is that the sector accounts for the vast majority of research and development spending. Presumably, though, much of this spending indicates the greater potential for innovation in this sector. Another factor is that manufacturing processes are more easily automated.¹² A third reason is that competition is more intense in manufacturing because its output is internationally tradable. By contrast, it seems more difficult to improve and measure productivity growth in services.¹³

This differential productivity growth between manufacturing and services in large economies like the United States that affect world prices eventually leads to a fall in the relative prices of goods. Think, for example, what has happened over time to the prices of computers and TVs compared with education and medical services. If competitive forces operate

10. Manufacturing averaged 17.3 percent of value-added in the economy between 1960 and 2007. Thus labor productivity growth in manufacturing was 1.8 percent faster than in nonmanufacturing.

11. For an elaboration, see Lawrence and Edwards (2013, 66–71).

12. Indeed Dani Rodrik (2011) has found that unlike the overall economy, manufacturing productivity growth occurs unconditionally. See also Mcmillan and Rodrik (2011).

13. The relatively slower productivity growth in services is sometimes described as “Baumol’s cost disease” after William Baumol, who with William Bowen first pointed out the inherent limitations on productivity growth in some services (Baumol and Bowen 1965). In the 1960s, they studied the performance arts and observed that the same number of musicians are needed to play a Beethoven string quartet today as were needed in the 19th century; that is, the productivity of classical performance has not increased.

properly, and productivity increases in an industry, eventually its relative prices will fall. Assuming given input costs, if prices did not fall, firms would be earning excess profits and over time new entrants would increase supply until prices fell sufficiently to restore normal profit levels.¹⁴ In the long run, therefore, a reasonable assumption is that relative prices will (roughly) keep step with productivity differentials.¹⁵

What has made manufacturing employment grow more slowly than employment in the overall economy? The answer reflects a combination of three major forces: productivity growth, demand for goods, and international trade.

The net response of employment to productivity changes will therefore depend on the responsiveness of demand to these price changes. Given a fixed quantity of output, faster productivity growth will mean less employment, since fewer workers are required to produce that given amount. But if demand is elastic, i.e., if the percentage increase in the quantity demanded is greater than the percentage quantity of labor saved per unit, lower prices could boost demand sufficiently to actually increase the demand for labor inputs. However, if demand is inelastic, fewer inputs may ultimately be required. Ultimately, therefore, the employment implications of productivity improvements will depend on how spending responds to lower prices.

Demand

While there is considerable debate about American prowess in production, no one doubts Americans' ability to spend! Thus it is informative to ask how Americans have allocated their spending between goods and services, since the demand for manufacturing workers will ultimately depend on the demand for goods.

14. In noncompetitive markets, a similar result occurs in the face of constant demand elasticity, since cost markups are unchanged. The markup is generally a function of demand elasticity. As long as demand elasticity does not change, markups will be constant and productivity growth reflected in lower prices.

15. This can be seen in Edwards and Lawrence (2013, 71, figure 3.5). Actually, this assumes (Hicks) neutral productivity growth and that factor shares are the same in manufacturing and other sectors of the economy. For the theoretical specification, see Feenstra (2004, 125). For evidence that prices track productivity growth, see Nordhaus (2006).

We have developed measures of total US spending on goods and services in both nominal and real terms. These measures reflect spending on finished goods by final purchasers and thus include more than just value added in manufacturing. When they buy finished manufactured goods in the United States, consumers have to pay not only for the manufacturing production embodied in goods but also for the raw materials and services that are used in production as well as the distribution services (transportation, wholesale and retail trade) required to bring the goods to markets. Moreover, they buy goods not only produced in the United States but also imported from the rest of the world. Thus we are measuring not simply the US market share of American producers but also the potential market share for all suppliers of manufacturing to the United States. If America had no trade, this would be the extent of the market for goods.

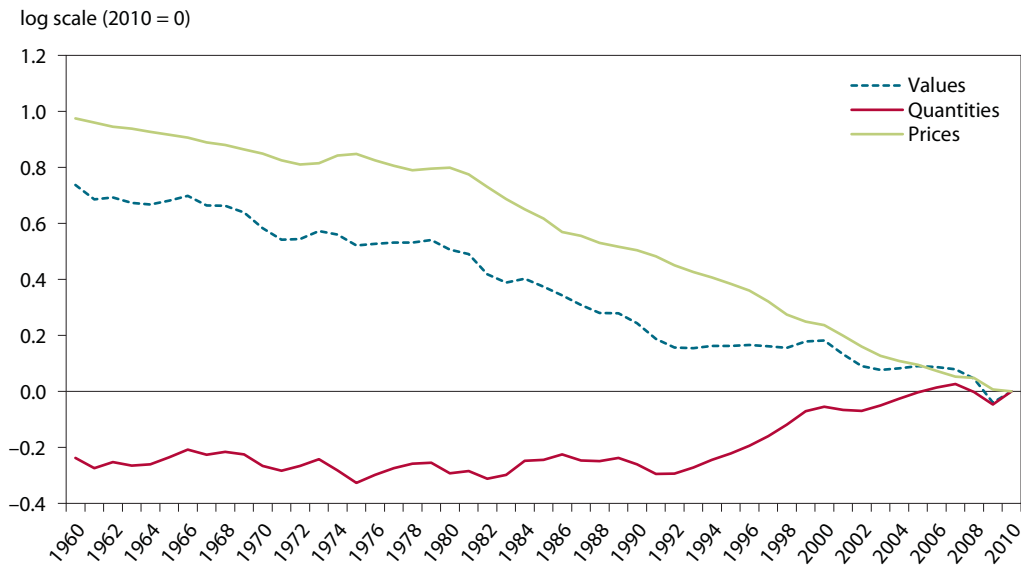
The national income accounts allow us to develop separate measures of US spending in total and on goods and services separately. Total production in the United States is given by income, which is equivalent to consumption plus investment plus government expenditure plus exports minus imports ($C + I + G + X - M$). Total spending by Americans excludes exports and is given by consumption plus investment plus government expenditure ($C + I + G$), which includes imports. We determine expenditure on goods (i.e., $C + I + G$) specifically by totaling the line items in the national income accounts that are reported for (1) personal consumption expenditure on goods, (2) private and government investment expenditure on equipment (and software, which is included in this category), and (3) government consumption expenditure on goods.¹⁶ Almost three-quarters of this spending on goods reflects personal consumption.¹⁷ We determine services expenditure by aggregating personal and government consumption expenditure on services. These measures of US domestic spending thus include imports but exclude exports.

Figure 3 shows powerful trends in the data over the past 50 years. The top line shows the dramatic decline in the prices of goods relative to services over the period—by 100 log points over the 50 years or 1.95 percent per year.¹⁸ If the relative price changes for goods move in line with relative changes

16. A more detailed description of our methodology can be found in Edwards and Lawrence (2013, 75).

17. Between 1969 and 2010, on average, personal consumption expenditure accounted for 73.4 percent of overall US spending on goods.

18. The goods prices relevant for *final* goods demand are not only those for the value added in the manufacturing process but also the costs of wholesale and retail distribution and those of the primary commodity and services inputs that are used in goods production. Given the final demand for goods, therefore, the demand for manufactured goods will thus also reflect any changes in distribution margins.

Figure 3 US spending on goods relative to services, 1960–2010

Source: Bureau of Economic Analysis, US National Income Accounts, www.bea.gov/iTable/index_nipa.cfm.

in productivity growth and the quantity of goods purchased were to grow at the same rate as the quantity of services, and the share of spending on imports remained constant, this would imply a reduction in the relative demand for labor in the production of consumption and investment goods relative to services of 1.95 percent per year.¹⁹ If, however, lower goods prices increased the quantity of goods purchased relative to services, the reductions in labor demand would be smaller.

As can be seen in the figure, from 1960 until about 1992, the quantity of goods purchased increased just about as rapidly as the quantity of services. After that, until 2000, the pace of goods purchases picked up, rising about 24 log points or 3 percent per year. But since 2000 the relative demand for goods has again remained constant. Thus over the full 50-year period, the annual average decline in prices, which is about 2 percent, has been offset by an increase in quantities of just 0.5 percent annually.

The 1990s were thus an unusual period in that the real share of spending on goods actually increased (figure 3, bottom line). Some of this was reflected in increased imports, especially from developing countries, and some of it was reflected in increased spending on electronic equipment (computers and telecommunications) associated with Y2K and the dot.com boom. But since 2000 the relative share of real spending on goods has again been quite constant, and remarkably even

though their relative prices had fallen rapidly, the share of total spending on equipment has fallen in half.

All told, the labor demand effect of the increase in quantity of goods consumed relative to services was insufficient to offset the decline in relative labor demand associated with the relatively strong productivity growth in the goods sector.

The result, as captured by the middle line in figure 3, was that for most of the period, (the 1990s are an exception) dollar spending on goods relative to services has a strong downward trend. In combination, consumers, government, and investors have been devoting declining shares of nominal spending to goods relative to services.²⁰ The overall impact, inclusive of investment expenditure on equipment and software, was a decline in nominal US spending on goods relative to services by 1.47 log points (percent) per year over the entire period.²¹

This sluggish increase in the relative volume of goods purchased in the face of relatively rapid growth in productivity in manufacturing and declining relative prices implies that even if the US economy had had no trade, the share of employment in the production of goods would have fallen relative to

19. Since incomes are also rising, this implicitly assumes a unitary income elasticity of demand for goods.

20. Thus, even if the demand for goods is (price) elastic, as found by William Nordhaus (2005), if the income demand elasticity is less than one, the share in overall spending on goods and employment could fall over time.

21. In 1960, for example, US consumers were allocating half of all their spending on consumption to goods—50.3 percent. By 2010 that share had fallen to 33 percent. Similarly, US government consumption and investment expenditure on goods made up 61 percent of expenditure in 1960, but by 2010 this had fallen to 42 percent.

employment in the production of services. The combination of relatively faster productivity growth in manufacturing, falling prices, and an unresponsive demand for goods implies that finished goods have a smaller share of overall US expenditures over time. The corollary of this outcome is that sectors with slower productivity growth assume greater importance in US incomes.

It is noteworthy that while overall median wages in the United States have been stagnant, there have been marked increases in the ability of those earning median wages to purchase durable goods such as TVs and other electronic products and automobiles.²² The stagnation in incomes reflects the fact that relative services prices (and the weight of services in overall spending) have been rising. All told, this means that over time, unless productivity growth in services accelerates, overall growth in the United States is likely to decline as the more dynamic goods sector makes up a smaller share of the economy.²³

Trade

So far we have tracked US spending on goods of various kinds, i.e., $C + I + G$. But ultimately employment in manufacturing depends not only on employment due to domestic spending ($C + I + G$) but also on employment due to the trade balance ($X - M$). In what follows, therefore, we calculate the employment equivalence of the manufacturing trade deficit.

These estimates need to be treated with great care. This is an arithmetic exercise rather than a simulation with an economic model. We provide it simply to give a sense of the order of magnitude of the jobs embodied in the manufacturing trade balance.²⁴ It should be emphasized that the trade deficit is an outcome driven by other factors (e.g., spending, relative prices) not an exogenous variable or causal factor. And thus the estimates we obtain here only indicate after the fact (ex post) the manufacturing employment equivalence of the manufacturing trade deficit and do not accurately capture the number of manufacturing jobs that might be added if the deficit were actually to be closed in one way or another.²⁵

22. We owe this observation to Lawrence Summers.

23. Nordhaus (2006, 38) estimated that the “growth disease,” the tendency of more technologically stagnant sectors in the economy to command higher output shares, lowered aggregate US productivity growth between 1948 and 2001 by one-half of a percentage point.

24. An earlier calculation along these lines is Bailey and Lawrence (2004).

25. See Edwards and Lawrence (2013, chapter 1) for a more complete discussion. As we elaborate in our book, a larger trade deficit that reflects imports that are growing because domestic production is being displaced could indeed lead to job loss, but no jobs need be lost when a larger deficit results from import growth that reflects an increase in domestic expenditure or increased

In the estimation, we assume that to close the trade deficit, domestic expenditure on these import industries is reoriented toward corresponding domestic products so that there’s an increase in US manufacturing employment. Similarly, to close the trade surpluses, we assume that exports and domestic production are reduced so that there’s a decrease in US manufacturing employment. We thus add the employment content of the trade balances in the manufacturing industries with trade deficits and subtract the employment content of the trade balances in industries with trade surpluses. To estimate job equivalents we assume that labor productivity each year would have been the same as was actually experienced that year in each industry (and those that supply it.)

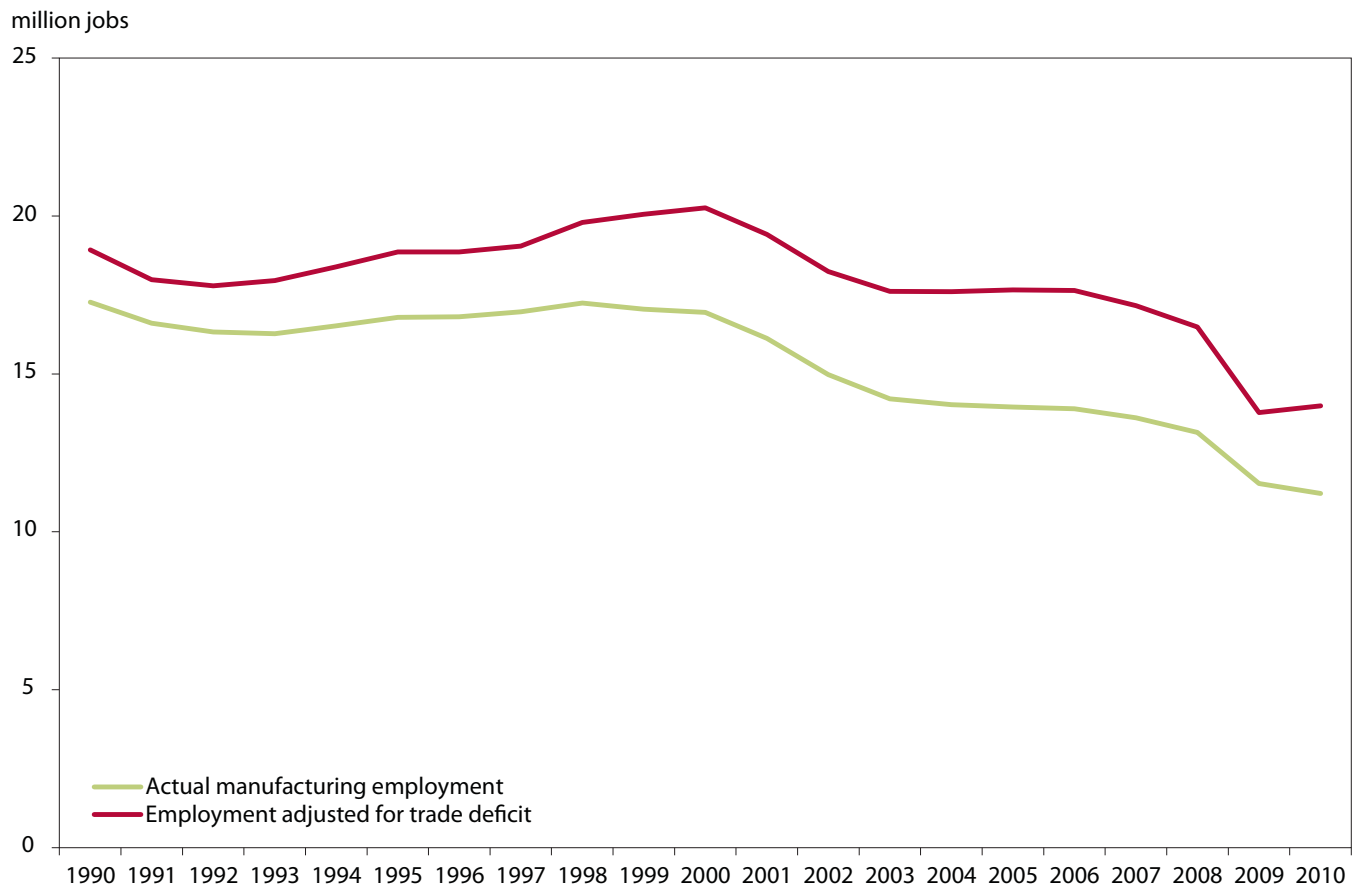
To carry out the estimation we assume that in the industries in which the United States ran trade deficits, domestic expenditure is reoriented toward domestic products such that the deficit is eliminated. Similarly, we assume that in industries in which the United States ran trade surpluses, exports and domestic production would have been reduced so that they matched imports. We thus add the employment content of the trade balances in the manufacturing industries in which the United States had deficits and subtract the employment content of the trade balances in industries in which the United States had surpluses. We also assume that labor productivity growth would have been the same as was actually experienced in each industry (and those that supply it.)

To undertake this analysis we use the annual Input-Output Tables produced by the US Bureau of Economic Analysis. We use these tables to link the changes in US spending to production (value added) in the US manufacturing sector. We use the tables to take account of not only the direct output effects of eliminating the deficits (or surpluses) in manufacturing but also the indirect effects on output in other manufacturing sectors. Given the changes in sector output we can then estimate the employment equivalence using the nominal employment/output ratios in each year.²⁶

Figure 4 shows actual manufacturing employment and an employment series that adds back the employment equivalence of the manufacturing trade deficit over the period from 1990 to 2010. This period coincides with a strong increase in the manufacturing trade deficit up to 2006–07, a narrowing of the deficit during the global financial crisis of 2008–09, and a rise as the economy began to recover in 2010. In 1990, the manufacturing trade deficit was equivalent (both directly and

demand for intermediate inputs needed for domestic production. By ignoring this distinction and claiming that all imports result in actual job loss, the estimates of Robert Scott (2010) exaggerate job losses due to trade.

26. Our methodology is described in detail in Edwards and Lawrence (2013, 80, footnote 32).

Figure 4 Manufacturing employment, actual and without trade deficit: Different levels, similar decline after 2000

Note: Estimates include the direct and indirect employment (full-time equivalent) effects in manufacturing, calculated using the 2005 Make and Use Tables of the Bureau of Economic Analysis, www.bea.gov/iTable/index_nipa.cfm.

Source: Authors' calculations using data from the Bureau of Economic Analysis and Bureau of Labor Statistics.

indirectly) to 1.65 million full-time equivalent jobs in manufacturing. This rose to 3.3 million jobs in 2000 with the sharp increases in the manufacturing trade deficit.²⁷ As a percentage of actual manufacturing employment, adding the jobs equivalent to the deficit raises manufacturing employment by 10.4 percent in 1990, 20 percent in 2000, 26 percent in 2007 just prior to the financial crisis, 20 percent in 2009, and 26 percent in 2010 as the economy began to recover.

The series also reveals that the rise in the manufacturing trade deficit basically had had very little impact on the total job equivalence of the trade deficit between 1998–99 and 2010. This conclusion is surprising. After all, despite the recession, the trade deficit in manufactured goods in 2010 of

\$644 billion was more than twice the \$256 billion deficit in 1998. But the employment equivalence of 15 percent of 1998 employment was 2.5 million, whereas the employment equivalence of 26 percent of 2010 employment was only marginally higher at 2.7 million.

The explanation for this paradox is that productivity growth in manufacturing was extraordinarily rapid over this period. Thus, over time any given trade balance translated into fewer job equivalents. Faster productivity growth (output per worker) had a very large impact on the employment equivalence of the manufacturing trade deficit over time. Indeed, at 1990 productivity levels the deficit in 2007 would have represented about 8 million jobs.

While manufacturing employment would be higher if the jobs embodied in the deficit are added to domestic production, the overall declines and timing of changes in manufacturing employment growth over the past decade are not very

27. Since the overall economy was at full employment (i.e., under 4 percent unemployment rate), an expansion in manufacturing employment would have required a reduction in employment elsewhere.

different. Both series indicate large and similar drops (on the order of 6 million jobs) in employment between 2000 and 2009, demonstrating the powerful role played by recessions rather than trade deficits as the major reason for the job loss.²⁸ Clearly both series are being heavily influenced by the combination of domestic demand and productivity growth that we identified earlier. All told, these results are considerably at odds with much of the popular discussion about recent manufacturing job loss in which international trade is seen as the most important factor.

Closing the US trade deficit in manufactured goods in the context of an overall economy that is growing should help boost both manufacturing and overall employment. The estimates on the order of 2.7 million manufacturing jobs we obtain for 2010 are only of the manufacturing employment content embodied in the manufacturing trade deficit in that year. Of course, the total employment impacts could be larger. Because manufacturing products embody services, if the deficit was closed through increased exports and the substitution of imports with domestic production, additional employment would also be created outside of the manufacturing sector. Moreover, under conditions of high unemployment, this additional demand could give rise to multiplier effects that would further boost both manufacturing and overall employment.

Closing the deficit would provide a one-time employment boost, but it would not change the long-run trend. Thus while the employment effects of a smaller trade deficit could be a substantial one-time employment boost, they would have to be set against the powerful forces of rapid productivity growth and inelastic demand we have found in the previous section. Taking a few steps upwards, on an escalator that is moving downwards can for some time offset your downward movement, but if you stop climbing upwards, you will continue your descent. Similarly, unless the deficit keeps on shrinking and eventually turns into an ever-growing surplus, ultimately, the long-run forces are likely to again resume their impact.

INTERNATIONAL PERSPECTIVES

Much of the discussion about deindustrialization in the United States focuses on policies and practices that are specifically American, with the presumption that had these been different, the United States might have avoided the shrinking share of manufacturing employment. It is useful, therefore, to compare the US experience with that of other industrial countries. This exercise shows that the United States is by no means unique. Declining employment shares in manufacturing and

Table 1 Share of employment in manufacturing, advanced economies, 1973–2010 (percent)

Country	1973 (1)	2000 (2)	2010 (3)	Change (3) – (1)
United States	24.8	14.4	10.1	–14.7
Canada	22.0	15.3	10.3	–11.7
Australia	23.3	12.0	8.9	–14.4
Japan	27.8	20.7	16.9	–10.9
France	28.8	17.6	13.1	–15.7
Germany	36.7	23.9	21.2	–15.5
Italy	27.9	23.6	18.8	–9.1
Netherlands	25.3	14.8	10.6	–14.7
United Kingdom	32.3	16.2	10.0	–22.3
Average change				–14.3

Source: Bureau of Labor Statistics.

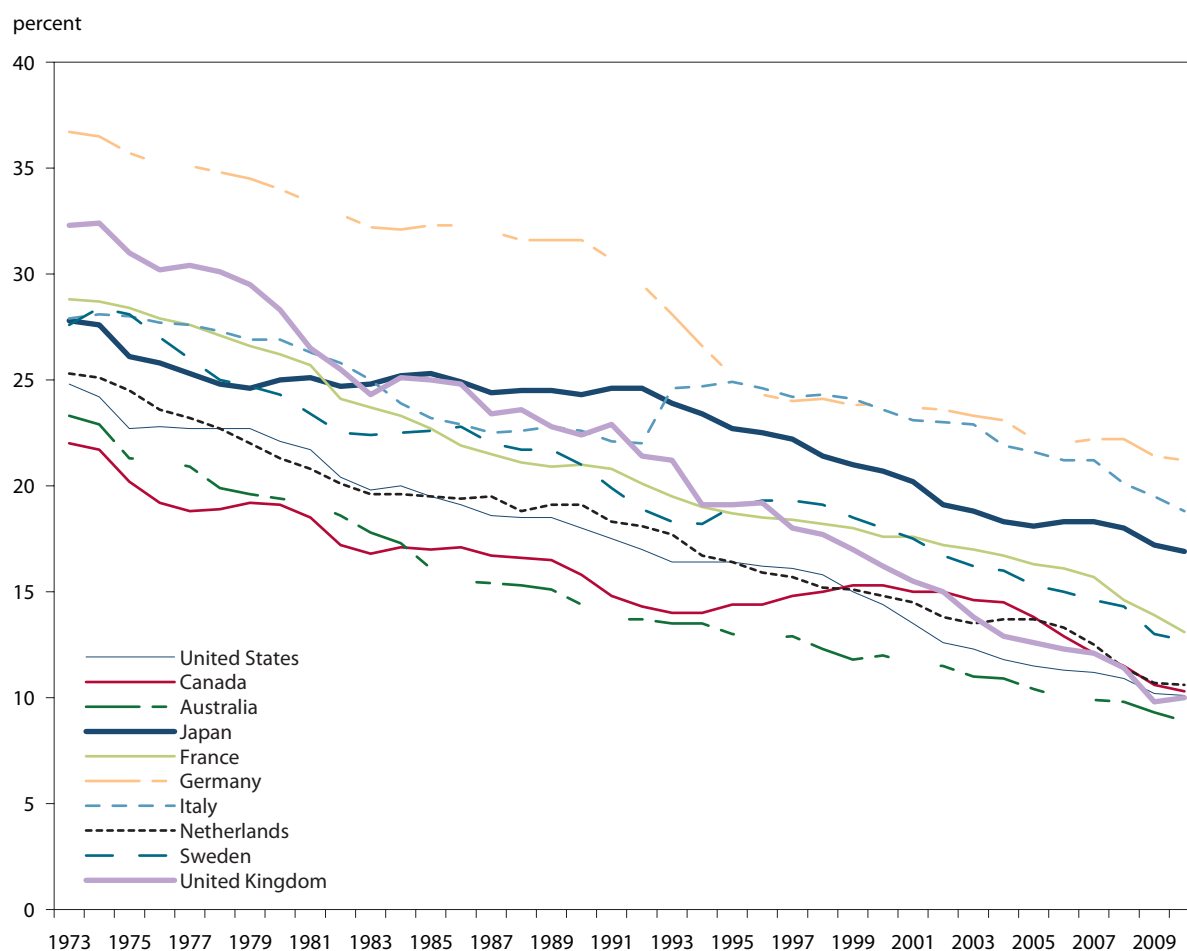
declining share of spending on goods in overall consumption are evident in all major industrial countries.

In 2010 the US employment share in manufacturing was actually quite typical of an industrial country. It was the same as in Canada (10.3 percent) and the Netherlands (10.6 percent), somewhat higher than Australia (8.9 percent), and lower than Sweden (12.7 percent) and France (13.1 percent). Also typical was the decline in the employment share in manufacturing. Between 1973 and 2010, the group of industrial countries presented in table 1 experienced declines in the manufacturing share of employment on the order of 10 to 22 percentage points over the 37-year period (figure 5).

As reported below, it is also noteworthy that as a share of GDP several of these countries ran large trade surpluses in their manufacturing trade (table 2). In 2010 these included Germany (9.9 percent of GDP), Japan (6.45 percent), and the Netherlands (5.52 percent). Their surpluses do help explain why countries like Germany, Japan, and Italy have higher manufacturing employment shares. But it is striking that the surpluses have not mitigated these countries' declining trends in the manufacturing employment share. These data underscore our argument in the previous section that while reducing the US deficit in manufactured goods could deliver a one-time boost to manufacturing employment, it would not permanently alter the declining trend in the manufacturing employment share.

We have argued that the declining share of national spending on goods plays an important role in the declining share of manufacturing employment in the United States. Is the United States unusual? We have gathered data on the share of overall consumption that is spent on goods in a number of OECD countries. In the United States, where consumption

28. Martin Baily and Barry Bosworth (2013) reach a similar conclusion.

Figure 5 Share of manufacturing in total employment, advanced economies, 1973–2010

Source: Bureau of Labor Statistics

Table 2 Manufacturing trade balance as share of GDP, advanced economies, 1973–2010 (percent)

Country	1973	1978	1986	1994	2002	2010	Average
Australia	-4.6	-5.5	-8.3	-7.7	-8.1	-8.2	-7.1
Canada	-4.0	-3.1	-3.1	-2.3	-1.3	-5.8	-3.3
Denmark	-7.4	-5.7	-5.4	0.3	-0.2	1.0	-2.9
France	0.9	2.0	0.2	0.8	1.1	-1.2	0.6
Germany				4.3	8.7	9.9	7.6
Italy	2.9	7.3	4.5	5.3	3.5	2.6	4.3
Japan	5.6	7.5	7.8	4.9	5.0	6.5	6.2
Netherlands	-1.8	-3.7	-2.7	0.3	4.0	5.5	0.3
Korea	2.3	4.4	10.3	4.3	8.8	16.5	7.8
United Kingdom	2.3	2.6	-2.0	-1.6	-4.2	-5.0	-1.3
United States	0.0	-0.4	-3.1	-2.1	-3.8	-3.2	-2.1

Sources: UN Comtrade Database; World Bank GDP data.

Table 3 Share of consumption spending on goods in total consumption, advanced economies, 1970–2010 (percent)

Country	1970	1980	1990	2000	2010	Annual change, 1980–2010
Australia	53	50	44	40	37	–0.45
Canada	58	56	51	47	46	–0.36
Denmark		57	51	50	47	–0.35
France	62	60	54	51	47	–0.42
Italy	68	66	59	54	49	–0.56
Korea	69	66	54	46	42	–0.8
Netherlands		59	57	51	49	–0.34
United Kingdom		69	61	56	53	–0.54
United States	50	46	40	37	34	–0.42
Average						–0.46

Source: OECD National Income Accounts.

spending accounts for about three-quarters of overall spending on goods, between 1970 and 2010, the share of goods in consumption fell from a half to just over a third—implying an annual average decline in the share of 0.42 percent. Table 3 shows that this is almost exactly equal to the average annual decline in the overall sample. While the pace of the US decline has been quite similar to that in other countries, the share of goods in US expenditure is the lowest in the sample, although Australia comes close.

Why do all developed countries exhibit similar behavior? The international evidence on the relationship between per capita income and the employment share in industry is captured in figure 6. The numbers reveal the combined impact of income growth and lower relative prices of manufactured goods. The relationship follows an inverted U shape, rising until per capita incomes reach around \$10,000 (1990 purchasing power parity (PPP)—adjusted dollars) and then declines steadily.²⁹

In the early years of development, it appears the responses to income growth and lower goods prices result in rising employment in manufacturing. This reflects patterns of both investment and consumption. Development requires high rates of investment, which in turn raises demand for metals such as copper and steel required for construction as well as equipment including machinery, buses, and railroads. As their incomes rise, consumers initially spend more on the basics such as food and clothing and cheap durables such as watches, cellphones, and bicycles. But as they move into the middle

class, they expand their demand for household durables such as furniture, TVs and refrigerators, and transportation equipment such as motor vehicles and automobiles. These activities each follow the conventional S-shaped pattern that is typical of diffusion. Initially, the demand for autos increases by relatively small numbers, but later as more people buy their first automobiles, the pace of demand accelerates.

Eventually, however, once everyone has the product, demand growth becomes dependent upon replacement. Most products in advanced economies have this feature. Most demand involves the replacement of older products. Under these circumstances productivity improvements that lead to falling prices will simply free up households to spend the money they have saved buying more of the services they want. This explains the transition in figure 5 as incomes rise from increasing to decreasing shares of manufacturing employment.

The experience in other industrial countries is consistent with the conclusions we have drawn with respect to the United States. Relatively faster productivity growth in the production of manufactured goods has led to declining relative goods prices. In response, however, consumers have chosen to devote more of the money they save to the purchase of services. The result is declining shares of expenditure and employment in the production of goods. Larger trade surpluses or smaller trade deficits are associated with larger shares of manufacturing employment but over the long run do not change the impact of the forces driving down the overall employment share in manufacturing.

THE FUTURE

Would cheaper US energy arrest the decline in manufacturing employment? Cheaper energy would certainly improve the international competitiveness of the more energy-intensive US industries. These include primary metals (energy use equal to 36 percent of value-added), paper products (21 percent), and nonmetallic minerals (19 percent).³⁰ In addition, with the exception of pharmaceuticals, the rest of the chemicals industry would also qualify. In 2011, these four industries accounted for 57 percent of overall US manufacturing energy use but only 14 percent of US manufacturing employment and less than 20 percent of US manufacturing trade (exports plus imports). Thus while their improved competitiveness could provide some boost to employment, the increase is unlikely to be large in relation to total manufacturing employment.³¹

Moreover, for the improved competitiveness of these sectors to reduce America's overall manufacturing trade deficit,

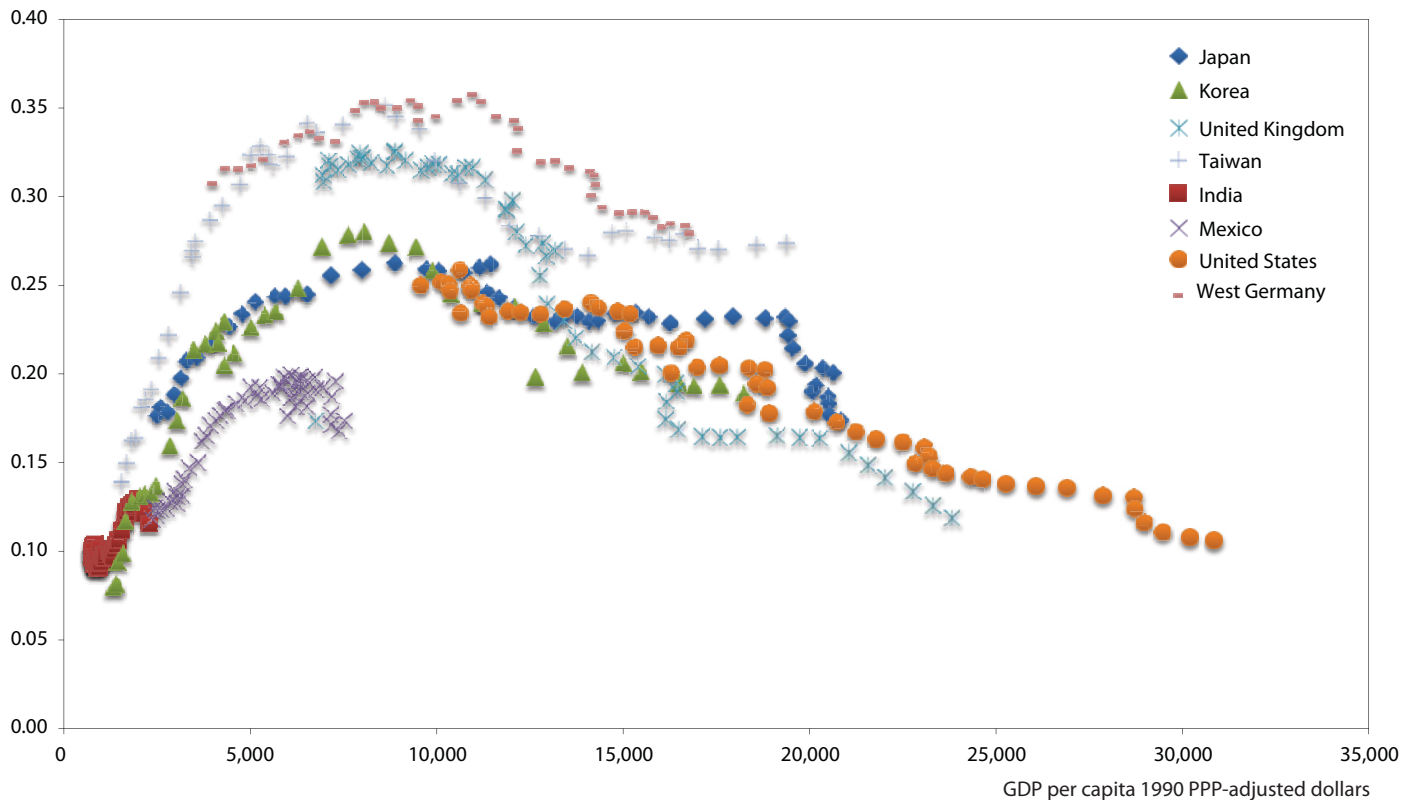
29. For a more complete exploration of this relationship, see McKinsey Global Institute (2012).

30. US Bureau of Economic Analysis, KLEMS data.

31. For a different view, see PricewaterhouseCoopers (2012).

Figure 6 Manufacturing's share of total employment follows an inverted U pattern

manufacturing employment share of total employment



PPP = purchasing power parity

Source: Groningen Growth and Development Centre, GGDC 10-Sector Database; Maddison Project Data based on McKinsey Global Institute (2012).

the macroeconomic context would also matter. In particular, the behavior of US saving and investment is important. Expansion of these capital-intensive sectors requires investment, and unless US national saving also increases, the overall current account could actually worsen. Even without an increase in national investment, if national saving does not rise, the additional net exports of these more energy-intensive sectors would also strengthen the real exchange rate—a form of the so-called Dutch disease—and crowd out net exports by other sectors. This would change the composition of the deficit but not in its aggregate magnitude. Indeed, given the capital intensity of the industries that use energy heavily, the employment impact on manufacturing could actually be negative!

In the context of the current economy, which has high unemployment, the effects of increased employment in these energy-based sectors could, however, raise incomes and generate the higher saving necessary to improve the current account. This would occur if the saving generated by the higher incomes that are induced exceeds the investment required. In this case

the trade balance and overall size of the manufacturing sector could increase.

A second factor in the outlook for US manufacturing involves the impact of rising wages in China. Undoubtedly, this will shift some production out of China, but the crucial issue here is whether the production that requires low wages is likely to shift to the United States. If the shift simply requires the same labor intensity as that used in China, it is more likely that the production will move to other developing countries that have lower labor costs (e.g., Vietnam, Bangladesh, Indonesia, and Mexico). If the shift is accompanied by the substitution of more automated technologies for the tasks previously undertaken by Chinese workers, production would be more likely to relocate to the United States. However, we should note that in this case while US production and employment in manufacturing might rise, the skill levels of the workers required are likely to be much higher than those who were previously displaced in manufacturing.

CONCLUDING COMMENTS

The analysis we have presented here shows that the performance of US manufacturing employment since 2000 is not surprising. The decline was perfectly predictable given the overall weakness in US employment growth. The analysis also suggests that some of the explanations for US manufacturing employment over the past decade are flawed and as a result policy prescriptions that rest on these explanations could be similarly flawed. These prescriptions tend to highlight the role played by international factors and trade and industrial poli-

Policy prescriptions tend to highlight the role played by international factors and trade and industrial policies in other countries and to overlook the more important role played by domestic productivity growth and demand.

cies in other countries and to overlook the more important role played by domestic productivity growth and demand. In addition they tend to stress unique features of American policies and performance and to ignore very similar declines in manufacturing employment experienced by other industrial countries, including those with large surpluses in manufacturing trade and more interventionist industrial policies. Our evidence also raises questions about claims that an industrial renaissance is the key to solving the problems facing relatively less-skilled US workers.

To be sure, there are prospects for increased growth in US manufacturing employment in the short run. First, as we have seen, manufacturing employment is sensitive to the business cycle, and if the overall recovery of the domestic economy is strong, manufacturing growth could outpace overall employment growth. Second, increased US energy production that results in relatively lower energy costs could boost the competitiveness of several US industries. In addition, the combination of higher labor costs in China and technological advances in automation could further enhance US manufacturing competitiveness. But for improved US competitiveness to actually reduce the US trade deficit in manufacturing, additional macro and microeconomic adjustments are required. In the aggregate US national saving needs to rise faster than US investment, and there needs to be an adequate supply of workers with the skills required to operate the new manufacturing technologies.

Over the long term, however, even with a reduction in the manufacturing trade deficit, our examination of the US historical experience and that of other major industrial economies suggests that in combination, rapid productivity growth and relatively unresponsive demand are likely to result in a diminished share for manufacturing in overall US employment growth. The key to increasing employment opportunities for less-skilled US workers is a broad-based economic recovery rather than industrial policies that focus on manufacturing.

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