



Economic Letter

Deindustrialization Redeploys Workers to Growing Service Sector

by Michael Sposi and Valerie Grossman

ABSTRACT: The decline of industrial employment in advanced economies is part of a long-term structural transition. A growing service sector, with an increasing share of jobs, has become key to long-run productivity growth.

Employment in the U.S. industrial sector—which includes mining, manufacturing and construction—increased by about 240,000 jobs annually from 1900 to 1980. By 1980, employment in the industrial sector had peaked and has since shed an average of about 165,000 jobs per year (*Chart 1*).

The decline has prompted debate about offshoring—outsourcing operations overseas—and trade protection. Displaced workers whose jobs moved to other countries have reason to be concerned. Nonetheless, the changing structure of the U.S. economy must be studied carefully because of its importance in determining long-run growth.

Since 1850, gross domestic product (GDP) per capita in the U.S. has grown at roughly 2 percent per year, and persistent increases in the standard of living have been accompanied by a massive reallocation of employment across three broad areas—the agricultural, industrial and service sectors. The U.S. experienced a declining share of agricultural employment, a rise and subsequent decline of industrial employment and, most recently, a rise in service employment (*Chart 2*). This process is known as “structural transformation.” In fact, every modern-day advanced economy has undergone the same process.

Three important characteristics help

determine employment makeup in the three main sectors. The first is the composition of household consumption expenditures, the second is how the three sectors are connected to each other on the production side of the economy, and the third is the extent of international linkages, particularly through trade.

Private Consumption Expenditures

U.S. household consumption patterns have changed. Just after World War II, U.S. spending on industrial goods accounted for more than 70 percent of total expenditures, and outlays for services totaled only 20 percent. Today these shares are reversed.

Demand has helped drive the change. As the economy grew, women entered the labor force, and services that were produced within the home—for example, cooking and child care—were increasingly traded on the market. More prominently, as household wealth grew and as people lived longer, a larger proportion of income was spent on services such as health care, education and entertainment.

Supply-side forces also triggered expenditure changes. The price of services grew much faster than those of agricultural and industrial goods. Agricultural prices in real (inflation-adjusted) terms have not changed much since World War II. However, industrial prices have grown by a

factor of almost six and services by a factor of almost 12. As services became relatively more expensive, they necessarily took up a larger share of household expenditures; a new TV is not a viable substitute for a root canal.

The price changes reflected differing growth in productivity across the sectors. On average, worker productivity grew by 5.2 percent in agriculture, 2.5 percent in industry and only 1.2 percent in services between 1947 and 2013. One may then ask why the economy has trended away from the high productivity growth sectors and into the sector with the slowest productivity growth. Part of the answer lies in the way the sectors are connected.

Sectoral Linkages

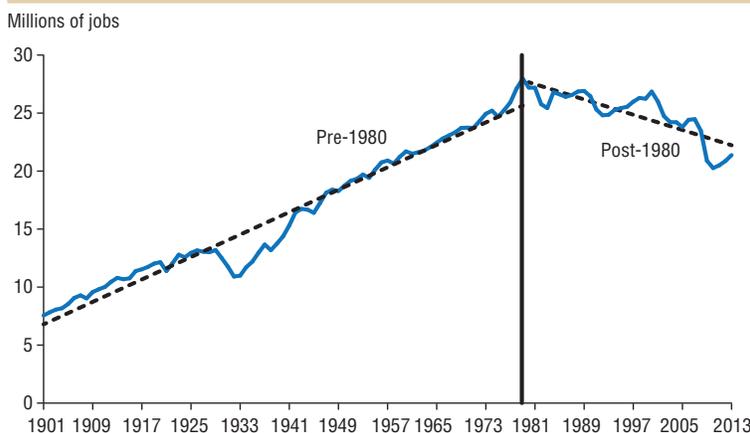
Not only did households allocate a larger proportion of spending toward services over time, but firms did as well. Businesses use services as inputs to the production process. Such inputs include professional services like finance and banking, legal, consulting, information technology and worker training. Other such inputs involved the use of software that helped automate manufacturing production.

Investment in intangible assets such as knowledge (training the workforce), human capital (accumulating new skills), organizational capital (figuring out how to structure and organize large entities to maximize efficiency), and research and development (creating and discovering new ideas) has played an increasingly important role since 1960.

The number of researchers engaged in R&D in the U.S. totaled 4,613 per million people in 2005, compared with only 1,265 per million people for the entire world. Moreover, R&D accounted for 2.8 percent of U.S. GDP in 2011, compared with only 2.1 percent of GDP for the entire world.

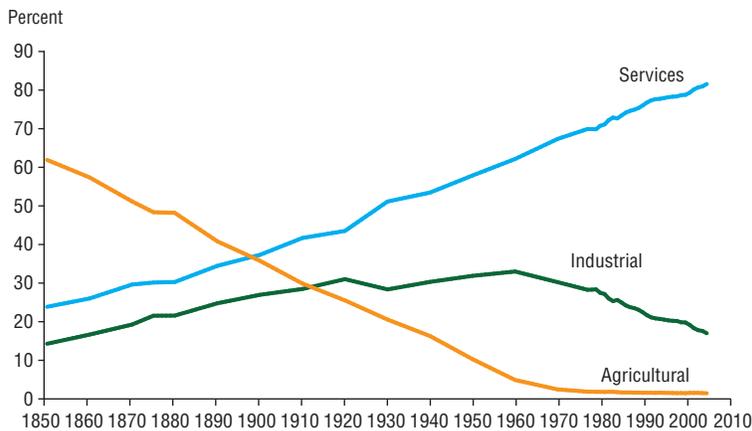
Sectoral connections have always played an important role. Before the Industrial Revolution, economies primarily relied on labor-intensive farming techniques. The onset of the Industrial Revolution led to new equipment and fertilizers that enhanced farmer productivity. Fewer workers were needed to produce a given level of agricultural output, which meant that workers could become employed in the production of industrial

Chart 1 Total Industrial Employment in the U.S. Slips After 1980



NOTE: Dotted line indicates data trend.
 SOURCES: International Historical Statistics (2013); U.S. Census Bureau; Bureau of Labor Statistics; Haver Analytics; authors' calculations.

Chart 2 Sectoral Composition of U.S. Employment Shifts Over Time



SOURCES: International Historical Statistics (2013); "Market Services Productivity Across Europe and the U.S.," by Robert Inklaar, Marcel P. Timmer and Bart van Ark, *Economic Policy*, vol. 23, no. 53, 2008, pp.139-94; authors' calculations.

goods and services. In turn, the increase in the size of the industrial and service sectors led to further improvements in farming equipment.

Just as the rise in industrial employment was crucial for productivity advancements in the agricultural sector and a driver of aggregate growth, eventually technological advancements for industrial productivity would be achieved through innovation and advances made in the service sector. The technology revolution brought forth the use of computing and the importance of software. New methods to automate production lines were implemented, boosting output per worker. Firms

invested in more sophisticated machinery and equipment.

As a result, industrial productivity grew 3.1 percent after 1980 compared with 2 percent previously. In addition, the proportion of high-tech production in total manufacturing value added increased from 30 percent to 40 percent between 1980 and 2013. Low-tech goods are still consumed in the U.S. by both households and businesses, but these items are increasingly imported from emerging economies.

International Linkages

The U.S. industrial employment decline coincided with Japan's post-World War II

industrialization. Japan accounted for 20 percent of U.S. imports in 1985, up from 1 percent in 1950, primarily involving low-tech goods—textiles, rubber and plastics. Japan's export-led growth was built on a large pool of cheap labor and access to capital goods from more-advanced economies such as the U.S. The proportion of labor employed in the industrial sector in Japan increased from 29 percent in 1950 to 36 percent in 1985, while that share in the U.S. fell from 32 percent to 29 percent.

As the Japanese economy grew, wages rose and its competitive advantage in exporting low-tech goods was lost to other emerging Asian economies. During the 1980s, Japan began producing and exporting more high-tech goods (semiconductors and computer chips) and investment goods (automobiles and medical equipment). Japan accounted for a declining share of U.S. imports—from 20 percent in 1985 to 6 percent in 2013. Simultaneously, the share of labor in Japan's industrial sector fell from 36 percent to 26 percent (Chart 3A).

As Japan's industrial sector shifted from low-tech exports to the production of high-tech goods and services, the Asian Tigers (Hong Kong, Singapore, South Korea and Taiwan) took over much of the low-tech work. The Tigers imported high-tech machines and equipment from advanced economies, such as the U.S. and Japan, and deployed their large supply of cheap labor. The Tigers accounted for 8 percent of U.S. imports in 1990, up from 3 percent in 1970; the Tigers accounted for 7 percent of Japan's imports in 1990, up from 2 percent in 1970.

Meanwhile, the share of labor in the industrial sector in the Tiger economies increased from 22 percent to 36 percent (Chart 3B). The export-led growth generated rapid increases in wages, and the Tigers' competitive advantage began to fall. As of 2013, the Tigers accounted for only 4 percent of U.S. imports and only about 5 percent of Japan's imports. The decline in industrial employment coincided with more service employment, while the industrial sector became more specialized, producing high-tech goods such as semiconductors and sophisticated electronics.

China, after its market reforms in 1978, picked up a lot of the low-tech manufacturing and exports. The export-led focus

generated a growing Chinese industrial sector; the share of industrial employment increased from 17 percent in 1978 to 30 percent in 2013. Similar to the growth experiences in Japan and in the Tiger countries, wages in China have risen dramatically and it faces the challenge of transitioning to a service-based economy.

Putting It All Together

Every advanced economy has experienced structural transformation, including the eventual decline of industrial employment. The decline reflects industrial production improvements arising from discovery and innovation in an expanding service sector. Globalization and international trade allow the U.S. to engage in high-value-added manufacturing and ser-

vices while importing low-tech goods from emerging economies.

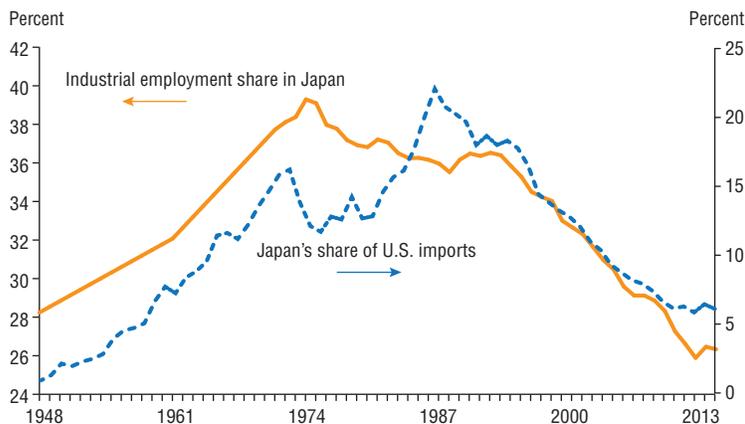
Taking GDP per capita as a measure of economic development, countries tend to follow very similar paths in terms of the composition of employment across the agricultural, industrial and service sectors of the economy as they develop.

For instance, real GDP per capita in the U.S. was about \$12,500 in 1950, with 32 percent of U.S. employment in the industrial sector and 58 percent in the service sector.¹ Real GDP per capita in the Tigers reached \$12,500 in 1994. At that time, the share of employment in the Tigers' industrial sector was 33 percent while services' employment share was 56 percent, very similar to the U.S. more than 40 years earlier. Other countries, including ones in

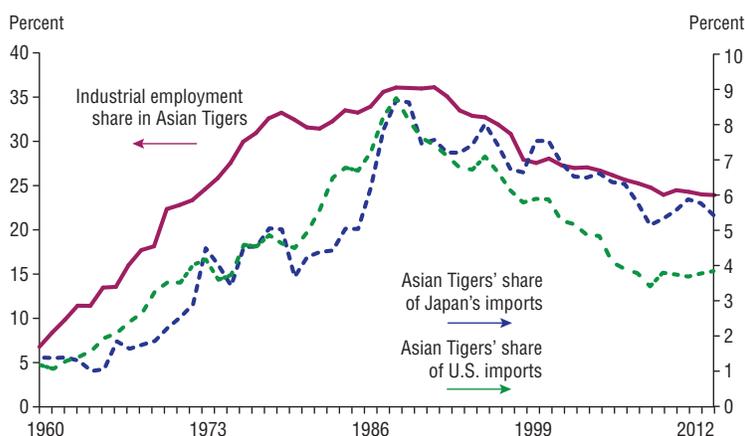
Chart 3

Industrial Employment Follows Export Flows

A. Japan Slides in Response to Diminished U.S. Import Share Since Mid-1980s



B. Asian Tigers Gain as Japan's Export Share Drops



SOURCES: International Historical Statistics (2013); "Market Services Productivity Across Europe and the U.S.," by Robert Inklaar, Marcel P. Timmer and Bart van Ark, *Economic Policy*, vol. 23, no. 53, 2008, pp. 139-94; International Monetary Fund's Direction of Trade Statistics; Haver Analytics; authors' calculations.

western Europe and Latin America, exhibit very similar relationships between the composition of employment and levels of development to those shown in Chart 4.²

Implications and Lessons

A shrinking manufacturing sector hurts some workers, who in the short run may lack the skills to find work in the service sector. As a result, there has been resistance in the U.S. to globalization and the offshoring of manufacturing. Indeed, many Americans have cast the perpetual U.S. manufacturing trade deficit in a negative light.

Still, U.S. manufacturing cannot compete with emerging economies' low labor costs for unskilled workers. Instead, the comparative advantage of the U.S. and

advanced economies is in producing high-tech and high-value-added goods and services, which is why these countries' wages and standards of living are higher.

Policies that aim at protecting the manufacturing sector in the U.S., such as import tariffs, export subsidies and restrictions on offshoring, ultimately interfere with the process of structural transformation and can reduce long-term growth.

Expanding U.S. industrial employment would require an increase in world demand for American manufactured goods, which can be achieved only by reductions in U.S. wages and living standards. Instead, policymakers should acknowledge the importance of a growing service sector and consider focusing resources on compensating displaced

manufacturing workers and incentivizing them to acquire skills to engage in higher-value-added activities.

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Notes

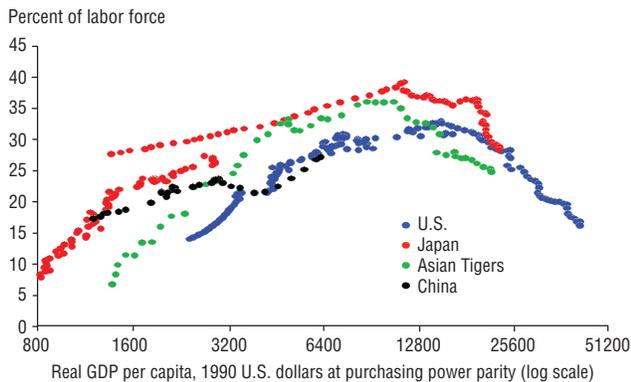
¹ Real GDP is measured in 1990 U.S. dollars at purchasing power parity.

² See "Growth and Structural Transformation," by Berthold Herrendorf, Richard Rogerson and Akos Valentinyi, in *Handbook of Economic Growth*, Philippe Aghion and Steven N. Durlauf, eds., vol. 2B, Amsterdam: Elsevier, 2014, pp. 855–941.

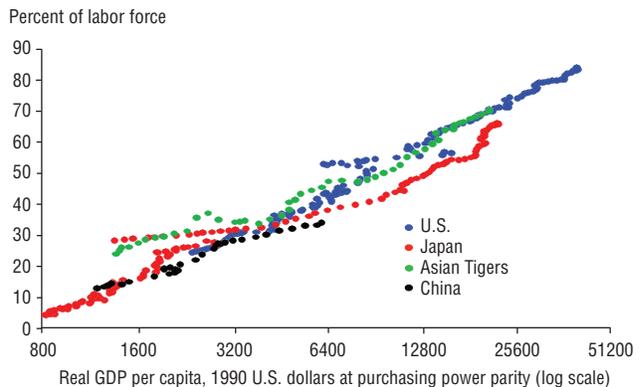
Chart 4

Common Employment Patterns Evident Among Economies

A. Industrial Labor Shares Rise and Fall During Development Process



B. Services' Share of Workforce Increases as Development Progresses



SOURCES: "The First Update of the Maddison Project: Re-Estimating Growth Before 1820," Maddison Project Working Paper No. 4, January 2013; International Historical Statistics (2013); China Statistical Yearbook 2013; "Market Services Productivity Across Europe and the U.S.," by Robert Inklaar, Marcel P. Timmer and Bart van Ark, *Economic Policy*, vol. 23, no. 53, 2008, pp. 139–94; "A Cross-Country Database for Sectoral Employment and Productivity in Asia and Latin America, 1950–2005," Groningen Growth and Development Center, Research Memorandum GD-98; authors' calculations.

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