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The Debate over the State of U.S. Manufacturing: How the Computer Industry Affects the Numbers and Perceptions

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The Debate over the State of U.S. Manufacturing

How the Computer Industry Affects the Numbers and Perceptions

Since 2000, the U.S. manufacturing sector has lost 5.5 million jobs, or about a third of its employment base. In response to these employment losses, a large trade deficit in manufactured goods, and concerns that U.S. manufacturing is losing its international competitiveness, President Obama recently announced the creation of a new cabinet-level Office of Manufacturing Policy.

The administration's move to develop policies promoting U.S. manufacturing has many detractors, however. At the heart of the debate over the appropriate policy response is a basic disagreement over the actual state of U.S. manufacturing. Those who oppose government intervention typically argue there is little need. They point to robust output growth in manufacturing that, except during recessions, has outpaced average annual growth of the U.S. economy for decades. Employment losses, it is argued, are largely a consequence of extraordinary productivity growth, which in turn reflects automation, not import competition. The U.S. manufacturing sector is healthy, according to this view. There is little or nothing to fix.[1]

The purpose of this article is to help reconcile the apparently contradictory sets of statistics that are brought to the debate. In particular, I argue that the aggregate manufacturing output and productivity statistics so commonly cited are widely misinterpreted.

Aggregate statistics mask quite divergent trends within manufacturing. The rapid output and productivity growth of the manufacturing sector is largely attributable to one small industry: computers and electronic products. For most of manufacturing, output growth has been relatively weak and productivity growth modest. In addition, the extraordinary output growth in the U.S. computer industry does not signal U.S. competitiveness in manufacturing computer and electronic products, and productivity growth has not caused the steep employment declines in this industry.

Different Statistics Paint Different Pictures

Output statistics such as those depicted in Figure 1 paint a rosy picture of the U.S. manufacturing sector. The figure, which plots indexes of real (price-adjusted) GDP and manufacturing value added from 1997 to 2011, shows that, except during recessions, growth in manufacturing real value added outpaced growth in real GDP. Over the entire time period, manufacturing output growth was greater than that of GDP.

In spite of its strong output growth, manufacturing employment has been

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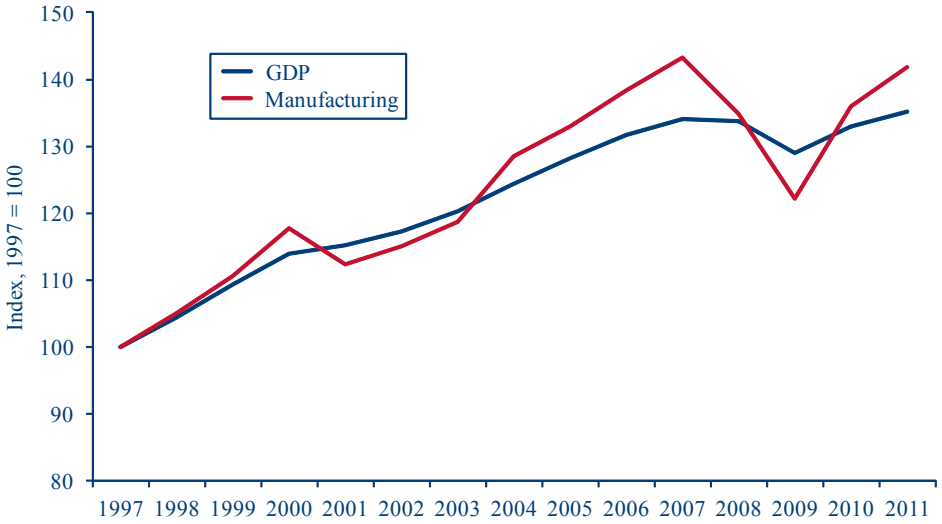
Figure 1 Growth in Real GDP and Manufacturing Value Added, 1997–2011

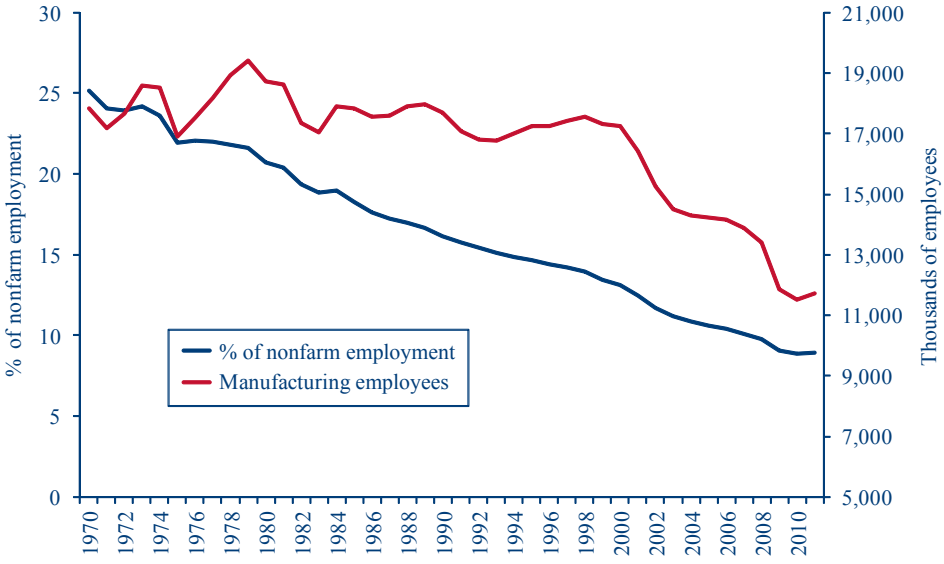


SOURCE: Bureau of Economic Analysis.

declining as a share of nonfarm payroll employment since the 1970s (Figure 2). The divergent output and employment trends are typically explained by the fact that labor productivity growth in manufacturing has also greatly outpaced that in the aggregate economy. From this perspective, recent employment declines in manufacturing seem part of a long-term trend. Numerous analysts have made analogies between the manufacturing sector and agriculture, which has experienced high output growth, but supports few jobs owing to the automation of farming. (See, for example, Reich [2009], Executive Office of the President [2009], and Roxburgh et al. [2012].)

A closer look at the manufacturing employment numbers, however, reveals a clear break in trend since 2000. Figure 2, which also plots manufacturing employment levels from 1970 to the present, shows that manufacturing employment was relatively stable or experienced modest trend declines until 2000.[2] From 2000 to 2002 manufacturing employment fell by 2 million, or 12 percent, and during the ensuing economic upturn, manufacturing employment continued to fall; this marked the first time manufacturing employment failed to rebound following a recession. Over the decade from 2000 to 2010, manufacturing employment declined by 5.7 million, or one-third. The sudden and sharp employment losses in the manufacturing sector are hard to fully square with a story about productivity improvements driven by automation. And although press reports have heralded manufacturing's employment gains in the last year, they are small compared to its losses during the Great Recession. Today, nonfarm payroll employment is 96 percent of what it was in 2007, immediately prior to the start of the recession; manufacturing employment is just 87 percent.

Figure 2 Manufacturing Employment, Number and as Percent of Nonfarm Payroll Employment, 1970-2011



SOURCE: Bureau of Labor Statistics.

Trade statistics also give cause for concern about the state of U.S. manufacturing. Eighteen of the 19 industries in the manufacturing sector run sizable trade deficits, according to data published by the Bureau of Economic Analysis; that is, the United States imports more than it exports in these industries' product categories. Moreover, between 1998 (the first year that these industry-level data are published) and 2007, the ratio of net exports (exports less imports) to domestic use of an industry's products worsened. This implies that domestic manufacturing output failed to keep pace with domestic use of manufactured goods. The picture has been more mixed since 2007, reflecting the worldwide recession, but apparel, textiles, furniture, autos, electrical appliances, and computers continued to show a loss of competitiveness by this metric.

What Accounts for Manufacturing's High Output Growth?

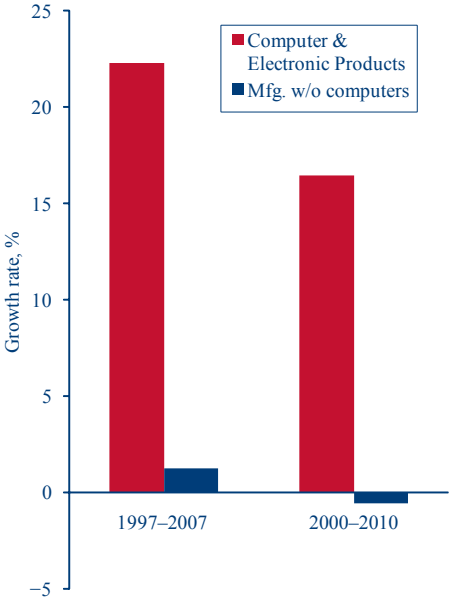
Manufacturing's strong growth in real value added seems at odds with the weak employment numbers and trade performance. These apparently

contradictory trends can be reconciled to a large degree by the fact that the manufacturing output statistics mask divergent trends within the manufacturing sector.

Figure 3 shows average annual growth in real value added for the computers and electronic products industry and for manufacturing excluding the computer industry from 1997 to 2007 (the decade leading up to the Great Recession) and from 2000 to 2010 (a period that incorporates the recession). Real value added in the computer industry grew at a staggering rate of 22 percent per year from 1997 to 2007 and 16 percent per year from 2000 to 2010. In contrast, average annual growth of real value added in the rest of manufacturing was just 1.2 percent per year from 1997 to 2007; real value added in the rest of manufacturing was actually about 6 percent lower in 2010 than at the start of the decade.

Although the computer and electronics products industry only accounted for 10–12 percent of value added in the manufacturing sector throughout the period, it has an outsized effect on aggregate manufacturing statistics. Without the computer industry, manufacturing real value-added growth has been much weaker than overall growth in the economy (Figure 4).[3] The computer industry has a similarly large impact on the aggregate manufacturing productivity statistics. For example, manufacturing multifactor productivity growth rates between 1997 and 2007 fall by almost half when the computer industry is excluded (Houseman et al. 2011).

Figure 3 Average Annual Growth Rates of Real Value Added in Computers and Manufacturing without Computers



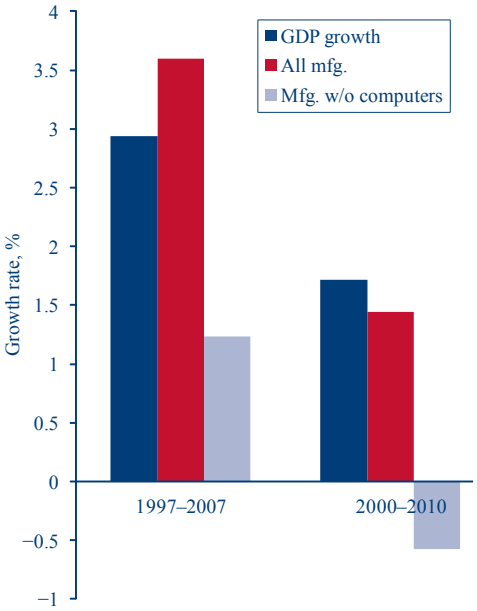
SOURCE: Author calculations using Bureau of Economic Analysis data.

The growth rates in Figures 3 and 4 are based on published data. In addition, the sizable growth of imported intermediates used in manufacturing has likely imparted a significant bias to real value added in the published statistics for all manufacturing industries. This bias arises because the price declines associated with the shift in sourcing to low-cost countries are not properly captured, which in turn results in an underestimation of the real growth in imports and an overestimation of the growth in real value added produced domestically. Accounting for offshoring bias, the average annual growth rate in real value added for manufacturing excluding computers was well under 1 percent between 1997 and 2007 (Houseman et al. 2011).

What Accounts for the Extraordinary Growth in Real Value Added and Productivity in the Computer Industry and What Does It Mean?

Is the computer and electronic products industry, which includes computers, semiconductors, and telecommunications equipment, the bright spot in American manufacturing? Not necessarily. Although some computer and electronics products companies headquartered in the United States are highly successful in product innovation and are competitive in international markets, the United States does not produce high-volume products in this industry anymore (Sturgeon and Kawakami 2010). And trade statistics cited above indicate that domestic production has not kept pace with consumption, leading to a widening trade deficit in these products.

Figure 4 Average Annual Growth Rates of Real GDP and Manufacturing Value Added



SOURCE: Author calculations using Bureau of Economic Analysis data.

What accounts then for the rapid growth in real value added in this industry? At least part of the explanation concerns the adjustment of price indexes used to deflate computers and semiconductors for improvements in quality. Computers and semiconductors are much more powerful today than they were a decade or even a year or two ago. Although product price indexes typically increase over time, for computers and semiconductors they have fallen rapidly. Largely reflecting adjustments by statistical agencies to account for the increased power of computers and semiconductors, the price indexes used to adjust shipments of computers and semiconductors have fallen at a rate of 21 percent and 13 percent per year, respectively, from 1998 to 2010. Such rapid price drops imply, for example, that for the same dollar value of computer shipments, the quality-adjusted quantity (real value) is 13 times higher in 2010 than in 1998.[4]

The rapid growth in real output coupled with a sharp drop in employment has led to surging productivity in the computer industry. But has productivity

growth caused these employment declines? Analysts often interpret productivity growth to mean that workers are working faster or that automation (the substitution of capital for labor) is driving the growth, as illustrated in a recent White House report on manufacturing: "Manufacturing workers have paradoxically often been the victims of their sector's own success, as rapid productivity growth has meant that goods can be produced with fewer workers" (Executive Office of the President 2009).

Underpinning the computer industry's rapid productivity growth, however, are price deflators that, when adjusted for quality improvements, are rapidly falling. The productivity growth in the computer industry largely reflects research and development innovations, and product improvements do not cause job losses. Today's computer may be in some statistical sense the equivalent of, say, 13 computers in 1998, but that does not, in and of itself, mean that fewer workers are needed to manufacture a computer today than in the past. In fact, job losses in the computer industry are attributable to the shift of electronics product manufacturing to Asia (see, for example, Roxburgh et al. 2012).

Conclusion

Strong output and productivity statistics have led many to dismiss out-of-hand concerns about the international competitiveness of U.S. manufacturing. The computer and electronics products industry, however, is driving these high growth rates in the aggregate statistics, despite the fact that this industry accounts for only about 10 percent of the sector's value added and employment. The irony is that high output growth in the computer industry is a poor metric of the competitiveness of U.S. factories in making computer and related electronic products. The manufacturing of these products has largely moved to Asia. Competition from foreign suppliers, not high productivity growth, is responsible for the sharp employment declines in the computer industry.

Understanding the international competitiveness of manufacturing and the consequences of import competition for workers and businesses is critical for developing sound manufacturing policy. As a start, analysts and policymakers should recognize that the aggregate output and productivity statistics are not representative of what is happening in most of manufacturing.

Notes

1. See, for example, Kevin Hasset, http://www.bloomberg.com/news/2010-08-16/obama-s-obsession-drives-progress-in-reverse-commentary-by-kevin-hassett.html and Mark J. Perry, http://blog.american.com/2012/02/u-s-manufacturing-is-already-doing-remarkably-well-without-taxpayer-help/. Atkinson et al. (2012, pp. 24–25) includes citations to many other prominent analysts and policymakers promoting this view.

2. The modest declines in manufacturing employment during the 1990s can be accounted for entirely by manufacturers' increased use of staffing industry workers, who are not counted as manufacturing employees. Although in official statistics manufacturing employment declined by 4.1 percent from 1989 to 2000, taking into account temporary help and other staffing workers assigned to manufacturing, employment rose by an estimated 1.3 percent (Dey, Houseman, and Polivka forthcoming).

3. The reason this fact is not more widely known may have to do with the way the statistics are published. In the late 1990s, the Bureau of Economic Analysis, along with the other U.S. statistical agencies, introduced the use of chained aggregates. Although BEA publishes value added in "real chained dollars" for all individual manufacturing industries, these industry-level real chained dollars cannot be summed to create a real series for subsets of industries. Growth rates for industry subsets may be approximated using a Törnqvist formula that uses both real and nominal value-added industry data. Specifically, the growth rate of real value-added for a subset of industries, expressed as a logarithmic change, is approximately equal to the weighted average of the growth rates of the component industries,

$$\ln(Q_t / Q_{t-1}) \approx \sum_i w_{i,t} \ln(q_{i,t} / q_{i,t-1})$$

where $q_{i,t}$ is the published real dollar or (equivalently) quantity index for industry i in year t and $w_{i,t}$ is the average of industry i's share of nominal value added in adjacent time periods $(t, t-1)$; $\sum_i w_{it} = 1$.

4. The statistics for the computer and electronics products industry also may be subject to significant measurement error, in addition to that discussed above. This industry has been characterized by rapid shifts in the sourcing of production and the development of global production chains that are difficult to capture in our statistical system, as currently designed. Such measurement error is the subject of on-going research supported by a Sloan Foundation grant that I am codirecting.

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