



Manufacturing Employment

Fact and Fiction

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Despite employing only 11 percent of all workers and 15 percent of male workers today, manufacturing industries are at the center of most discussions of how to grow the American economy. This is because, in the minds of many, the economy is about producing things, which leads to other economic activities—advertising, researching, transporting goods to market, and retailing. Also, just 50 years ago manufacturing industries employed 36 percent of male workers. Given that the 1950s and 1960s were prosperous, many people tie the explosive growth of the middle class after World War II to the relatively high wages of male manufacturing workers.

Many policymakers hope that manufacturing can again play that role in today's economy. In August 2011, the *New York Times*' "Room for Debate" section brought together eight experts, including me, to opine on manufacturing's ability to fuel economic recovery. Seven of the commentators, including the secretary of the Department of Labor, predicted a surge in manufacturing jobs that would propel our economic recovery. They talked about reinvention, comparative advantage, jobs coming home from abroad, high research and development spending, and the centrality of goods production in the economy.

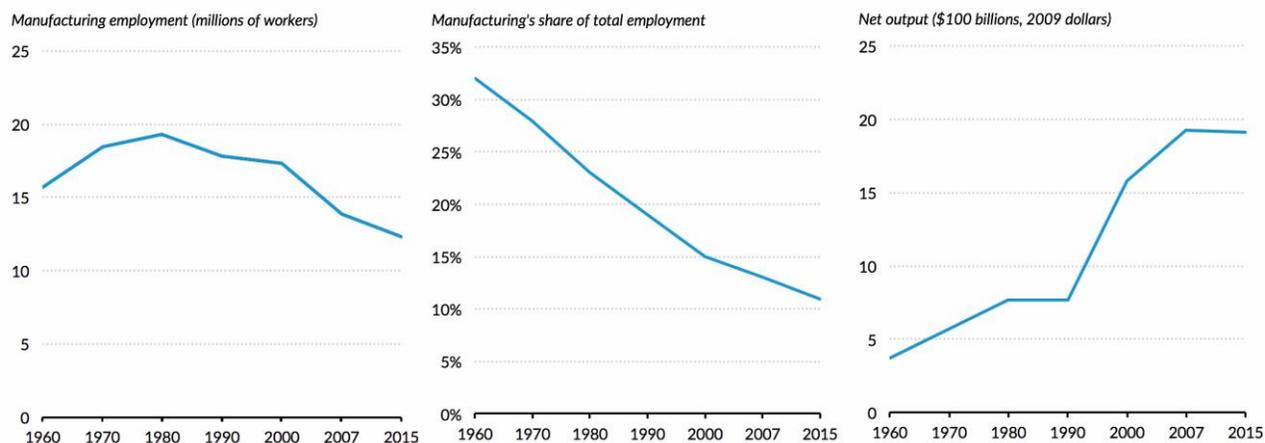
Since that date, overall employment has grown 11 percent (14.5 million jobs), while manufacturing employment grew just 6 percent (700,00 jobs). These events validated my 2011 skepticism that manufacturing could fuel employment growth, and this brief shows that increased productivity has led to much greater output with fewer workers. In this brief, the first in a series on manufacturing's role in the US economy, I show the evolution of employment across five industrial clusters (agriculture, nonmanufacturing production industries, manufacturing, low-end services, and high-end services). I also

show how earnings have changed across industries. Finally, I document changes in the regional distribution of manufacturing jobs to show which regions lost the most manufacturing employment and the timing of those losses.

Employment Trends

The share of the workforce employed in manufacturing plummeted between 1960 and 2015 (figure 1). Although the *percentage* of the workforce employed in manufacturing persistently declined, the absolute *number* of manufacturing workers increased steadily until 1980 before declining slowly through 2000. Between 2000 and 2015, manufacturing lost 5 million jobs, dropping below the number of manufacturing jobs in 1960. Over the past several years, however, manufacturing employment has stabilized at between 12 and 13 million jobs. Despite the fall in the absolute number of manufacturing workers, inflation-adjusted net output (total sales minus the costs of purchased inputs)¹ has increased dramatically. In figure 1, the dramatic difference between the net output and manufacturing employment lines shows the wonders of persistent, strong productivity growth as output per employee increased sixfold over these years.

FIGURE 1
Greater Output with Declining Manufacturing Employment, 1960–2015



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Sources: Author's calculations from 1960, 1980, and 2000 censuses, the Conference Board Total Economy Database Data, and 2015 American Community Survey.

Although these numbers show what is happening to the domestic manufacturing industries, President Donald Trump and Senator Bernie Sanders articulated during the 2016 presidential campaign the widely held position that the huge increase in foreign-made goods, especially from China, led to manufacturing employment decline.² There is a difference, though, between people losing jobs and the overall state of the labor force. Although exports have risen more slowly than imports, these producers provide many jobs. Further, Rose (2010) showed that there was no statistical relationship between

rising imports or trade deficits and total employment or unemployment. So, a strong economy leads to higher trade deficits and high employment.

Rose (2018a) shows that eliminating the trade deficit could potentially add 3 million new manufacturing jobs. To put this number into perspective, if 32 percent of the workforce were employed in manufacturing today (as was the case in 1960), the industry would employ 30 million more workers. So of the 30 million “missing” manufacturing jobs, just 10 percent have been lost because of increased trade deficits; the remaining 90 percent have been lost because of increasing productivity. This back-of-the-envelope calculation is consistent with other research. Collard-Wexler and De Loecker (2015) find that steel industries lost three-quarters of their workforce while producing the same output from 1963 to 2002. Even during the 2000s, when manufacturing was losing many jobs and the trade deficit reached almost 6 percent of gross domestic product, Hicks and Devaray (2015) found that productivity gains caused 87 percent of manufacturing job losses between 2000 and 2010.

The “losers” from rising imports are the workers whose plants have closed or relocated. From 2003 to 2015, 136,000 workers per year were eligible for government benefits because of job displacements due to imports (Hufbauer and Lu 2017). The “winners” of trade are all those that benefit from greater economic efficiency, lower prices, and more consumer choices. This trade-off has led to ambivalent feelings among the public about the overall effects of trade; a 2016 Pew Research Center poll found that 43 percent of the public thought free trade agreements were bad for the US; 47 percent thought they were positive.³

Where Are Americans Employed?

To contextualize manufacturing’s decline, I examine how employment changed across industries and regions over the past 55 years. I divide the economy into five broad industry groups:⁴

- **agriculture:** farm workers and owners
- **nonmanufacturing production industries:** mining, construction, transportation, utilities, wholesale, and warehousing⁵
- **manufacturing**
- **low-end services:** retail and personal and food services
- **high-end services:** business (law, finance, and consulting), government, health care, and education⁶

Over these years, manufacturing went from the largest employer to the fourth-largest, bigger than only agriculture (table 1). Although the decline in the manufacturing was large, from 32 to less than 11 percent of total employment, agriculture and nonmanufacturing production industries also declined. Despite that decline, the manual labor-intensive industries in nonmanufacturing production went from being significantly smaller than manufacturing to almost 5 percentage points larger in 2015. The two service industries gained employment shares, reaching a combined 73 percent of all employment. The

low-end retail and food service industries grew by 9 percentage points, while high-end services grew by over 16 percentage points. Thus, nearly 64 percent of the growth in service employment occurred in the high-end service industries, and those jobs employ many college-educated workers.

TABLE 1
Changing Employment Shares, 1960–2015 (%)

	1960	1980	2000	2015
Agriculture	3.2	2.5	1.4	1.5
Nonmanufacturing production industries	17.7	16.8	16.1	15.1
Manufacturing	32.0	23.0	15.1	10.6
Low-end services	21.2	22.3	26.8	30.5
High-end services	25.9	35.4	40.6	42.3

Sources: Author's calculations from 1960, 1980, and 2000 censuses and 2015 American Community Survey.

The changing distribution of employment across sectors is important because the pay across sectors varies. Manufacturing pay has been the highest of any sector for two of the four years studied and a close second in the other two years (table 2). Agriculture and low-end services earnings have always been far lower than manufacturing earnings. In contrast, the median earnings of the nonmanufacturing production industries have been very close to manufacturing's, and in 1960 and 1980 they surpassed manufacturing's.

TABLE 2
Median Earnings by Industry, 1960–2015
Constant 2015 dollars

	1960	1980	2000	2015
Agriculture	7,900	21,900	24,800	25,000
Nonmanufacturing production industries	30,100	38,500	41,300	40,000
Manufacturing	28,900	35,600	42,400	42,000
Low-end services	13,600	19,200	23,400	20,000
High-end services	25,000	30,100	41,300	43,500

Sources: Author's computations from 1960, 1980, and 2000 censuses and 2015 American Community Survey.

Notes: All earnings are rounded to the nearest \$100. Earnings from 1960, 1980, and 2000 were converted to 2015 dollars using the Bureau of Economic Analysis's personal consumption expenditure deflator.

Earnings increased the most in high-end services: In 1960 and 1980, median earnings in this sector trailed manufacturing's by 13 and 15 percent, respectively. But the gap narrowed in 2000 to 3 percent before high-end services earnings surpassed manufacturing earnings by 4 percent in 2015. High-end services have always had more managers, professionals, and workers with a college degree than other industries. In 1960 and 1980, these advantages were offset by teachers' low pay and the considerable number of women in clerical jobs. As the office economy grew after 1980, computers decreased the share of clerical workers and increased the number of high-paying managerial and professional jobs (Rose 2010).

Manufacturing jobs still pay relatively well, but they employ fewer workers today than in the past. Manufacturing’s employment decline is offset by the rise in employment in both the low- and high-end service sectors. The new jobs in high-end service industries pay better than those in manufacturing, but those in low-end services pay much less. Note that even within the manufacturing sector, there were important shifts in the type of work performed. As a share of total employment in the industry, traditional, physical “blue-collar” jobs declined, while managerial and professional jobs increased. In 1960, 70 percent of manufacturing jobs were blue collar; just 10 percent were managerial or professional. By 2015, the blue-collar share declined to 53 percent while the managerial and professional share rose to 27 percent. And managerial and professional jobs generally pay more than blue-collar jobs. That shift to higher-paying jobs meant gains within occupations were much smaller. Rose (2018b) tracks the fate of earnings for male manufacturing workers without a bachelor’s degree.

The Geography of Manufacturing Employment

Manufacturing employment has also changed across US regions over time. In 1960, manufacturing concentrations were highest in the New England, Mid-Atlantic, and East North Central (the upper Midwest of Ohio to Wisconsin, spanning Indiana, Illinois, and Michigan) regions (table 3). By 2015, New England and the Mid-Atlantic states (New York, New Jersey, and Pennsylvania) had a lower manufacturing concentration than the national average. Dropping from 41 percent in 1960 to 17 percent in 2015, the East North Central states, like every other region, experienced a dramatic decline in manufacturing share. The high price of land and labor drove manufacturers away, and employment shares in the high-end service sector grew to the highest in the country. But this region still led the country in manufacturing share by a significant amount in 2015.

TABLE 3

Manufacturing Share of Total Employment by Region, 1960–2015 (%)

	1960	1980	2000	2015
New England	41.5	28.8	15.3	10.4
Mid-Atlantic	37.2	24.7	14.3	9.5
East North Central	41.0	29.8	21.9	16.9
West North Central	24.2	19.7	16.5	13.1
South Atlantic	27.4	21.0	13.3	8.6
East South Central	29.1	25.4	20.3	14.2
West South Central	19.4	18.1	13.3	9.6
Mountain	15.2	12.4	9.6	7.2
Pacific	27.1	19.8	13.4	9.9
US total	32.0	22.9	15.0	10.9

Sources: Author’s computations from 1960, 1980, and 2000 censuses and 2015 American Community Survey.

The two other regions with an above-average manufacturing share in 2015 both had below-average manufacturing shares in 1960: the East South Central (Alabama, Kentucky, Mississippi, and Tennessee) and the West North Central (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota) regions. The East South Central region benefited from two waves of manufacturing

employment—the movement of firms from New England and the Mid-Atlantic in the 1970s and 1980s and the arrival of many automobile “transplants,” or foreign firms opening factories in America, after 1980. Although the first movement was clearly because firms could offer lower wages in the East South Central region, transplant factories often paid close to union scale (although not with as generous benefits). But for foreign firms, the flexibility of control over production without approval of a union was very attractive: South Carolina, for example, has the second lowest unionization rate among all states and has attracted a variety of big foreign manufacturing companies, such as BMW, Mercedes-Benz, Volvo, Bridgestone, Bosch, and Michelin (Colliers International 2016).

TABLE 4
Median Manufacturing Earnings by Region, 1980–2015
Constant 2015 dollars

	1960	1980	2000	2015
New England	23,500	29,900	46,100	54,000
Mid-Atlantic	25,700	34,100	42,200	48,000
East North Central	28,600	39,900	42,200	44,000
West North Central	25,700	33,100	37,000	40,000
South Atlantic	18,400	25,400	37,000	41,500
East South Central	18,400	25,400	34,300	40,000
West South Central	24,000	31,100	38,500	45,000
Mountain	27,400	31,600	39,500	44,000
Pacific	29,100	35,000	43,100	50,000

Sources: Author's computations from 1960, 1980, and 2000 censuses and 2015 American Community Survey;

Notes: Pre-2015 dollars are converted to 2015 dollars using the Bureau of Economic Analysis Personal Consumption Expenditure deflator. All earnings are rounded to the nearest \$100.

All regions' median manufacturing earnings rose over time. Average earnings for workers in the manufacturing industry across the nine regions show a narrowing difference between the highest- and lowest-earning region: in 1960 and 1980, the highest earning region earned 58 percent more than the lowest, but in 2000 and 2015, the gap was only 35 percent. The three regions with the highest pay—New England, Mid-Atlantic, and Pacific—were coastal states that lost most of their manufacturing employment. The earnings in the rest of the regions were reasonably close, varying from \$40,000 to \$45,000. Finally, the relative position of the East North Central region (the traditional Midwest) declined dramatically; in 1960, manufacturing earnings in this region were a close second to manufacturing in the Pacific states. By 2015, falling median earnings placed them in the middle range, even though they had the highest concentration of manufacturing workers.

Conclusion

The US manufacturing sector is strong and will continue to be responsible for about 12 percent of our output. Even if the trade deficit goes down, manufacturing is unlikely to generate enough new jobs to

return the sector to its past prominence. Nevertheless, the share of all US workers employed in manufacturing industries has declined substantially since 1960.

The decline in manufacturing employment as a share of total employment in the US is not exclusively a US phenomenon. Between 1973 and 2012, manufacturing's share of total employment declined in 15 other developed, industrialized countries.⁷ In 1973, 40 percent of the jobs in Germany and 24 percent of the jobs in Great Britain were in manufacturing; in the other 13 countries manufacturing industries employed just over 25 percent of many countries' workforces. By 2012, those with the biggest declines were Great Britain (24 percentage points), Germany (19 percentage points), and the US (16 percentage points). Italy and Japan had small declines from a relatively high level, while Canada had a small decline from an already low level. In 2012, Australia, Great Britain, the US, Canada, and the Netherlands had the lowest shares (running from 9.7 to 10.8 percent of employment) in 2012. At the high end of the scale were Germany (20.5 percent), Italy (19.5 percent), and Japan (17.3 percent).

In the US, the new normal for manufacturing employment may be between 11 and 13 million jobs, but new factory technology may increase output, lowering this figure. Further, new jobs in manufacturing may look very different from the traditional high-paying, middle-skill, blue-collar jobs of the past. Instead, more workers will be skilled technicians who set up and repair computer-driven machines, high-end managers, sales representatives, accountants, designers, and research scientists.

Methodology

Because of the desire to investigate regions, specific manufacturing industries, and occupations, I used large datasets: the long-form censuses of 1960, 1980, and 2000 and the 2015 American Community Survey. These datasets are available in a harmonized form (similar coding of each variable) from the Minnesota Population Center of the University of Minnesota.

I divided the industries into five sectors and divided the manufacturing industries into 12 further industries; the coding is available from me upon request. Earnings were converted into 2015 dollars using the Bureau of Economic Analysis's personal consumption expenditures deflator.

Notes

¹ Net output is commonly referred to as the "value added" by each firm and consists of charges for depreciation, total labor compensation, and gross surplus (profits, interest payments, and certain taxes).

² Acemoglu et al. (2014) find that from 1999 to 2011, the rise in Chinese imports led to 2.4 million job losses, of which 580,000 were manufacturing jobs (about 10 percent of manufacturing losses during these years).

³ See Chapter 3, "Views on Economy, Government Services, Trade," of Pew Research Center (2016). A Gallup poll found a similar split on attitudes towards the North American Free Trade Agreement (48 percent positive versus 46 percent negative): Andrew V. Pestano, "Poll: Americans Split over NAFTA's Effect on U.S.," *United Press International*, February 24, 2017.

⁴ The data in the tables come from weighted counts from the Integrated Public Use Microdata Series, or IPUMS, microdata from the 1960, 1980, and 2000 decennial censuses and the 2015 American Community Survey. These numbers do not completely replicate employment by industry from census surveys of employers. The number of workers employed in manufacturing in the 2015 American Community Survey is 15 million, while the comparable number from government surveys of businesses is just over 12 million. Since government surveys of companies do not have demographic information, all tables in this study will be derived from the census surveys of individuals, which rely on individuals' self-reporting.

⁵ I call this group "production industries" because they have high shares of blue-collar occupations almost equal to the blue-collar share in manufacturing.

⁶ Since 1996, I have been describing the ascendancy of work in offices, government, health care, and education. See my 2010 book, *Rebound: Why America Will Emerge Stronger from the Financial Crisis*, and a further elaboration on the importance of high-end services in Carnevale and Rose (2015).

⁷ Data are available from the Bureau of Labor Statistics' International Labor Comparisons; see <https://www.bls.gov/fls/>.

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About the Author



Stephen Rose is a nonresident fellow in the Income and Benefits Policy Center at the Urban Institute. He is a nationally recognized labor economist and has spent the last 35 years researching and writing about the interactions between formal education, training, career movements, incomes, and earnings. His book *Social Stratification in the United States* was originally published in 1978, and the seventh edition was released in

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