

Background

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Technology Explains Drop in Manufacturing Jobs

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Abstract: *Attempts by Members of Congress to save U.S. manufacturing jobs by restricting international trade, particularly with China, are misguided and futile. Technological improvements, not international trade, are reducing U.S. manufacturing employment by automating many rote tasks. During the past decade, manufacturing employment has fallen by one-third while manufacturing output has remained roughly constant. Congress can best help the manufacturing sector and the rest of the economy by improving U.S. competitiveness and by creating a better business environment in the U.S.*

Manufacturing employment has fallen by one-third over the past decade. Some Members of Congress contend that foreign trade has allowed American employers to offshore these jobs. In fact, technology has driven down manufacturing employment. Computers have made manufacturers more productive by automating many routine tasks. American manufacturers now employ fewer workers to produce more goods. This means less expensive manufactured goods, more manufacturing jobs for highly skilled workers, and the elimination of millions of low-skill assembly line positions. These same forces have reduced manufacturing employment around the world. Increased productivity led Chinese employers to eliminate millions of manufacturing jobs in the late 1990s.

Congress should not restrict trade in the mistaken belief that such a policy would bring back American

Talking Points

- U.S. manufacturing employment has fallen by one-third in the past decade, but manufacturing output has remained roughly constant.
- Technological improvements are driving this increasing productivity. Computers and machines have automated many routine tasks, increasing productivity and enabling manufacturers to produce the same amount of goods with fewer workers.
- Advances in manufacturing technology have also created new jobs for the highly skilled workers who operate these machines. Employment has increased for the most skilled manufacturing workers.
- Foreign trade explains little of the drop in manufacturing employment. Chinese manufacturing employment also decreased when China privatized state-owned enterprises, and the private companies adopted productivity-increasing technology.
- Increases in Chinese imports to America have come largely at the expense of other Asian trading partners of the U.S.
- Congress cannot bring back jobs automated by technology by restricting trade. To promote job creation Congress should improve the U.S. business climate.

This paper, in its entirety, can be found at:
<http://report.heritage.org/bg2476>

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manufacturing jobs. Instead, Congress should create a better business climate for all employers.

Manufacturing Employment Down

The number of Americans employed in manufacturing has dropped significantly over the past decade. Manufacturing employment dropped 20 percent between the peak in 2000 and the end of the most recent expansion in 2007. Since the recession started, manufacturing employment has fallen

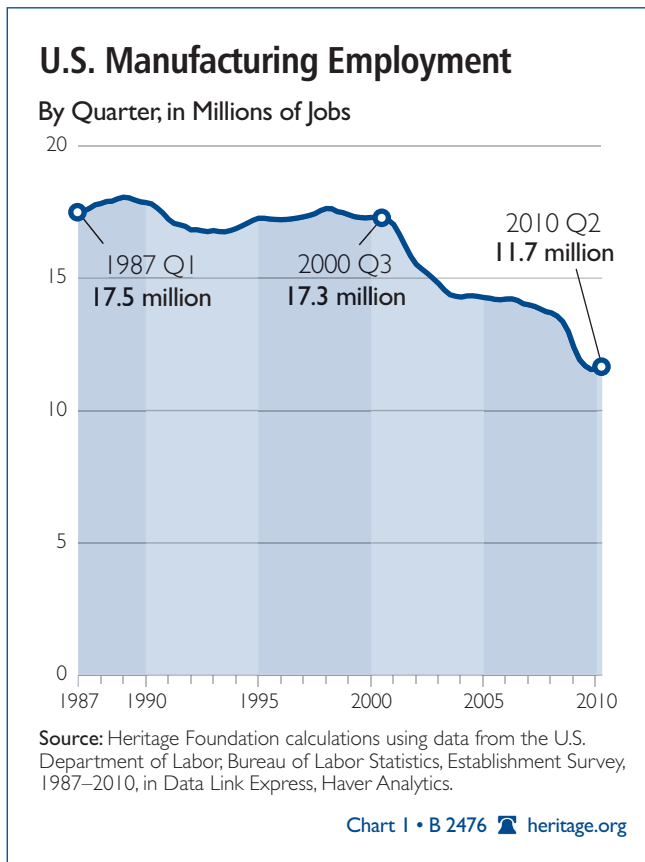
by an additional 15 percent.¹ Over the past decade manufacturers have shed a net 5.6 million jobs.

Many Members of Congress blame foreign competition for these job reductions.² They contend that a flood of inexpensive imports from low-wage nations, especially from China, have put domestic manufacturers out of business. They also believe that reducing imports would restore U.S. manufacturing jobs. This mistaken belief led the House of Representatives to pass the End the Trade Deficit Act (H.R. 1875) in July 2010 and the Currency Reform for Fair Trade Act (H.R. 2378) in September 2010.

Trade with China Not at Fault

While foreign trade has put some domestic manufacturing companies out of business, it has also created new opportunities for domestic firms to export their products. Research shows that trade has had little effect on overall manufacturing employment. Instead, it has shifted jobs from less productive firms to more productive domestic firms.³

The argument that Chinese trade has cost U.S. manufacturing jobs has even less support. Trade with China has increased, but this increase has come largely at the expense of other U.S. trading partners. Chart 2 shows imports of goods to the United States from the Pacific Rim as a percent of all U.S. goods imports.⁴ The share of imports coming from China has increased by 14 percentage points since 1992. However, the proportion of U.S. imports coming from Pacific Rim nations other than China has dropped by 19 percent. The overall proportion of goods the U.S. imported from the Pacific Rim actually fell during that period.

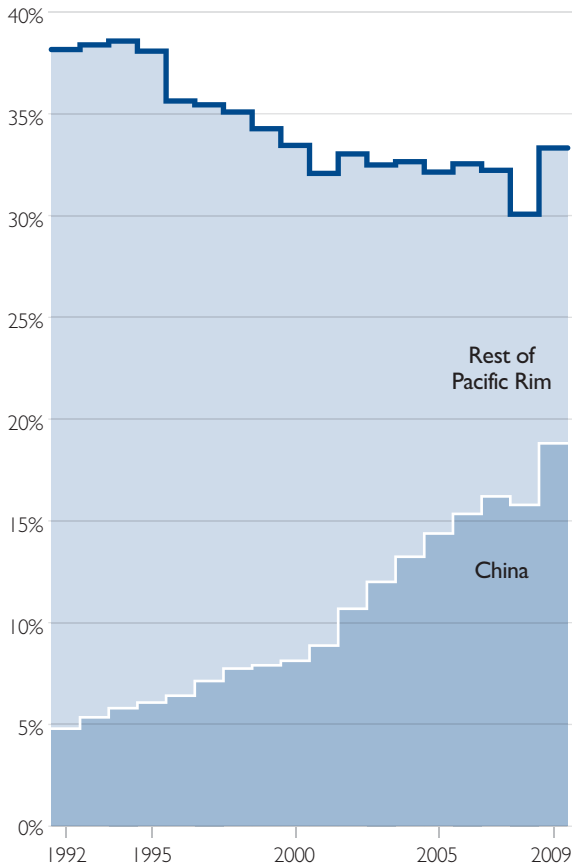


1. Heritage Foundation calculations using data from the U.S. Department of Labor, Bureau of Labor Statistics, Establishment Survey, 2000–2010, in Data Link Express, Haver Analytics.
2. For example, see press release, “DeFazio Defends American Jobs, Secures Vote on Trade Bill Next Week,” Office of Representative Peter DeFazio (D–OR), July 21, 2010, at http://www.defazio.house.gov/index.php?option=com_content&view=article&id=596%3Adefazio-defends-american-jobs-secures-house-vote-on-trade-bill-next-week&catid=61&Itemid=70 (October 6, 2010).
3. Andrew Bernard, Jonathan Eaton, J. Bradford Jensen, and Samuel Kortum, “Plants and Productivity in International Trade,” *American Economic Review*, Vol. 93, No. 4 (September 2003), pp. 1268–1290.
4. The Pacific Rim nations are Brunei, Hong Kong, Indonesia, Japan, South Korea, Macao, Malaysia, New Zealand, Papua New Guinea, the Philippines, Singapore, and Taiwan.

China Provides Majority of U.S. Imports from the Pacific Rim

U.S. imports from the Pacific Rim have remained relatively steady since 2000, but China has received a growing share of the region's total. In 1992, China provided 13 percent of Pacific Rim imports to the U.S., but in 2009 China provided 56 percent.

U.S. Imports from the Pacific Rim as a Percentage of Total U.S. Imports



Note: The Pacific Rim nations are Brunei, China, Hong Kong, Indonesia, Japan, South Korea, Macao, Malaysia, New Zealand, Papua New Guinea, the Philippines, Singapore, and Taiwan.

Source: Heritage Foundation calculations using data from the U.S. Census Bureau, "Trade in Goods (Imports, Exports and Trade Balance) with World, Seasonally Adjusted," 1991–2010, at <http://www.census.gov/foreign-trade/balance/c0004.html> (October 6, 2010), and "U.S. Trade in Goods (Imports, Exports and Balance) by Country," 1991–2010, at <http://www.census.gov/foreign-trade/balance/index.html> (October 6, 2010).

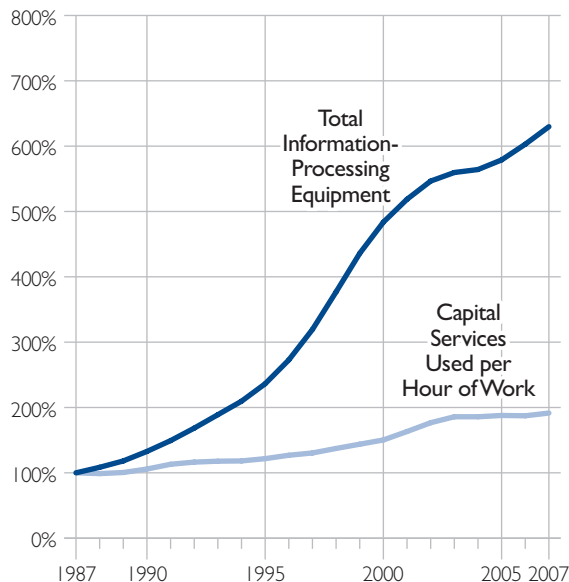
Chart 2 • B 2476 heritage.org

Americans are now buying goods manufactured in China instead of goods made in Japan, Indonesia, or Taiwan. However, this shift does not explain

Manufacturers Using More Capital

Since 1987, U.S. manufacturers have increased sixfold the amount of information-processing equipment, such as computers and robots, they use in production. During the same period, manufacturers also nearly doubled the amount of capital used per employee hour of work.

Manufacturers' Use of Capital (1987=100%)



Source: Heritage Foundation calculations using data from the U.S. Department of Labor, Bureau of Labor Statistics, "Multifactor Productivity," 1987–2007, in Data Link Express, Haver Analytics.

Chart 3 • B 2476 heritage.org

why domestic manufacturing employment has fallen so sharply.

Technological Advances Automate Work

U.S. manufacturing employment has fallen primarily because U.S. businesses have changed how they manufacture goods. Advances in computers and robotics enable machines to perform many rote tasks that once required human labor. Manufacturers have replaced human labor with these machines in their production processes.

Chart 3 shows an index of the capital services used per hour worked in manufacturing and an index of the information processing equipment, such as computers and software, used by all American manufacturers. Manufacturers used more than

six times as much information processing equipment in 2007 as they used two decades earlier. The amount of capital used per hour of employee work has nearly doubled in that time.⁵ Computers and robots now do tasks that once required workers on an assembly line.

More Highly Skilled Manufacturing Jobs

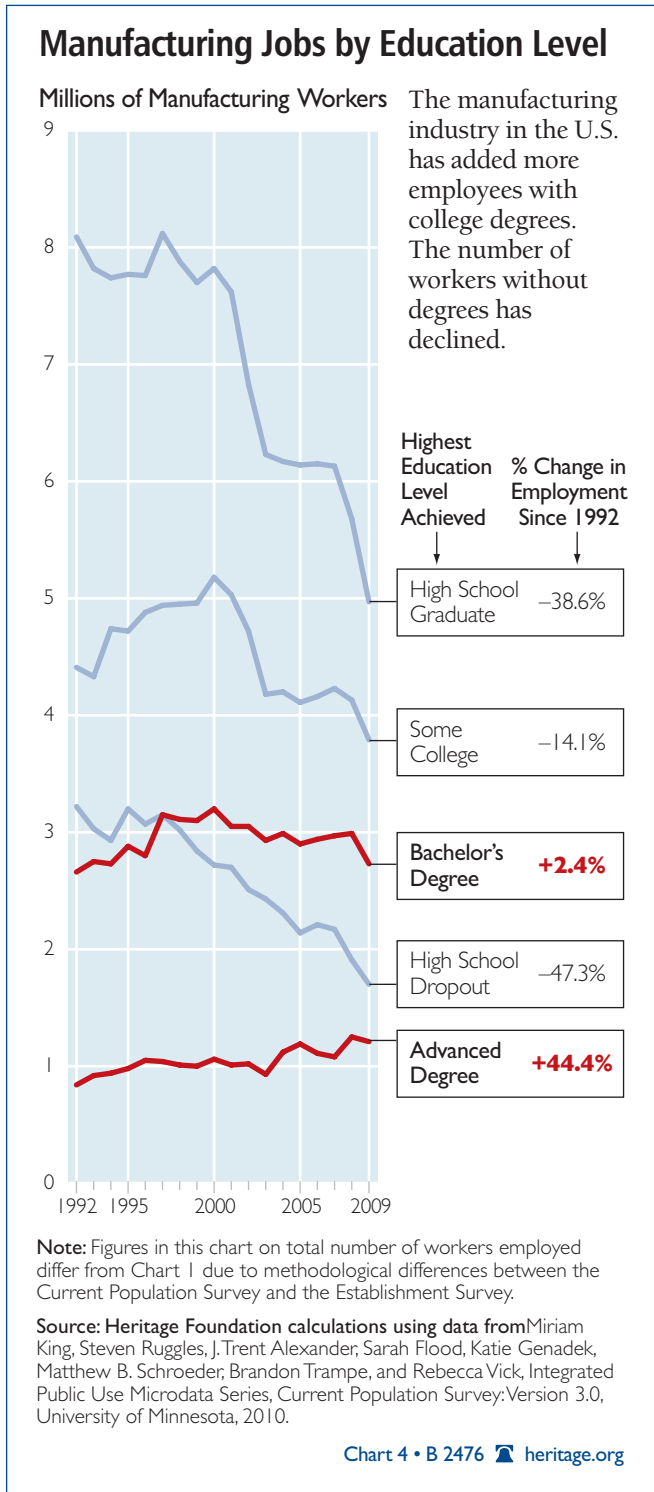
This has changed the types of workers that manufacturers need. Manufacturers need fewer unskilled workers to perform rote tasks, but more highly skilled workers to operate the machines that automated those tasks. Manufacturers have substituted brains for brawn. Chart 4 illustrates this, displaying total manufacturing employment (in millions of workers) by education level since 1992 and the percent change since 1992.

Manufacturing job opportunities have increased for skilled workers even as overall manufacturing employment has fallen. The number of manufacturing workers employed with an advanced degree (education beyond a bachelor's degree) increased from 841,000 to 1,065,000 between 1992 and 2000. That figure has continued to increase over the past decade. By 2009, manufacturers employed 1,214,000 workers with an advanced degree—a 44 percent increase since 1992.⁶

Manufacturing employment among workers with a college education has also held up much better than manufacturing employment overall. It rose 20 percent between 1992 and 2000 and fell by only 15 percent between 2000 and 2009—an overall increase of 2.4 percent since 1992.

Fewer Unskilled Jobs

On the other hand, unskilled manufacturing positions have dropped by more than positions for high-skilled workers have risen. Between 1992 and 2000, overall manufacturing employment increased, but the number of manufacturing workers with high school education or less dropped from 11.3 million to 10.5 million. Between 2000 and 2009, it dropped by an additional 37 percent to 6.7 million posi-



5. Capital services are a measure of capital inputs used in manufacturing that accounts for the depreciation of capital assets over time. Overall capital services include equipment, structures, inventory, and land—more than information processing equipment and software.

tions.⁷ Manufacturing is becoming a highly skilled occupation that requires less manual labor.

Increased Productivity and Production

This transformation has made manufacturers more productive. Manufacturing productivity has doubled

since 1987 and has increased during the past decade. Today, manufacturing workers produce 38 percent more per hour than they produced in 2000.

As a result, America produces more manufactured goods today than a generation ago. Production has risen 46 percent since 1987. Since 2000, manufacturing output has remained relatively stable even as the manufacturing workforce has shrunk. Despite cutbacks in the current recession, manufacturers are producing only slightly less (6.7 percent) than they did in the boom year of 2000. America's manufacturing base remains strong, but technology allows manufacturers to produce more goods with fewer workers.

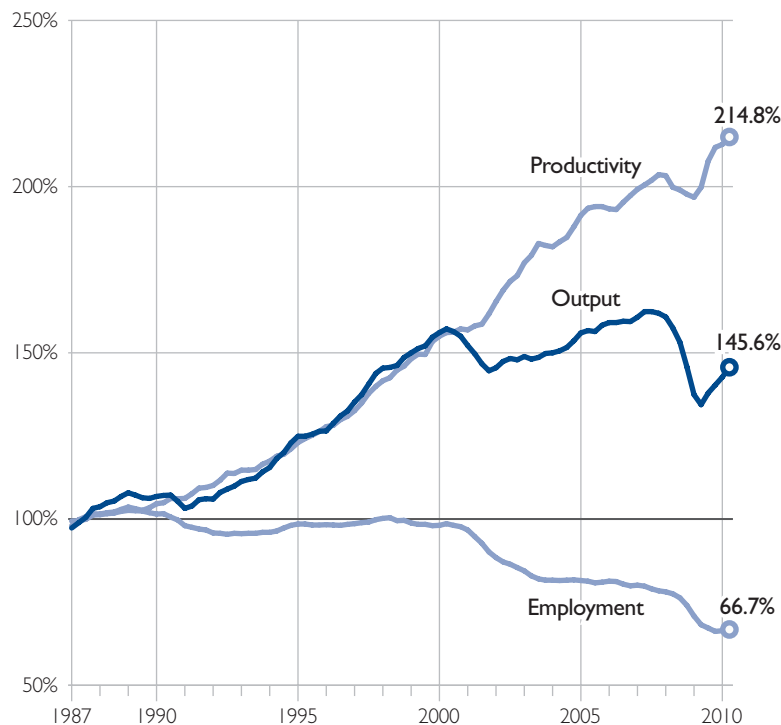
More Affordable Manufactured Goods

Increased productivity has also made manufactured goods more affordable. After accounting for improved quality, a new car costs as much in 2010 as in 1994—despite inflation rising 46 percent during that period.⁸ This is a widespread phenomenon. The prices of most manufactured goods have risen by less than inflation. Chart 6 shows the price level for commodities and the overall price level since 1983.⁹

Between 1983 and 2000, the price level inflated 72 percent. During that time the price of commodities increased by only 49 percent. Between 2000 and 2009, the

U.S. Manufacturing Productivity and Output Have Risen While Employment Has Declined

1987=100%



Source: U.S. Department of Labor, Bureau of Labor Statistics, "Productivity and Costs: Manufacturing Sector," 1987–2010, in Data Link Express, Haver Analytics.

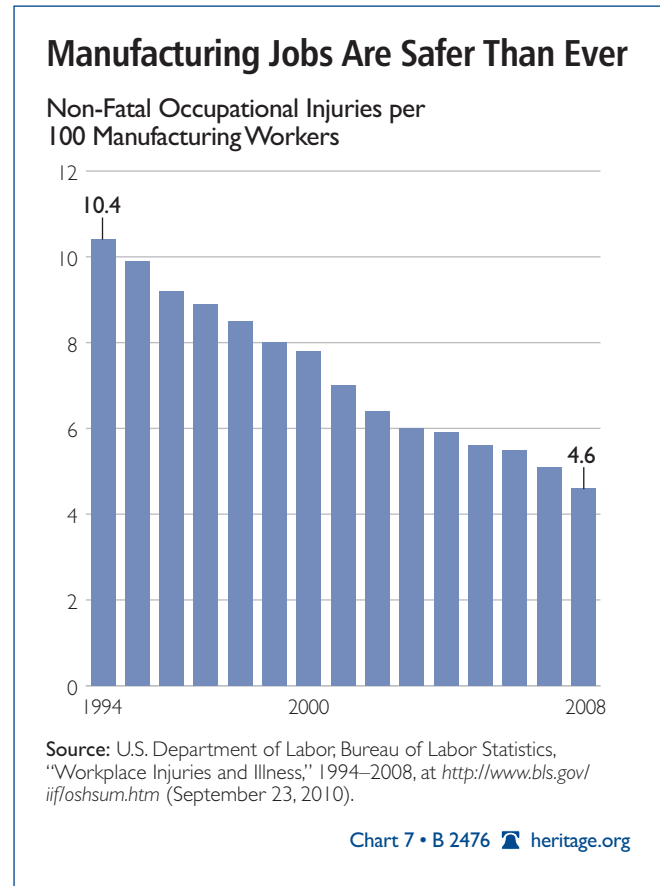
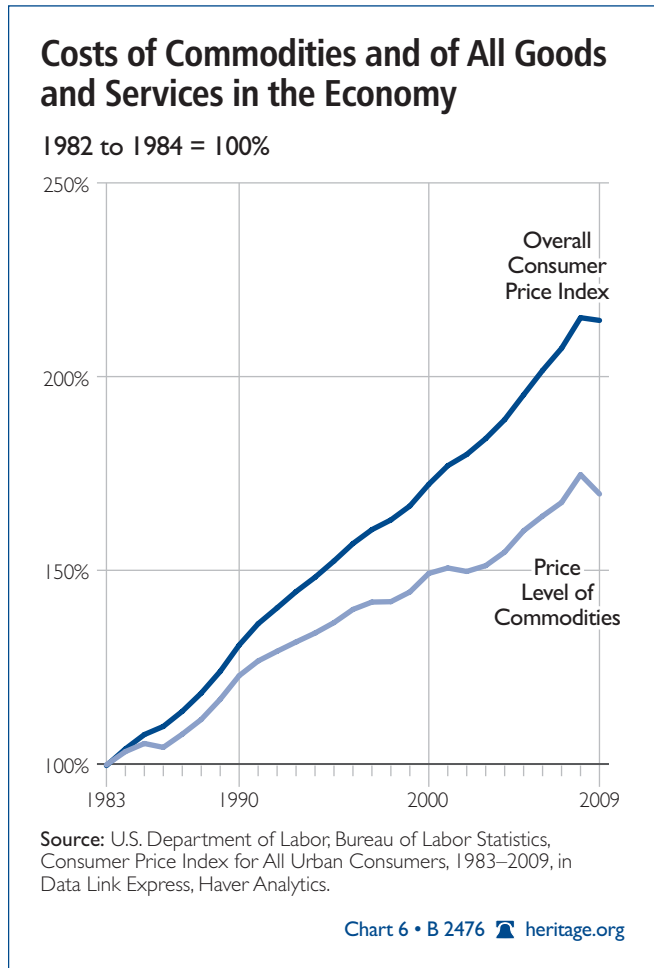
Chart 5 • B 2476 heritage.org

6. This differs from the data in Chart 1 due to methodological differences between the Current Population Survey and the Establishment Survey.
7. Heritage Foundation calculations using data from Miriam King, Steven Ruggles, J. Trent Alexander, Sarah Flood, Katie Genadek, Matthew B. Schroeder, Brandon Trampe, and Rebecca Vick, Integrated Public Use Microdata Series, Current Population Survey: Version 3.0, University of Minnesota, 2010. This figure combines the data for workers without a high school diploma and workers with a high school education used in Chart 4. This differs from the data in Chart 1 due to methodological differences between the Current Population Survey and the Establishment survey.
8. Heritage Foundation calculations using data from the U.S. Department of Labor, Bureau of Labor Statistics, "Consumer Price Index (CPI), New Vehicles," 1994–2010, in Data Link Express, Haver Analytics.
9. Most, but not all, commodities are manufactured goods.

price of commodities went up by 14 percent while the economy-wide price level inflated by 25 percent. Increased productivity allows many families to enjoy manufactured goods that would have otherwise been out of their reach.

negotiated its famous “30-and-out” retirement benefits in part because its members wanted off the assembly line as soon as possible. Automating rote tasks relieves workers of the need to perform them. Instead, workers manage the machines that produce manufactured goods. Most workers prefer this to the drudgery of the assembly line.¹⁰

Modern manufacturing work is also safer. Managing machines presents fewer opportunities for injury than working on an assembly line. Consequently, manufacturing work has become dramatically safer over the past two decades. The number of on-the-job injuries has fallen from 10.4 injuries per 100 manufacturing workers in 1992 to 7.8 in 2000 and then to 4.6 in 2008.¹¹ Technology has made manufacturing safer and less onerous for workers.



Improved Quality of Work

These technological advances also benefit workers. In the short term, automation eliminates the need for many unskilled positions and leads to painful job losses. In the longer term, it reduces the drudgery of work and makes it safer.

Few workers enjoy performing repetitive tasks on the assembly line. The United Auto Workers

10. Brahim Coulibaly, “Changes in Job Quality and Trends in Labor Hours,” Board of Governors of the Federal Reserve System *International Finance Discussion Paper* No. 882, October 2006, at <http://www.federalreserve.gov/pubs/ifdp/2006/882/ifdp882.pdf> (October 6, 2010).

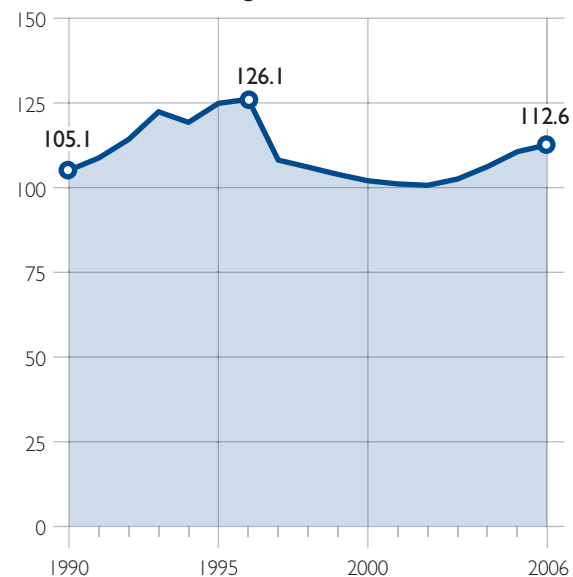
Chinese Manufacturing Employment Down

American manufacturing employment has not gone primarily overseas. Instead, machines are performing tasks that were once performed by human labor. This has happened around the world, including in China. Chinese labor force statistics are not as reliable as those collected by Western nations, but they do shed light on Chinese employment trends.

Chinese Manufacturing Employment

China's manufacturing workforce has remained relatively flat. Since 1996, manufacturing employment has dropped by more than 10 percent while the overall population has grown by more than 15 percent.

Chinese Manufacturing Workforce, in Millions



Sources: Erin Lett and Judith Banister, "China's Manufacturing Employment and Compensation Costs: 2002–06," *Monthly Labor Review*, Vol. 132, No. 4 (April 2009), p. 32, Table 1, at <http://www.bls.gov/opub/mlr/2009/04/art3full.pdf> (October 6, 2010).

Chart 8 • B 2476  heritage.org

Chinese manufacturing employment peaked in 1996 at 126 million workers.¹² The privatization of inefficient state-owned enterprises and the adoption of productivity-increasing technology eliminated tens of millions of Chinese manufacturing jobs between 1996 and 2002. Chinese manufacturing employment partially recovered to 113 million by 2006, but was still well below its 1996 level.¹³ The same factors that have eliminated American manufacturing jobs have also eliminated millions of manufacturing jobs in China. Congress cannot bring back manufacturing positions eliminated by technology by restricting foreign trade.

Improve Competitiveness

Congress could restore manufacturing employment to pre-2000 levels only by prohibiting the use of modern technology, but this would severely hurt the economy. Banning the use of laborsaving technology in manufacturing makes no more economic sense than prohibiting backhoes from moving dirt on construction sites.

Congress should instead look for ways to improve U.S. competitiveness and to create a better business climate. This would encourage both manufacturing and non-manufacturing companies to expand. Specifically, Congress could:

- Freeze individual and business tax rates at current levels;
- Deal with the budget deficit through spending reductions;
- Adopt tort reforms to limit frivolous lawsuits, including clear statutes of limitations, limits on punitive damages, and sanctions for frivolous claims; and
- Streamline or eliminate federal regulations that fail a cost-benefit test. For example, Section 404 of the Sarbanes–Oxley Act imposes large accounting costs on publicly traded firms while providing little benefit to shareholders.

11. U.S. Department of Labor, Bureau of Labor Statistics, "Summary News Release: Workplace Injuries and Illness," 1994–2008, at <http://www.bls.gov/iif/oshsum.htm> (October 6, 2010).
12. Erin Lett and Judith Banister, "China's Manufacturing Employment and Compensation Costs: 2002–06," *Monthly Labor Review*, Vol. 132, No. 4 (April 2009), p. 32, Table 1, at <http://www.bls.gov/opub/mlr/2009/04/art3full.pdf> (October 6, 2010).
13. The most recent reliable Chinese manufacturing employment statistics available from the Bureau of Labor Statistics go through 2006.

Adopting these measures would create a better business climate and lead businesses to hire. Restricting foreign trade will not.

Conclusion

U.S. manufacturing employment has dropped by one-third over the past decade. Contrary to popular belief, these jobs have not moved overseas. They have been automated. Manufacturers have become more productive and can now produce the same amount of goods with fewer workers. Technology has eliminated many unskilled manufacturing jobs, while creating some new highly skilled positions.

These same factors have eliminated manufacturing jobs in countries around the world, including

China. Despite the short-term pain of job losses, automation of rote work benefits workers and consumers. Automation of rote tasks on the assembly line reduces the drudgery of work and improves worker safety. Increased productivity has also made manufactured goods more affordable for American families.

Attempting to bring back the jobs lost to automation by restricting foreign trade will fail. Congress should abandon this approach and instead promote job creation by creating a better business climate.

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