

# TRADE, WAGE INEQUALITY, AND REGIONAL DISLOCATION IN THE UNITED STATES, WITH REFERENCE TO THE NORTH AMERICAN FREE TRADE AGREEMENT AND TRADE WITH MEXICO

**January 2018**

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**P<sup>3</sup> | PRODUCTIVITY AND  
PROSPERITY PROJECT**

**ASU** W. P. CAREY  
SCHOOL of BUSINESS  
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**A Report from the Productivity and Prosperity Project (P3),  
Supported by the Office of the University Economist**

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## **SUMMARY**

International trade results in a net aggregate economic benefit for each nation that participates. However, trade between a developed country and a less-developed country can result in significant short-term employment dislocation and long-term effects on the distribution of wages and incomes across individuals and regions.

Existing measures of trade flows between two nations are flawed since they are based on gross value instead of value added. More generally, the balance of trade — exports minus imports — does not accurately portray the value of trade. An overall trade deficit, as in the United States, is merely indicative of an imbalance in global capital flows. The U.S. trade deficit is a consequence of the fact that foreigners are building up claims on U.S. domestic assets at a faster rate than U.S. entities are building up asset claims abroad.

The North American Free Trade Agreement (NAFTA) currently is being renegotiated. General agreement is present on the need to update this 25-year-old trade pact. Less agreement exists regarding other U.S. objectives of the renegotiation, most notably the first-listed objective to “improve the U.S. trade balance and reduce the trade deficit with the NAFTA countries.”

Using trade policy to mitigate the adverse distributional consequences of trade is problematic for several reasons. First, the most efficient policy is to allow free trade and realize the attendant efficiency gains, but use some form of trade adjustment assistance to help compensate the losers. Second, trade policy does not deal with dislocation or wage losses that are due to technological change rather than import competition. Finally, import restrictions are a “beggar-thy-neighbor” policy — a policy that may improve social welfare in the protected country but does so by imposing economic losses on other countries.

### **International Trade**

Historically, most international trade in manufactured goods was conducted between developed countries and consisted of trade of finished products. The basis for this trade was efficiencies derived from economies of scale made possible by the expansion of markets. Each country specialized in the manufacture of particular products and by doing so was able to produce goods at a lower cost than other countries. Economic gains were realized by each trading country with few negative effects within any country.

Since the 1970s, trade has increasingly involved both developed and developing countries. Rather than based on economies of scale, most of this trade is based on comparative advantage. Developing countries specialize in standardized products that make intensive use of low-skill labor. Developed countries specialize in products that are technology and skilled-labor intensive.

Trade between developed and developing countries also results in a net positive economic gain for each country. However, localized negative effects may be significant within the developed nation. For example, as the manufacturing of a basic product shifts from high-cost developed countries to low-cost developing countries, employment losses occur in the developed country and workers who continue to produce the product in developed countries experience wage reductions. Typically, manufacturing of a given product is concentrated in relatively few locations within the developed nation. Due to multiplier effects, workers in other industries in

these locations also may be adversely affected. Thus, entire communities may suffer when the production of a product is shifted to another country.

Since the developed nation on net benefits from the trade with developing nations, those workers in the developed nation who suffer from this trade should be able to be compensated. Indeed, the United States and other developed countries do have such mechanisms in place. The Trade Adjustment Assistance Program in the United States is designed to assist both workers and companies that have been adversely affected by international trade. This program offers displaced workers extended unemployment insurance benefits, job training, financial assistance for job searches and relocations, and assistance with health insurance. However, evaluations of the program have indicated that it has not been particularly effective.

Another significant change in international trade is the increase in trade of intermediate goods. Instead of a good being wholly manufactured in one country as in the past, many finished products today consist of parts produced in multiple countries. This division of the production process is done to realize cost efficiencies. In many cases, the international movement of intermediate goods is between different locations of the same multinational company. Trade between nations of intermediate goods is indicative of the integration of the manufacturing process rather than competition for the production of finished goods. Various measures indicate that trade between the United States and each of its NAFTA partners, Canada and Mexico, is more complementary than is the trade between the United States and China.

The trade of intermediate goods has rendered bilateral trade imbalances misleading, if not meaningless. International trade needs to be measured as the value added in each nation, but trade statistics are expressed as gross values of the good. For example, only 60 percent of the gross value of Chinese exports of manufactures represents value added in China. China assembles parts and components that are produced in other eastern Asian countries. The value of U.S. imports from China, as measured in conventional trade statistics, thus overstates the contribution of Chinese resources in producing those goods.

More generally, trade imbalances are a poor measure of the value of international trade. An imbalance in overall international trade, such as in the United States, is a reflection of imbalances in capital flows. The U.S. trade deficit indicates that U.S. savings are inadequate to finance U.S. domestic investments, which could result from deficient U.S. savings and/or a strong investment climate. The imbalance in trade flows has nothing to do with foreign trade barriers or bad trade deals.

### **Income Inequality**

Inequality in the distribution of income has been increasing since the late 1970s in the United States and other developed countries. Since this has coincided with the increase in trade between developed and developing countries, and since declines in wages of certain workers impacted by this trade have been both theorized and empirically measured, discussions of trade and income inequality have been linked. The role of trade relative to other factors in the rise of income inequality is examined in this paper.

A century ago, inequality in capital (property) income was a significant cause of income inequality. Today, the inequality of capital income is much lower. The increase in income inequality over the last 40 years has largely resulted from growing dispersion of wage and salary earnings. Through the early 1990s, increasing dispersion occurred throughout the earnings distribution, but since then, the gap in earnings between the bottom and the middle has narrowed slightly. In contrast, earnings at the high end, particularly at the very top of the distribution, have continued to rise much faster than for other workers.

Rising inequality of earnings of the top 1 percent largely results from “superstars” with extremely high earnings. Athletes, actors, doctors, and lawyers are among those with earnings in the top 0.1 percent, but two other professions account for both the largest shares of total income and the greatest increases in share over time among the top 0.1 percent: executive/managerial and financial professions. Deregulation may have contributed to the earnings gains in financial professions, while the increases of executives may be due more to the erosion of social norms than economic forces.

Among the other 99 percent of wage and salary earners, various factors have contributed to the increase in inequality, including the decline of labor unions and decreases in the inflation-adjusted minimum wage holding down earnings of the less well educated. The primary factor, especially during the 1980s and 1990s, was the rising return to educational attainment. Supply and demand factors have contributed to the greater gains in earnings among the better educated. During the 1980s and into the 1990s, gains in educational attainment stalled while the smaller baby-bust generation was entering the workforce, increasing the premium paid to those with higher educational attainment. There was also evidence that the rising college wage premium was being driven by a temporal increase in the relative demand for highly educated workers versus less-educated workers.

The consensus view of labor economists during the mid-1990s was that the relative increase in demand for highly educated workers was due more to changes in technology than to increased trade with developing countries. The volume of trade between the United States and less developed countries was simply too small to account for a significant fraction of observed increases in skilled-to-unskilled wages. There was also abundant evidence from econometric and case studies of a positive correlation between industry-level indicators of technological change (such as investment in computers and increased use of computers by employees) and growth in the importance of skilled and highly educated workers in industry employment. The phrase “skill-biased technological change” came to be used to describe the idea that new technologies such as the computer complement, rather than replace, highly educated workers. In contrast, computers can replace workers performing routine, codifiable tasks.

Since the early 1990s, U.S. imports of manufactured goods from less-developed countries have increased as a share of GDP from 2.5 percent to around 7 percent. There are now numerous studies of local labor markets that show that U.S. wages and employment have been impacted significantly over the past 15 years by imports from, and the offshoring of activities to, less-developed countries, especially China and Mexico. When listing factors responsible for the deterioration of real wages and employment opportunities at the lower end of the U.S. labor

market, prominent labor economist David Autor now includes globalization along with computer-driven technological advance.

U.S. manufacturing employment has been falling as a share of total employment since the early 1960s. In contrast, manufacturing output has held steady as a share of GDP. Economists generally view the long-term decline in the importance of manufacturing as a sector of employment as a sign of successful implementation of labor-saving technology that has raised labor productivity. There is evidence, however, that since 2000 much of the absolute decline in U.S. manufacturing employment has been the result of increased competition of imports from developing countries, especially China and Mexico. Because manufacturing activity is more geographically concentrated than most sectors of the economy, declines in manufacturing employment are associated with increasing income inequality between regions of a country, in the United States and in other advanced nations.

### **NAFTA**

Signed in December 1992, the North American Free Trade Agreement between the United States, Canada, and Mexico went into effect at the beginning of 1994. The goal was to eliminate barriers to trade and investment between the three countries.

At the time NAFTA was implemented, the expectation among economists was that the agreement would have only a small positive overall economic effect on the U.S. economy. Local job losses also were expected to be small relative to the number of jobs lost due to other factors. A larger net positive effect was expected in Mexico.

Subsequent studies generally have concluded that NAFTA has significantly increased trade and investment flows between the member countries. However, effects on the broader economy appear to be much smaller, marginally positive in the United States and only a little larger in Mexico. As expected, the effects on local labor markets in the United States have been relatively small, with at most 5 percent of dislocated workers traced to imports from Mexico.

The smaller-than-expected overall positive economic effect on Mexico likely results from structural problems within Mexico, such as underdeveloped financial markets and a lack of private credit for companies and households. In addition, Mexico has had the misfortune of competing with China on a similar range of manufactured products.

In 2016, the United States had a merchandise trade deficit of \$753 billion, 20.5 percent of the value of total trade (imports plus exports). The flawed data on bilateral trade by country indicate that China, the largest trading partner with the United States, accounted for 46 percent of the U.S.'s total trade deficit; the deficit was equal to 60 percent of the total trade value between the two countries. The size of the trade deficit with Mexico ranked third highest at 9.4 percent of the international total, but the deficit as a share of total bilateral trade was only 13 percent. The trade deficit with Canada was even smaller at 2.2 percent of the total deficit and 3 percent of total bilateral trade with the United States.

Intra-industry trade is substantial between the United States and both Canada and Mexico. In the case of Canada, this trade likely consists of similar but differentiated finished products. For

example, a particular model of automobile may be finished in a Canadian facility while a similar model may be produced in the United States. In the case of Mexico, the intra-industry trade likely represents the trade of intermediate goods as part of the integration of the manufacturing process in the two countries.

Intrafirm trade between affiliates of the same company accounts for one-fourth of the imports to the United States from Canada and 18 percent of the exports from the United States to Canada. Intrafirm trade also is responsible for higher proportions of the trade between the United States and Mexico than with other major trading partners, at 18 percent of U.S. imports and 12 percent of U.S. exports. Estimates of the value added in trade also indicate the significant role of Canada and Mexico in goods exported from the United States.

Trade of goods accounted for three-fourths of the total U.S. trade in 2016. The United States had a trade surplus in the trade of services overall and with each of its major trading partners. Combining trade of goods and services, the overall U.S. trade deficit was 10 percent of the value of total trade. The combined trade deficit with China accounted for 61 percent of the U.S. total; Mexico's share was 12 percent. A small combined trade surplus was present with Canada.

A recent study on the effects of NAFTA on local labor markets, focusing on wages, indicated that some American workers, especially high-school dropouts, were negatively and significantly affected. In contrast, effects on college-educated workers were insignificant.

NAFTA currently is being renegotiated. The discussion, which began in August, is expected to last through the first quarter of 2018. Prior to the opening of the talks, the United States released a document citing the nation's objectives. More recently, the objectives have been grouped into two broad categories. The first broad objective is to update the agreement to take into account economic developments, such as e-commerce. The second broad objective is to reduce the trade deficit of the United States. Agreement among the three nations on the second objective will be difficult to achieve. As of late January, prior to the sixth round of talks, progress had been made on the first objective of updating the agreement, but the second broad U.S. objective remains highly contentious.

If the talks do result in an agreement between the three nations, ratification of the agreement must be made by each nation. In the United States, a lengthy process (lasting at least the better part of a year) must be followed, culminating in an up-or-down vote of Congress.

If an agreement is not reached between the three countries and the United States pulls out of NAFTA, each country would be negatively affected economically. Higher tariffs and broken supply chains would increase costs and raise prices for U.S. consumers. The price of U.S. goods in Mexico also would increase, which could cause demand to decline and in turn have a negative effect on U.S. employment. An example of an unintended consequence could be an increase in immigration to the United States from Mexico due to the negative economic effects in Mexico of ending NAFTA.

In two recent studies, Arizona was ranked as having the ninth-greatest negative effect from a termination of NAFTA. Each study rates Michigan as being the most vulnerable state.

## **PRIMER ON INTERNATIONAL TRADE**

International trade consists of the exchange of goods and services between countries. Merchandise trade includes agricultural products, primary commodities, and intermediate and finished manufactured goods. Trade in services has been growing in importance and covers a variety of services such as financial and professional services, telecommunications, travel, and transportation services. Much of the focus in this paper will be on trade in manufactured goods. This is because imports of manufactures from developing countries represent the greatest threat to employment and wages of low-skill workers in the United States.

In this paper, an “export” generally is defined as a good or service sold to a buyer in another country, and an “import” generally is a good or service purchased from a seller in another country. However, as discussed in this section, trade increasingly includes goods shipped across international borders between affiliates of a specific company.

### **Historical Trade**

Historically, international trade was not substantial. Much of what trade did occur was between a native country and its colonies, with foodstuffs and raw materials exported from the colonies and finished goods exported from the home country. Later, as colonies became independent, the same type of trade continued between developed and developing countries.

During the 19th century, manufactured goods became more important in the national product of advanced nations and also became more important in international trade. Growth in world trade following World War II primarily involved the advanced countries of North America and western Europe trading finished manufactured goods. This trade was based on efficiencies derived from economies of scale that resulted in cost savings made possible by the expansion of markets. Countries with similar factor endowments<sup>1</sup> can benefit by specializing in niche areas of manufacturing (e.g., varieties of cars or capital goods), reducing per unit costs through expanded scale, and then engaging in two-way trade in similar products. Trade based on economies of scale between countries at a similar stage of economic development result in gains in national income that come with minimal employment dislocation and changes in wage structure.

### **The Evolution of Trade Since 1970**

#### **Increase in Trade Between Developed and Developing Nations**

The nature of trade began to change in the 1970s. Following the lead of Japan, which had achieved rapid economic development in part through strong export performance, other eastern Asian countries, including South Korea, Taiwan, Singapore, and Hong Kong (the “Asian Tigers”), adopted export-led development strategies. By 1990, developing countries accounted for 35 percent of U.S. imports of manufactures. The four Asian Tigers alone accounted for 14 percent of total U.S. manufacturing imports.

Wanting to replicate the growth experiences of eastern Asian countries, more and more developing countries, including countries in Latin America, eastern Europe, and other parts of Asia, adopted market-friendly policies. The period from the mid-1980s through the mid-1990s

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<sup>1</sup> “Factor endowments” consist of a country’s supplies of productive resources including land, labor and capital.

witnessed an almost universal movement toward freer trade on the part of countries in the less-developed world.

The result for the United States has been an even more rapid increase in trade with developing countries (see Chart 1). U.S. imports from developing countries have increased from 2.4 percent of gross domestic product (GDP) in 1990 to 6.6 percent of GDP in 2015. Developing countries now account for 61 percent of U.S. imports of manufactured goods. Particularly significant in U.S. trade has been the rise of Mexico and, more recently, of China as suppliers of U.S. imports (see Chart 2). In 1990, the Four Asian Tigers accounted for 41 percent of U.S. imports of manufactures from developing countries. By 2015, the share from the Asian Tigers had fallen to 11 percent, while the shares from Mexico and China had risen to 22 percent and 40 percent, respectively.

The growth in U.S. imports from Mexico and China has been much more rapid than can be explained by growth in the GDPs of these countries. Much of this “excess growth” in trade likely has been due to reductions in trade barriers. In the case of Mexico, the North American Free Trade Agreement (NAFTA) played an important role in the rapid growth of trade between the United States and Mexico. China has been an aggressive practitioner of export promotion and realized substantial reductions in trade barriers as a part of joining the World Trade Organization (WTO) in 2001. Krugman (2008)<sup>2</sup> also speculates that Chinese exports may have been disproportionately encouraged by declines in the cost of communication and shipping which have encouraged offshoring<sup>3</sup> and the development of regional production platforms.

Trade between a developed country like the United States and developing countries like Mexico and China are based more on comparative advantage<sup>4</sup> than economies of scale. Each kind of trade generates efficiency gains in world production and raises the level of national income in each participating country. However, unlike trade that is based on economies of scale, trade based on comparative advantage that takes place between countries at different stages of economic development is likely to generate serious employment dislocation and cause changes in relative domestic wages between the skilled and unskilled. Krugman (2008) provides an illuminating calculation showing that a significant decline has taken place since 1990 in the ratio of the average compensation of foreign workers who produce U.S. imports of manufactured goods to the overall U.S. rate of compensation. This decline has been driven in large part by the emergence of Mexico and China as major suppliers of U.S. imported goods.

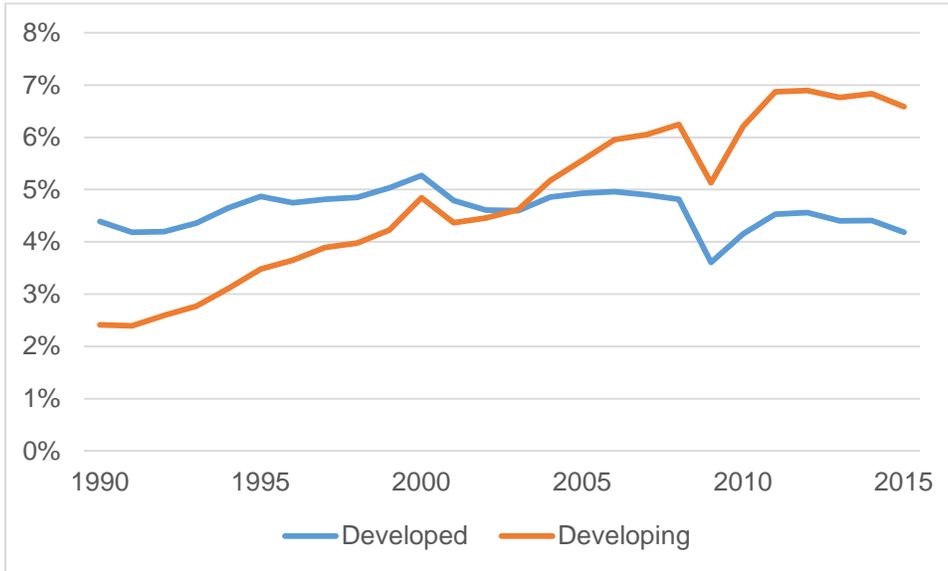
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<sup>2</sup> Complete references to sources are provided in the “References” section at the end of this paper.

<sup>3</sup> “Offshoring” refers to locating some of a company’s processes or services in another country in order to take advantage of lower costs. This is distinct from “outsourcing,” which refers to buying from a third party something that a company used to produce itself.

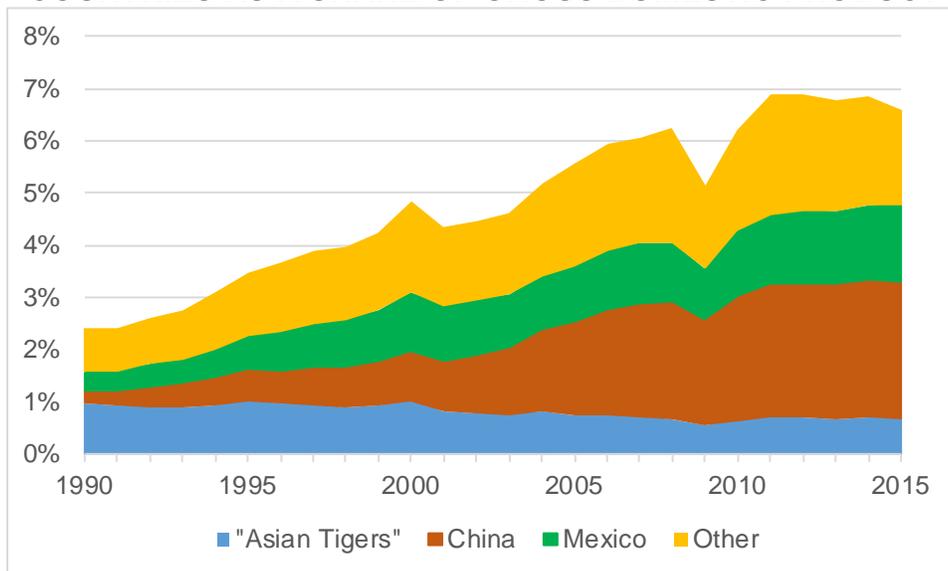
<sup>4</sup> “Comparative advantage” in international trade theory refers to the ability to produce a good at a lower opportunity cost (the quantity of other goods that could have been produced with the resources used to produce a given good).

**CHART 1**  
**UNITED STATES IMPORTS OF MANUFACTURES FROM DEVELOPED AND DEVELOPING COUNTRIES AS A SHARE OF GROSS DOMESTIC PRODUCT**



Source: Calculated from U.S. International Trade Commission DataWeb.

**CHART 2**  
**UNITED STATES IMPORTS OF MANUFACTURES FROM DEVELOPING COUNTRIES AS A SHARE OF GROSS DOMESTIC PRODUCT**



Source: Calculated from U.S. International Trade Commission DataWeb.

### **Increases in Trade of Intermediate Goods and Offshoring**

Organizational innovations and declines in the cost of international communication and shipping have made it possible to break up the production process into separate stages and tasks and locate them in different geographic areas. This division of the production process is called “vertical disintegration.” An unskilled labor-intensive stage of production in an otherwise skilled labor-intensive process need no longer be performed in the same physical location but instead can be offshored to a country with lower unskilled wages. The component part or task that is produced in another country can then be imported and reconnected with the remaining stages of production.

By breaking up the value chain in this way, production costs can be reduced, generating efficiencies that are realized in the form of additional gains from trade. For trade of this nature, imports of goods produced abroad are no longer simply substitutes for goods produced at home but instead are complementary with home production. Benefits associated with imports are no longer limited to consumers of final goods but also accrue to domestic producers whose processes and costs have become integrated with foreign producers.

**Intra-industry Trade.** Intra-industry trade refers to the simultaneous import and export by a country of goods in a specific production category. Intra-industry trade may arise when countries specialize and trade in similar but highly differentiated final products, such as passenger cars and light trucks, or sedans and minivans. Gains from this kind of specialization are driven by economies of scale. Trade of this nature may involve goods with similar factor intensities<sup>5</sup> being traded by countries with similar factor endowments and have nothing to do with the vertical disintegration of international production. Intra-industry trade of this type is common and prevalent among developed countries.

Exchanges of goods at different stages of production would not show up as intra-industry trade if the data were presented at sufficiently fine levels of disaggregation. Because of the realities of commodity aggregation, however, data on trade even at the finest levels of disaggregation include both final and intermediate goods. The phenomenon of vertical disintegration and trade in intermediates also appears in trade data as intra-industry trade.

The degree of intra-industry trade in a particular product category is commonly measured by the Grubel-Lloyd index. This is a number between 0 and 100 that takes on a value of 100 when a country imports as much of a product as it exports, and a value of 0 when a country imports but does not export an item, or vice versa; see Organisation for Economic Co-operation and Development (OECD, 2002, p. 160).

Table 1 provides Grubel-Lloyd measures of intra-industry trade between the United States and each of its top five trading partners. The highest values are for Canada and Mexico, the country’s NAFTA partners. Canada is a developed country with wage levels similar to the United States. Much of the intra-industry trade between these partners may consist of two-way trade in similar but differentiated finished products. The high Grubel-Lloyd statistic for Mexico, on the other hand, is indicative of trade in intermediates and a high degree of integration in the manufacturing

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<sup>5</sup> “Factor intensity” is the relative importance of one factor versus others in production in an industry, usually compared across industries.

**TABLE 1**  
**INTRA-INDUSTRY TRADE BETWEEN THE UNITED STATES**  
**AND ITS TOP TRADING PARTNERS**

	Total Bilateral	Grubel-Lloyd Index of Intra-Industry Trade**	
	Trade, 2015*	2015	2005
Canada	\$460	69.5	67.0
Mexico	478	56.2	58.2
Germany	165	52.2	49.6
Japan	182	41.9	36.9
China	583	19.2	16.9

\* In billions; the value is the sum of the import and export values.

\*\* Calculated using trade in manufactures reported by 4-digit North American Industry Classification System (NAICS) code.

Source: Calculated from U.S. Department of Commerce, Census Bureau.

sectors of the two countries. Wilson (2016) uses these and other statistics to argue that U.S.-Mexico trade serves to support a regionally integrated manufacturing platform and that production in the two countries should be viewed as complementary rather than rival. Measures of the degree of intra-industry trade between the United States and Japan and China are much lower, especially for China. Imports from these countries may be better viewed as substitutable for, rather than complementary with, U.S. production.

Measures of U.S. intra-industry trade were calculated for two years, 2005 and 2015. With the exception of Mexico, the Grubel-Lloyd index increased for each of the major trading partners over this time period. Calculations made previously by the OECD demonstrated trend increases in the importance of intra-industry trade for all major OECD countries during the 1970s and 1980s. More recently, the OECD (2002) found that measures of intra-industry trade continued to increase in the 1990s and that the gains were particularly large in Mexico and eastern European countries. This likely reflects movements toward greater regional integration of manufacturing within North America and Europe, e.g., an alignment of Mexico with the United States and eastern Europe with western Europe. The OECD study did not speak generally to trends in intra-industry trade within eastern Asia, as only Japan and Korea are OECD members. However, for these two countries, the data did show large increases in intra-industry trade from low initial levels.

**Intrafirm Trade.** When control of technology and product quality is important, the offshoring of tasks and intermediate activities is often accomplished through cross-border trade between a multinational company and its foreign affiliates — what is referred to as “intrafirm” trade. Tables 2 and 3 show recent statistics on the importance of intrafirm trade between the United States and its top trading partners. The perspective in Table 2 is the flow of goods from U.S. parents to affiliates located abroad. The rank order across trading partners in intrafirm exports as a percentage of total exports is the same as for intra-industry trade (Table 1). The highest percentages of total U.S. exports that involve related parties are for Canada and Mexico. In the case of Canada, for example, 18 percent of total U.S. exports of manufactures to Canada are

**TABLE 2**  
**EXPORTS OF MANUFACTURED GOODS SHIPPED TO FOREIGN AFFILIATES**  
**BY UNITED STATES PARENTS, 2014**

	Intrafirm Exports*	Percent of Total U.S. Exports
Canada	\$49.4	18.1%
Mexico	26.2	12.1
Germany	5.2	11.8
Japan	3.9	7.2
China	5.9	6.5

\* In billions; data are for majority-owned affiliates.

Sources: Calculated from U.S. Department of Commerce, Census Bureau and Bureau of Economic Analysis.

**TABLE 3**  
**IMPORTS OF MANUFACTURED GOODS SHIPPED TO UNITED STATES PARENTS**  
**BY FOREIGN AFFILIATES, 2014**

	Intrafirm Imports*	Percent of Total U.S. Imports
Canada	\$54.9	24.8%
Mexico	44.2	17.8
Germany	6.3	5.2
Japan	2.5	1.9
China	6.8	1.4

\* In billions; data are for majority-owned affiliates.

Sources: Calculated from U.S. Department of Commerce, Census Bureau and Bureau of Economic Analysis.

from a U.S. parent to an affiliate located in Canada. The lowest percentages of exports that occur through intrafirm trade are for Japan and China.

The perspective in Table 3 is U.S. imports by parent companies of goods produced by foreign affiliates. Similar to the patterns in the two previous tables, the highest percentages of imports from affiliates to total bilateral imports are for Canada and Mexico, and the lowest percentages are for the Asian countries. Whether because of distance or NAFTA, data on both intra-industry trade and intrafirm trade indicate substantially more complementarity and vertical integration of production between the United States and its NAFTA partners than between the United States and its other top trading partners.

**Trade Measured as Value Added.** Exports and imports are measured in gross value terms. When goods are wholly produced within the country of origin, the gross value of the goods exported is the same as the value added by the source country. Trade in intermediate goods

destroys this equivalence and renders many trade statistics, such as ratios of exports to GDP and bilateral trade imbalances, misleading or useless.

An anatomy of the value added in an Apple iPod is particularly illuminating (see Dedrick, et al. 2008). As of 2008, the iPod was assembled in and exported from China, so China was credited in the data with the gross value of the device. However, assembly and testing accounted for only 3 percent of the iPod's total input cost. The hard drive accounted for about half of the price, but many of the components requiring skilled labor were made elsewhere. The display was made in Japan; the semiconductors were made in the United States and Taiwan. The Chinese gate price of an assembled iPod was \$144, but as little as \$4 of this may have been Chinese value added. Koopman, et al. (2008) estimate that on average, foreign countries contributed 60 percent of the value added embodied in Chinese exports of computers, office equipment, and telecom equipment.

Efforts to develop systematic methods for estimating the value added in trade have been ongoing since 2010 (see, for example, Koopman, et al. 2010). One notable recent collaboration is the OECD-WTO Trade in Value Added Database. Tables 4 and 5 show selected results from this database (the latest data are for 2011). Table 4 shows estimates of value added by source in the gross manufactured exports of selected countries. Looking first at the United States, 79 percent of the gross value of all U.S. exports of manufactures represents U.S. value added. The remaining 21 percent reflects value added or productive activity from other countries. The top

**TABLE 4**  
**SHARES OF VALUE ADDED BY COUNTRY IN THE EXPORTS**  
**OF SELECTED COUNTRIES, 2011**

Value Added by Country as a Percentage of Gross Exports						
<b>U.S. Exports:</b>	U.S.	Canada	China	Mexico	Japan	Other
Total Manufactures	78.5%	3.2%	2.4%	1.9%	1.5%	12.5%
Motor Vehicles & Parts	64.6	4.5	4.6	3.8	4.8	17.7
Electrical Equipment	85.2	1.3	2.9	1.2	1.4	8.0
<b>Chinese Exports:</b>	China	Japan	U.S.	Korea	Taiwan	Other
Total Manufactures	59.9	6.0	3.8	3.4	2.4	24.5
Electrical Equipment	46.2	10.1	5.2	5.9	4.8	27.8
<b>German Exports:</b>	Germany	U.S.	France	U.K.*	Italy	Other
Total Manufactures	69.3	2.4	2.2	1.9	1.8	22.4
Motor Vehicles & Parts	67.9	2.3	2.5	2.0	2.4	22.9
Nonelectrical Machinery	73.3	2.0	1.9	1.4	2.1	19.3
<b>Japanese Exports:</b>	Japan	China	U.S.	Korea	Germany	Other
Total Manufactures	81.8	2.8	1.9	0.8	0.7	12.0
Motor Vehicles & Parts	86.1	2.3	1.5	0.7	0.9	8.5

\* United Kingdom

Source: Organisation for Economic Co-operation and Development (OECD), OECD-WTO Trade in Value Added Database.

**TABLE 5**  
**VALUE ADDED IN UNITED STATES OF IMPORTS**  
**FROM SELECTED COUNTRIES, 2011**

	Gross Value of Imports*	U.S. Value Added*	U.S. Share
U.S. Imports from Canada			
Total Manufactures	\$192.5	\$28.3	14.7%
Motor Vehicles & Parts	44.2	11.7	26.5
U.S. Imports from Mexico			
Total Manufactures	166.6	26.2	15.7
Motor Vehicles & Parts	44.5	8.0	18.0
Electrical Equipment	52.9	9.0	17.0
U.S. Imports from China			
Total Manufactures	327.4	13.4	4.1
Electrical Equipment	158.8	8.4	5.3
U.S. Imports from Japan			
Total Manufactures	91.2	1.7	1.9
Motor Vehicles & Parts	32.0	0.5	1.5

\* In billions.

Source: Organisation for Economic Co-operation and Development (OECD), OECD-WTO Trade in Value Added Database.

four foreign sources of value added in these U.S. exports are, in descending order of importance, Canada, China, Mexico, and Japan. The presence of Canada and Mexico on this list is impressive in light of how small these economies are in relation to the economies of China and Japan. Looking at a few selected industries, U.S. exports of motor vehicles and parts contain relatively large amounts of foreign value added. Exports of electronic equipment, on the other hand, contain little foreign value added.

Table 4 also provides a breakdown of value added by source country for the exports of China, Germany, and Japan. China's exports contain the greatest foreign value added, with 40 percent of gross export value representing foreign value added. Not surprisingly, three of the four countries contributing the largest percentages of value added to China's exports are eastern Asian countries. The country with the highest domestic value-added content, and the smallest share of value added from foreign sources, is Japan. Eighty-two percent of the gross value of Japanese manufacturing exports is accounted for by domestic production.

Table 5 provides another perspective on the importance of global sourcing and supply chains in U.S. trade, indicating how much of the gross value of U.S. imports of manufactured goods actually represents U.S. value added (i.e., reflects U.S. upstream production). Approximately 15 percent of the value of manufactures imported from Canada and Mexico consists of U.S.-made intermediate goods and services. This is much higher than the share of U.S. value added in U.S. imports from China and Japan. Auto production is especially integrated across countries. Twenty-seven percent of U.S. imports of motor vehicles and parts from Canada represents U.S.

production at an earlier stage. In the case of imports of motor vehicles from Mexico, the share of U.S. value added is 18 percent.

### **Economic Theory on the Effects of Trade Between Developed and Developing Nations**

Trade in manufactures between developed and developing countries seems to fit the classical theory of comparative advantage “to a T,” e.g., the theory of comparative advantage as articulated in the trade theory of Eli Heckscher and Bertil Ohlin.<sup>6</sup> In their model of trade, country differences in factor endowments create differences in relative costs. Countries like the United States that are abundant in high-skill labor are able to produce at low relative cost (have a comparative advantage in) goods that are high-skill labor intensive. Countries like Mexico and China that are abundant in low-skill labor produce at low relative cost goods that are low-skill labor intensive. Having the opportunity to trade with other countries, at relative prices that are different, increases the consumption possibilities in a nation.

Gains from trade will accrue even if a country does not adapt its internal production to better suit new market conditions. A profit-maximizing adaptation of domestic production serves to increase further the gains from trade. In responding to new world prices, countries will specialize in goods in which they have a comparative advantage, and they will move out of industries whose production can be replaced with cheaper imports. This reallocation of resources further increases real national income. World production efficiency is enhanced when countries with relatively low costs of producing particular goods specialize in these industries and replace production by countries with higher costs. These gains in world production efficiency are an important underlying determinant of the gains in national income realized through trade.

The theory of comparative advantage and the real income gains that can be expected from specialization and trade apply to trade in tasks and intermediate goods as much as they apply to trade in finished goods. Sectors in a country abundant in high-skill labor that can outsource various component activities will outsource low-skill, labor-intensive tasks to low-wage countries.

In traditional trade theory, gains from trade arise not because trade expands economywide employment opportunities and increases aggregate employment, but rather because trade induces a pattern of specialization in which workers leave jobs with low value added and take jobs with higher value added. Trade can be a disruptive process, with substantial dislocation and temporary unemployment. However, in economies with functioning labor markets, and especially in economies with high worker mobility, the long-run effects of trade on aggregate employment are expected to be small, either up or down. Trade both creates and destroys jobs. Those who work in import-competing industries or have skills used intensively in import industries may face a loss of employment, but trade expands employment opportunities in export industries. Jobs are also created in nontraded industries, supported by the gain in real national income which trade brings about. When looking at a particular skill group, the net effect of these shocks on labor demand may be either positive or negative. Market adjustments in wages will serve to eliminate excess supply or demand and maintain full employment.

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<sup>6</sup> Ohlin's 1933 book *Interregional and International Trade* introduced this theory.

The Heckscher-Ohlin model of international trade makes clear that while trade generates gains in national income, it will create losers as well as winners within a country. Trade can have potentially serious consequences for income distribution. In the short run, losing groups include workers and owners of capital in import-competing industries. Among the winners are owners of resources employed in export industries. In the long run, it is not the industry of employment that is critical but the type of resource.

For developed countries abundant in high-skill labor and scarce in low-skill labor, trade will raise the ratio of high-skill to low-skill wages. Skilled workers benefit disproportionately from trade. Low-skill workers may lose absolutely, even in the long run. These tendencies in wage adjustment apply whether a worker is employed in an import-competing industry, an export industry, or a nontraded industry.

Trade will also change relative wages in developing countries. Traditional theory predicts that countries that are abundant in low-skill labor will find that trade serves to reduce wage inequality. The biggest beneficiaries from trade will be low-skill workers — those who are in abundance in the country and define its areas of comparative advantage.

The conclusions of traditional trade theory are robust and unambiguous. Trade between developed and less-developed countries should produce gains in real national income for every participating country. There will be particular individuals who suffer an economic loss. However, the existence of gains in national income imply that the winners should be able to compensate the losers. The first-best response to adverse distributional effects from trade is not to restrict trade but to compensate the losers. In practice, of course, some countries make trade adjustment assistance a higher priority than do other countries. The effects of trade within a country and trade adjustment assistance are discussed further in a later section of this paper.

### **Empirical Evidence of the Effects of Trade Between Developed and Developing Nations**

It is difficult to identify the effects of trade — on national income, employment, and wage inequality — in aggregate data. The analysis is limited by a small number of observations and changing conditions. A summary of the consensus views of economists on these issues follows.

### **Trade and Real Income Growth in Developed Countries**

Macroeconomists generally believe that for advanced countries, factors such as technological change and demography have larger effects on GDP growth than do marginal changes in trade policy or changes in world market conditions. Annual rates of real GDP growth have been trending down over the past several decades throughout the developed world. Increased trade opportunities with developing countries may have provided a boost to growth, but this effect has been swamped by diminished contributions to growth from technological change and by the aging of populations and declines in the rate of growth in the working-age population.

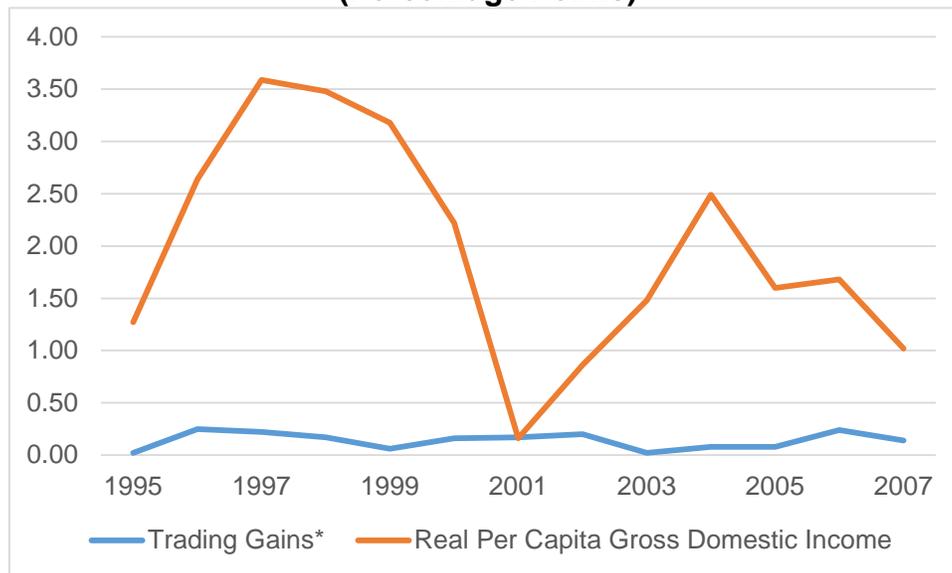
Routine government statistics do provide one measure of the effect of changing conditions in international markets on a nation's real national income — a measure known as “command GDP.” This statistic measures the effect of changes in world market prices on the purchasing power of a country's output or income. Real national income rises if world prices of a country's exports increase relative to the prices of its imports (representing an improvement in the

country’s “terms of trade”) and vice versa if prices of imports increase relative to the prices of items exported.

Chart 3 shows calculations from Reinsdorf (2010) of the contribution of changing U.S. terms of trade on growth in U.S. real domestic income over the period from 1995 through 2007. This was a period of great change in the size and nature of U.S. trade, especially trade with developing countries. For perspective, the exhibit also shows annual growth in U.S. per capita real gross domestic income. The analysis accounts for changes in all prices except for petroleum and related products. The net effect of changes in world market conditions (excluding petroleum) on U.S. real national income was positive, i.e., the U.S. generally experienced improvements in its terms of trade. Reductions in import prices made possible through increased trade with developing countries such as China and Mexico were more important than any losses associated with declines in world prices of U.S. exports.

For the United States — a country that does not rely heavily on international trade and whose exports are highly diversified — the contribution of changing terms of trade is relatively small when compared to the size of the overall growth in real national income. From 1995 through 2007, the average contribution of changes in U.S. terms of trade to growth in real national income was 0.14 percent. This compares with an average annual increase in U.S. real per capita gross domestic income of 2.0 percent. Growth in real per capita national income is also affected

**CHART 3**  
**CONTRIBUTION OF CHANGES IN U.S. TERMS OF TRADE TO ANNUAL GROWTH**  
**IN U.S. REAL PER CAPITA GROSS DOMESTIC INCOME**  
**(Percentage Points)**



\* Excluding petroleum and petroleum products.

Source: Derived from Reinsdorf (2010), Table 2.

by technological change, changes in the employment-to-population ratio, and changes in labor productivity associated with mechanization and rising educational attainment. Impacts from changes in world market conditions represent only one relatively minor factor on this list.

Several caveats concerning the above analysis should be noted. First, differences in growth between command GDP and real GDP pick up only the effects of changes in world market conditions on a country that is already open to world trade. The differences do not measure the overall consequences of being open to trade. In addition, the effects identified refer only to changing conditions in international markets for trading goods and services. They do not account for effects on national income arising from changes in foreign investment outflows and inflows. Finally, the calculations assume that the economy is at full employment. They do not account for changes in national employment that may arise because of changes in import and export prices.

### **Trade and Real Income Growth in Developing Countries**

Here the evidence is more conclusive and easier to see. Less-developed countries that have opened up to trade, especially those in Asia, have experienced substantially higher rates of economic growth. There are some important exceptions, often when movements toward freer trade are not accompanied by market-supporting institutional reforms. Mexico is a case in point; this is discussed later in this paper.

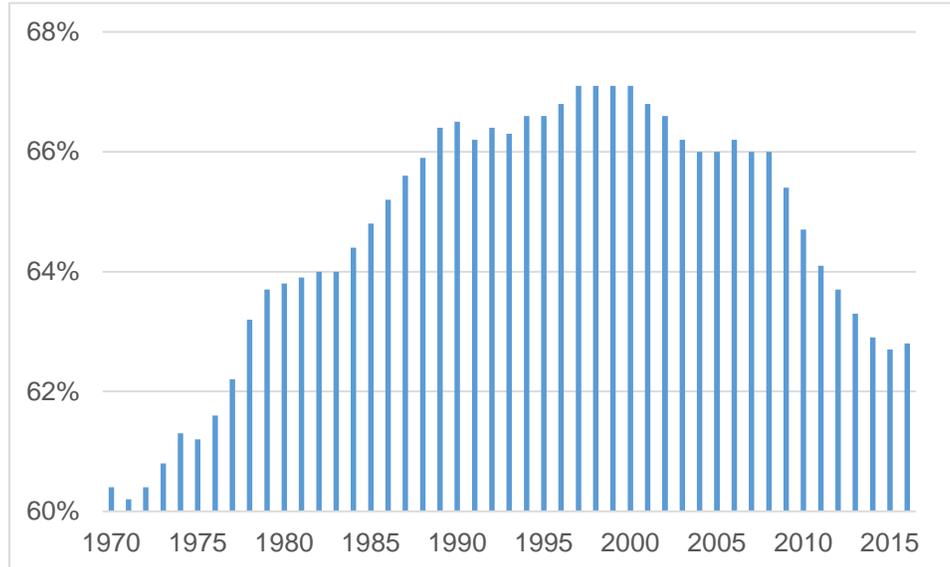
### **National Employment Levels and Unemployment Rates**

In theory, microeconomic shocks such as changes in trade regimes should have no significant long-run effect on aggregate employment provided that necessary wage adjustments are not blocked by unions, minimum wage laws, or other labor-market rigidities. In the United States, with its relatively flexible labor markets, there has been no clear trend movement in the national unemployment rate. The largest recent changes in the rate of unemployment have been cyclical, brought on by the financial crisis and the Great Recession, followed by an economic recovery and expansion.

However, there has been a trend decline in U.S. labor force participation since 2000 (see Chart 4). The drop in labor force participation has been especially large since the onset of the Great Depression in 2007, and it barely began to recover in 2016. A useful analysis of the recent decline in U.S. labor force participation is provided by Braun, et al. (2014). The authors find that 1.7 percentage points of the 3.1 percentage-point decline from 2007 through 2014 can be accounted for by the aging of the population. Over the life cycle of an individual, labor force participation rises throughout the 20s, flattens out during prime working-age years, and then falls to low levels as people enter their 60s and go into retirement. Using labor force participation rates by age in 2007 and then folding in changes in the age distribution of the U.S. population that have taken place since then, the authors find that shifts in the age distribution (e.g., the aging of the baby-boom generation) can explain 1.7 points of the drop in labor force participation since 2007. The authors also find from a longer time series analysis of labor force participation that cyclical factors (e.g., the Great Recession) have also played a role, accounting for 0.5 percentage points of the drop in labor force participation.

This leaves unexplained approximately a full percentage point of the decline in U.S. labor force participation since 2007 and as much as another percentage point of the drop from 2000 to 2007.

**CHART 4**  
**CIVILIAN LABOR FORCE PARTICIPATION RATE IN THE UNITED STATES**



Source: Federal Reserve Bank of St. Louis, <https://fred.stlouisfed.org/>.

Following the longer-term analysis of the Council of Economic Advisors (CEA, 2016), much of the decline in labor force participation among prime-age males that has occurred over the past several decades is concentrated among less-educated men. Very little of this decline can be explained by disincentive effects from public assistance programs. Instead, the data support a story of falling wages associated with a decline in labor demand, with adult men responding to the low returns to work effort by choosing not to participate in the labor force. The CEA staff speculate that much of the reduction in labor demand may be due changes in technology, automation, and globalization (CEA, 2016).

**Wage Inequality in the United States and Other Advanced Countries**

There has been a large trend increase in wage inequality in the United States and some other advanced countries since the early 1980s. This roughly coincides with the period of rapid growth in trade between developed and developing countries. The timing is right and the causal relationship between the two trends is straight out of mainstream trade theory. Findings from numerous studies of the sources of rising U.S. wage inequality will be reviewed later. At this point, simply note that trade and certain types of technological change would be expected to have similar effects on the wage distribution. It is difficult to separate the two. Tasks that involve routine and repetitive manual or cognitive actions are those that can be most easily offshored, but they are also precisely the kind of tasks than can be replicated by a machine or computer software.

**Wage Inequality in Developing Countries**

In traditional Heckscher-Ohlin trade theory involving trade between developed countries with abundant high-skill labor and developing countries with abundant low-skill labor, economic integration through trade raises the ratio of low-skill to high-skill wages in the developing

countries. In these countries, trade not only increases national income but also reduces wage inequality. Empirical data, however, conclusively show that shifts in income distribution and wage structure in developing countries have gone in the opposite direction, even in countries that have had major episodes of trade liberalization (see Goldberg and Pavcnik 2007).

Rising inequality in the distribution of personal income could be explained by the fact that trade liberalization is often accompanied by broader market reforms that increase economic opportunities and assign income more on the basis of productivity than personal relationships. However, the data show that the skill premium in wages has generally fallen in developing countries. Feenstra (2008) notes that offshoring is often accomplished through intrafirm trade and involves technology transfer. In this case, vertical disintegration and an offshoring of tasks may raise the relative demand for skilled workers not only in developed countries but also in developing countries. It is also possible that the effects on wage structure expected from Heckscher-Ohlin trade theory are, in fact, present but that they are swamped by global technology shocks that are biased in favor of skilled labor.

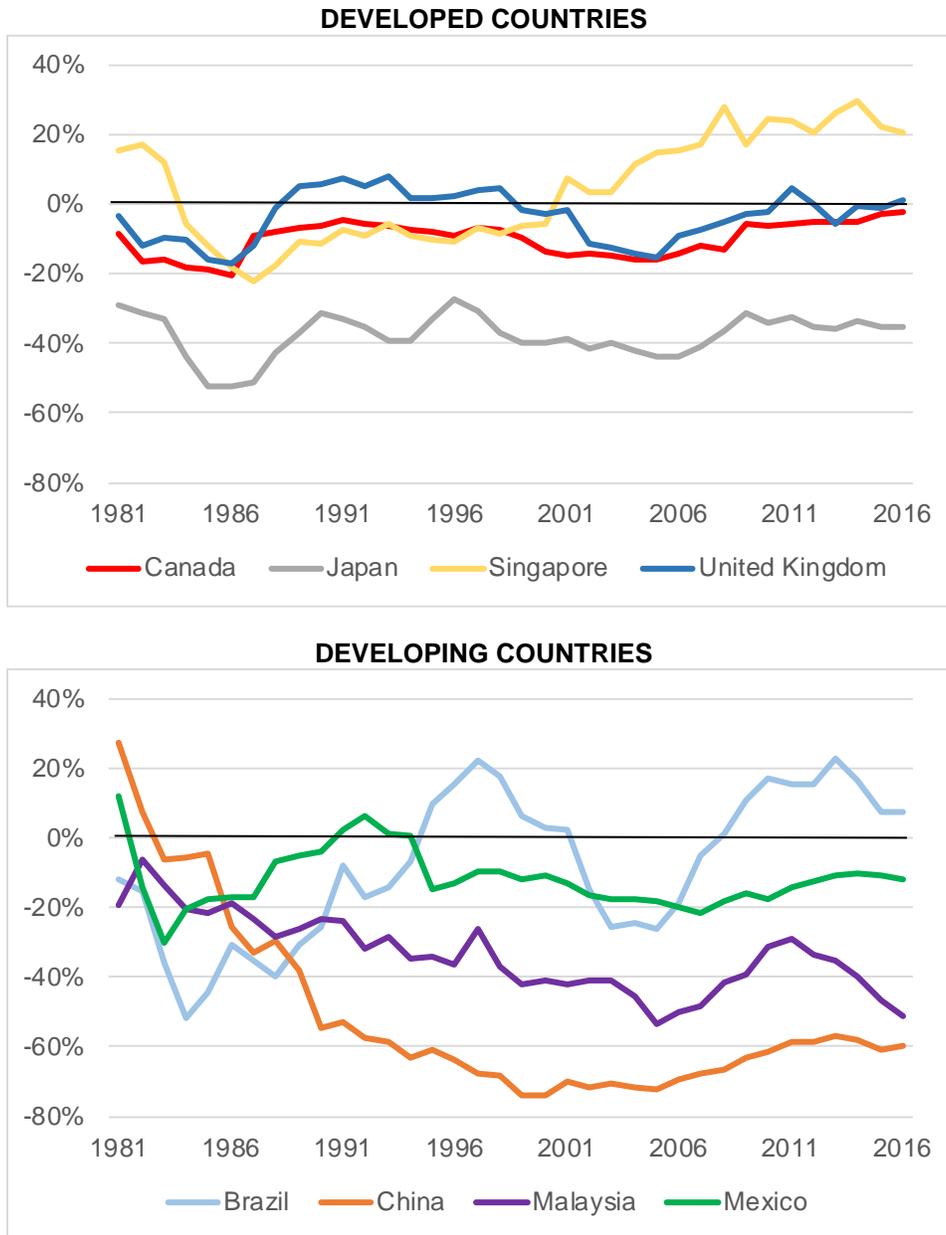
### **Trade Imbalances**

Chart 5 shows bilateral trade balances — those involving a country and one of its trading partners — in U.S. merchandise trade with selected countries, expressed as net exports as a share of total trade (the sum of imports and exports). The selected countries include developed and developing countries and nations with and without a trade agreement with the United States. These data from routine government statistics are flawed and incomplete in that they are measures of gross exports and imports rather than value added, and they do not include trade in services, a category in which the U.S. exports more than it imports.

In the top graph of Chart 5 of developed countries, a free trade agreement is in place with Canada and Singapore, but not with the United Kingdom or Japan. An agreement with Canada went into effect in 1988. It did not have an effect on the bilateral trade balance. The value of exports and imports has been similar with the United Kingdom, though the balance has cycled over time. The trade agreement with Singapore was effective in 2004. While the U.S. trade balance with Singapore has improved since then, the improvement began before 2004 and the United States also had a substantial surplus in the early 1980s. Thus, the data in the top part of Chart 5 show no apparent connection between the U.S. trade balance with a developed country and whether the U.S. has a free trade agreement with that country.

In the bottom graph of Chart 5 of developing countries, a free trade agreement is in place with Mexico but not with the other nations. While the bilateral trade imbalance with Mexico appears to have worsened with the onset of NAFTA in 1994, an imbalance of a similar magnitude had been present during the early-to-mid-1980s. Brazil provides an example of how the trade balance can swing from positive to negative and back without any trade agreement. The U.S. trade imbalances with China and Malaysia worsened considerably during the 1980s but have not changed much since then. The data on U.S. trade with developing countries also show no apparent relationship between the U.S. trade balance and free trade agreements.

**CHART 5  
BILATERAL MERCHANDISE TRADE, UNITED STATES WITH SELECTED  
COUNTRIES, NET EXPORTS AS A SHARE OF TOTAL IMPORTS AND EXPORTS**



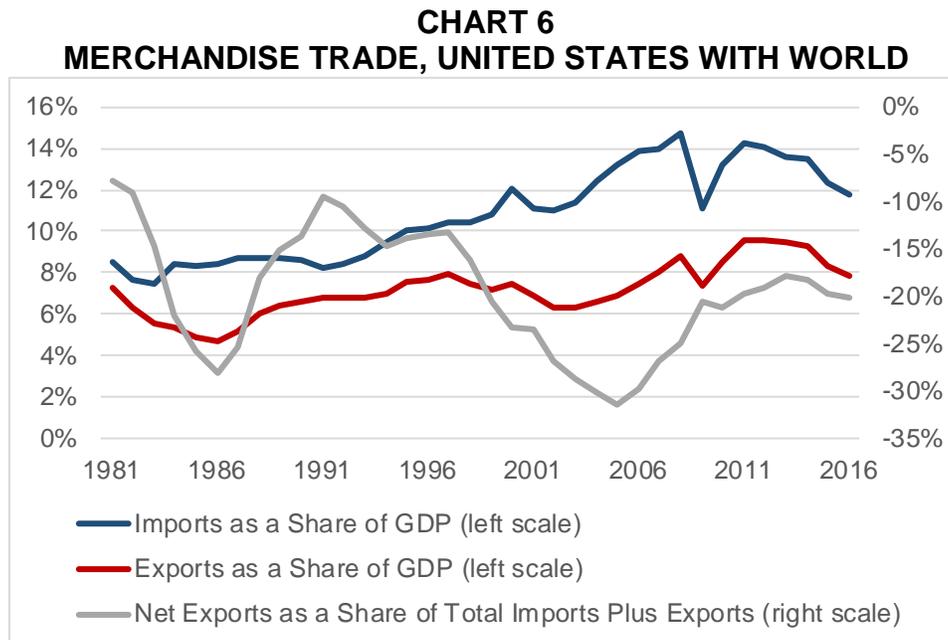
Source: International Monetary Fund.

Economists have long understood that trade balances are terrible measures of the gains from international trade. This is especially true of bilateral trade balances. Imbalances in bilateral trade are to be expected as an outcome of optimal multilateral exchange.

This is easiest to see in the case of an individual. An economics professor runs a trade surplus with his/her students — selling them knowledge about economics without buying anything from them — and a trade deficit with, for example, the professor’s favorite Mexican restaurant. It would be extremely limiting if the professor could only buy the things he/she wanted from people who wanted to learn economics from the professor. The social contrivance of money as a medium of exchange makes it possible to trade with a wide variety of people without requiring a “double coincidence of wants.”

This principle also applies to trade between countries. Take the example of three countries, each of whose total exports equals its total imports, so that trade is balanced overall. However, there is an imbalance in trade between each pair of countries. Country A runs a trade surplus with Country B, which it uses to pay for its trade deficit with Country C. Country B runs a trade surplus with Country C and an offsetting trade deficit with Country A. Country C runs a trade deficit with Country B, which it pays for by running a trade surplus with Country A.

Broad measures of the U.S. trade balance, covering all countries, indicate that the U.S. has been running a merchandise trade deficit with the rest of the world since the late 1970s and that a significant widening of that deficit occurred between the mid-1990s and mid-2000s. This is shown in two ways in Chart 6. Given the large size of the global U.S. trade deficit, it would not be surprising to see deficits in the bilateral balances of U.S. trade with each of its major trading partners.



Source: International Monetary Fund.

In the top portion of Table 6, U.S. merchandise trade data with the world and with each of its top 10 trading partners are shown for 2016. There is only one country (the United Kingdom) with which the United States ran a merchandise trade surplus, and that surplus was very small. The U.S. had a merchandise trade deficit with each of the other nine countries. U.S. trade of goods with China and each of its North American neighbors greatly exceeded that of any other country; each of these top three trading partners accounted for between 14-and-16 percent of the world total of imports plus exports. The trade deficit with China was very large as a percentage of the volume of the trade of goods with that country. Though only 16 percent of U.S. merchandise trade was with China, 47 percent of the U.S. merchandise trade deficit resulted from trade with China. In contrast, other than trade with the United Kingdom, the U.S.-Canada and U.S.-Mexico merchandise trade imbalances were the smallest among the top 10 trading partners when measured as a percentage of total bilateral trade of goods.

The middle portion of Table 6 provides data on trade of services. The United States had a trade surplus with the world, and with eight of its 10 largest trading partners, in the trade of services in 2016. However, the total value of the trade of services was only one-third that of goods.

The combined value of trade in goods and services is shown in the bottom portion of Table 6. Though not as large a deficit as with goods alone, the United States had a substantial goods and services trade deficit with the world, and with eight of its top 10 trading partners, in 2016.

Data on trade of services are not available for as many years as trade of goods. In Chart 7, the U.S. trade balance with the world since 1992 is displayed for goods, services, and the combined total. From the late 1990s through the mid-2000s, the trade balance — expressed as net exports as a share of total trade — worsened for both goods and services. Since then, the surplus in services had returned to the level of the early 1990s, while the deficit in goods has narrowed but remains larger than in the early 1990s.

The U.S. global trade deficit does not indicate that U.S. exports are being systematically restricted by countries around the world or that the multilateral reductions in trade barriers accomplished under the World Trade Organization discriminate against the United States. Economists believe that persistent global trade imbalances, such as the U.S. trade deficit, is a reflection of and a consequence of imbalances in global capital flows. The U.S. trade deficit with the world has arisen because U.S. national saving is insufficient to finance U.S. domestic investment.<sup>7</sup> This may be either good or bad — the result of a strong investment climate or deficient national saving. Whatever the case, the imbalance in trade flows has nothing to do with foreign trade barriers or bad trade deals.

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<sup>7</sup> The relationship between trade flows and capital flows is complex. See Bernanke (2005) for an explanation.

**TABLE 6**  
**UNITED STATES TRADE BALANCE BY PARTNER COUNTRY, 2016**

	<b>U.S. Imports Plus Exports*</b>	<b>U.S. Imports*</b>	<b>U.S. Exports*</b>	<b>Trade Balance*</b>	<b>Trade Balance**</b>
<b>Goods</b>					
Total of All Nations	\$3,663,915	\$2,208,211	\$1,455,704	-\$752,507	-20.5%
China	579,286	463,288	115,998	-347,290	-60.0
Canada	550,872	283,574	267,298	-16,276	-3.0
Mexico	530,279	300,403	229,876	-70,527	-13.3
Japan	198,135	134,184	63,951	-70,233	-35.4
Germany	163,896	114,573	49,323	-65,250	-39.8
United Kingdom	110,563	54,946	55,617	671	0.6
South Korea	113,082	70,384	42,698	-27,686	-24.5
France	78,320	47,044	31,276	-15,768	-20.1
India	67,749	46,125	21,624	-24,501	-36.2
Taiwan	65,682	39,248	26,434	-12,814	-19.5
Balance of World	1,206,051	654,442	551,609	-102,833	-8.5
<b>Services</b>					
Total of All Nations	1,257,022	504,654	752,368	247,714	19.7
China	70,296	16,139	54,157	38,018	54.1
Canada	83,907	29,950	53,957	24,007	28.6
Mexico	56,614	24,569	32,045	7,476	13.2
Japan	75,158	31,004	44,154	13,150	17.5
Germany	65,033	33,395	31,638	-1,757	-2.7
United Kingdom	117,427	51,698	65,729	14,031	11.9
South Korea	32,029	10,974	21,055	10,081	31.5
France	36,125	16,451	19,674	3,223	8.9
India	46,440	25,808	20,632	-5,176	-11.1
Taiwan	19,429	7,732	11,697	3,965	20.4
Balance of World	654,564	256,934	397,630	140,696	21.5
<b>Goods &amp; Services</b>					
Total of All Nations	4,920,937	2,712,865	2,208,072	-504,793	-10.3
China	649,582	479,427	170,155	-309,272	-47.6
Canada	634,779	313,524	321,255	7,731	1.2
Mexico	586,893	324,972	261,921	-63,051	-10.7
Japan	273,293	165,188	108,105	-57,083	-20.9
Germany	228,929	147,968	80,961	-67,007	-29.3
United Kingdom	227,990	106,644	121,346	14,702	6.4
South Korea	145,111	81,358	63,753	-17,605	-12.1
France	114,445	63,495	50,950	-12,545	-11.0
India	114,189	71,933	42,256	-29,677	-26.0
Taiwan	85,111	46,980	38,131	-8,849	-10.4
Balance of World	1,860,615	911,376	949,239	37,863	2.0

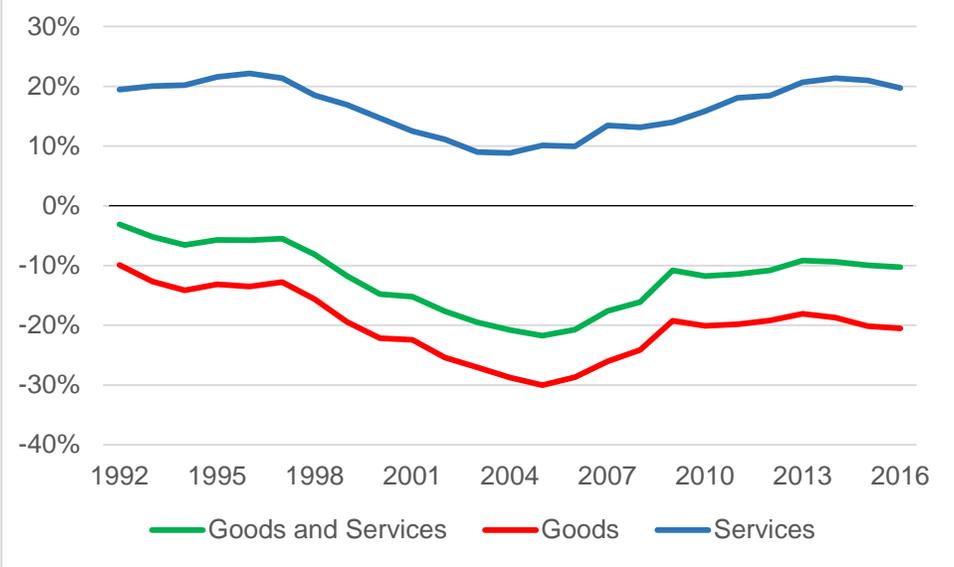
\* In millions.

\*\* As a percentage of total trade.

Note: The countries are listed in order of total trade of goods and services.

Source: U.S. Department of Commerce, Bureau of Economic Analysis.

**CHART 7  
 UNITED STATES TRADE BALANCE WITH THE WORLD,  
 NET EXPORTS AS A SHARE OF TOTAL IMPORTS AND EXPORTS**



Source: U.S. Department of Commerce, Bureau of Economic Analysis.

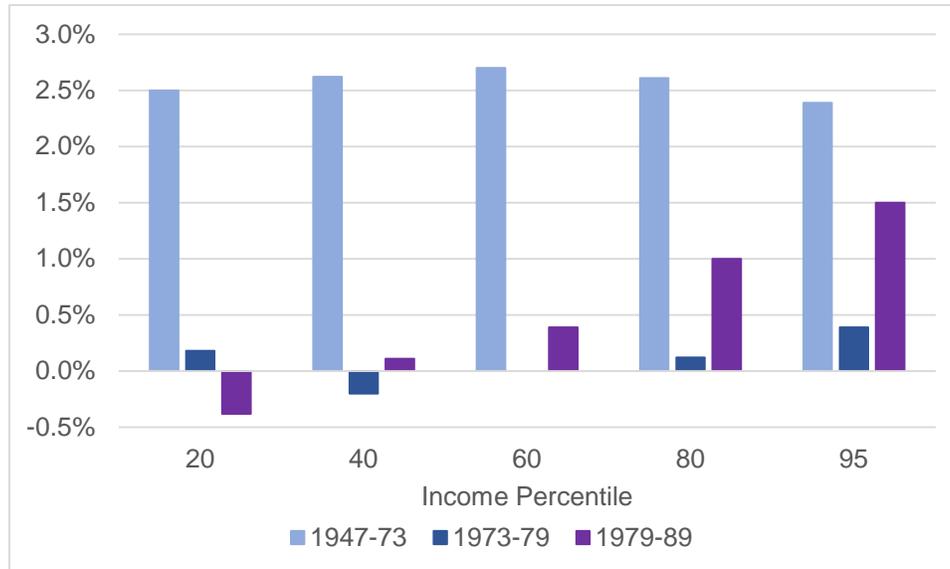
## PRIMER ON INCOME AND WAGE INEQUALITY

Economic growth in the United States following World War II was rapid and evenly distributed across income classes. This is shown in Chart 8, which comes from Paul Krugman's book *Peddling Prosperity*, published in 1995. Krugman used the chart to point out disturbing new growth trends in the U.S. economy. Since the early 1970s, the overall rate of economic growth had fallen well below what it had been during the first two decades after the war. Equally disturbing in his view were shifting patterns of income distribution. Household incomes at the top of the income distribution were growing much more rapidly than were incomes at the lower end of the distribution. Krugman was writing in the early 1990s. What he did not know at the time was the extent to which these new patterns in U.S. economic growth, particularly the widening of income inequality, would continue.

Charts 9 and 10 provide updates to Krugman's chart. Chart 9 shows data for the period of 1967 through 2015 on incomes at the 90th, 50th (median), and 10th percentiles of the household income distribution. The data are in 2015 dollars and are indexed to the year 1975. The chart indicates, for example, that the level of real household income that defined the 90th percentile in 2015 was 155 percent of what it was in 1975 (55 percent higher). In contrast, income at the 10th percentile was only 8 percent higher. Even at the median, the increase was only 19.5 percent.

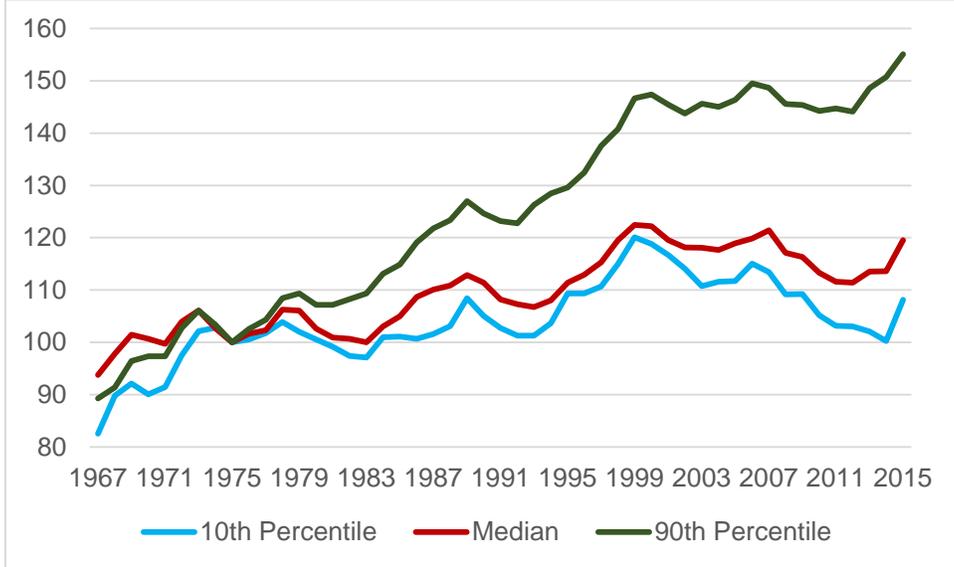
Chart 10 is constructed from the data in Chart 9. It displays movements in two measures of income dispersion: the ratio of incomes at the 90th percentile versus the 50th percentile and the ratio of incomes at the 50th percentile versus the 10th percentile. The two charts make clear that the trend of rising income inequality observed during the 1970s and 1980s was not an anomaly.

**CHART 8**  
**AVERAGE ANNUAL PERCENT CHANGE IN INFLATION-ADJUSTED HOUSEHOLD INCOME BY INCOME BRACKET IN THE UNITED STATES**



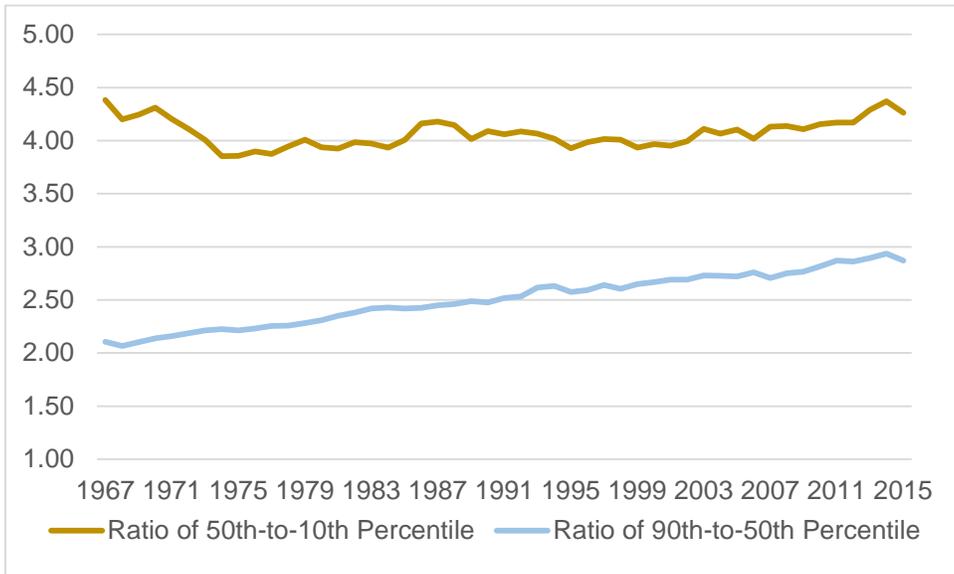
Source: Krugman (1995).

**CHART 9**  
**INFLATION-ADJUSTED INCOME AT SELECTED PERCENTILES**  
**IN THE UNITED STATES EXPRESSED AS AN INDEX, 1975 = 100**



Source: Calculated from U.S. Department of Commerce, Census Bureau, Current Population Survey.

**CHART 10**  
**HOUSEHOLD INCOME DISPERSION IN THE UNITED STATES**



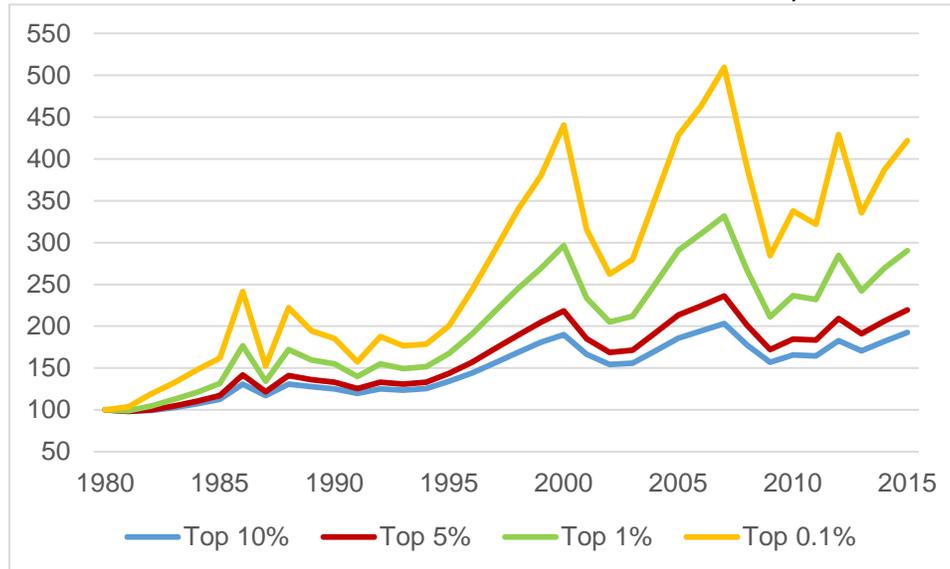
Source: Calculated from U.S. Department of Commerce, Census Bureau, Current Population Survey.

Household income at the top of the distribution has continued to grow faster than median household income. While not as dramatic, income inequality has also increased recently in the bottom half of the income distribution. After a period from the late 1980s through the early 2000s during which income inequality at the bottom narrowed slightly relative to the median, since 2002 incomes at the 10th percentile have lagged median household income.

The data in Charts 9 and 10 come from the Current Population Survey, a survey of U.S. households conducted each year by the Census Bureau. Because of top coding at very high income levels,<sup>8</sup> the data from these surveys cannot identify changes at the very top of the income distribution. To shed light on this part of the distribution, Tony Atkinson, Thomas Piketty, and Emmanuel Saez have pioneered methods of supplementing survey data with information from income tax returns. Chart 11 shows estimates provided by Saez (2016) of real income growth within the top decile (10 percent) over the period from 1980 through 2015. The data reveal that the higher the income, the faster the rate of growth in income. Over the period from 1980 through 2015, the average annual rate of income growth was 1.9 percent at the 90th percentile of households, 2.3 percent at the 95th percentile, 3.1 percent at the 99th percentile, and 4.2 percent at the 99.9th percentile.

One of the advantages of using data from tax records is that it is possible to gain a broad historical perspective on movements at the top end of the income distribution. Chart 12 shows estimates from Saez (2016) for the period from 1917 through 2015 of the share of national income accruing to households in three segments of the top income decile: households between

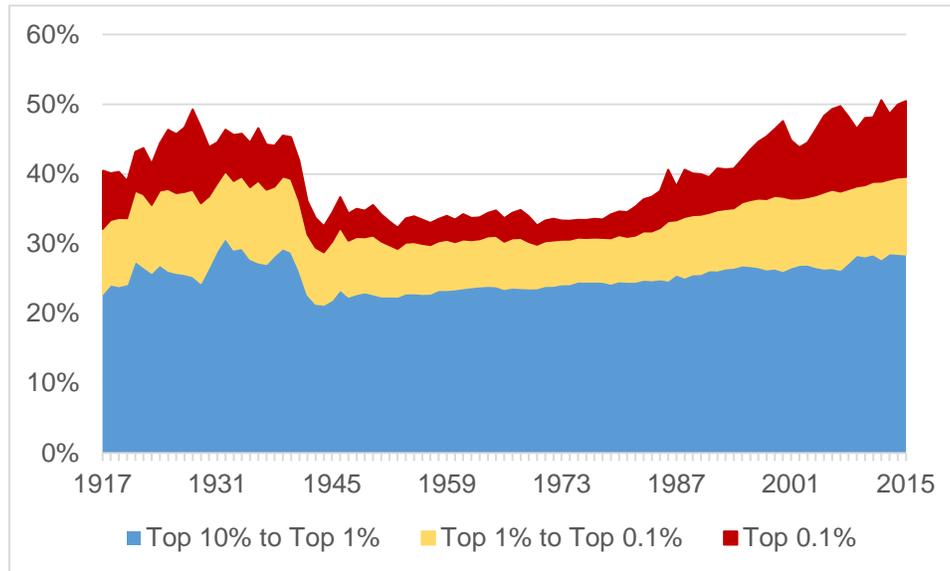
**CHART 11**  
**INFLATION-ADJUSTED INCOME GROWTH WITHIN THE TOP DECILE**  
**IN THE UNITED STATES EXPRESSED AS AN INDEX, 1980 = 100**



Source: Emmanuel Saez (2016), Table A6.

<sup>8</sup> For example, incomes of \$1 million or more might be entered as \$999,999.

**CHART 12**  
**SHARES OF TOTAL INCOME RECEIVED BY THE HIGHEST INCOME EARNERS,**  
**UNITED STATES**



Note: In 2015, the income was \$124,800 at the 90th percentile, \$442,900 at the 99th percentile, and \$2,045,000 at the 99.9th percentile.

Source: Emmanuel Saez (2016), Table A3.

the top 10th-and-1st percentiles of the income distribution, those between the top 1-and-0.1 percentiles, and those within the top 0.1 percentile.

U.S. national income was highly concentrated early in the twentieth century. The share of income accruing to the top 10 percent of households increased significantly during the Roaring '20s, reaching 49 percent in 1928. The share fell off in the 1929 stock market crash and stayed around 45 percent through the Great Depression. The top 10 percent share then fell sharply during World War II, a period during which wages and prices were controlled and saving was diverted from private investment to financing the war effort.

By 1947, the share of national income received by the top 10 percent of households had fallen to 34 percent. It remained around this level until the late 1970s. At that point, top income shares began a steady upward march to reach highs that are historically unprecedented. The share of national income received by the top 10 percent of households is now 50 percent. The top 10 percent share rose a total of 16 percentage points over the period from 1980 through 2015. Breaking this down by segments within the top income decile, the share received by the top 10-to-1 percent rose 4 percentage points, the share of the top 1-to-0.1 percent increased 4½ percentage points, and the share accruing to the top 0.1 percent rose 7½ percentage points. So, half of the increase in the share of national income going to the top 10 percent accrued to the top 0.1 percent of households.

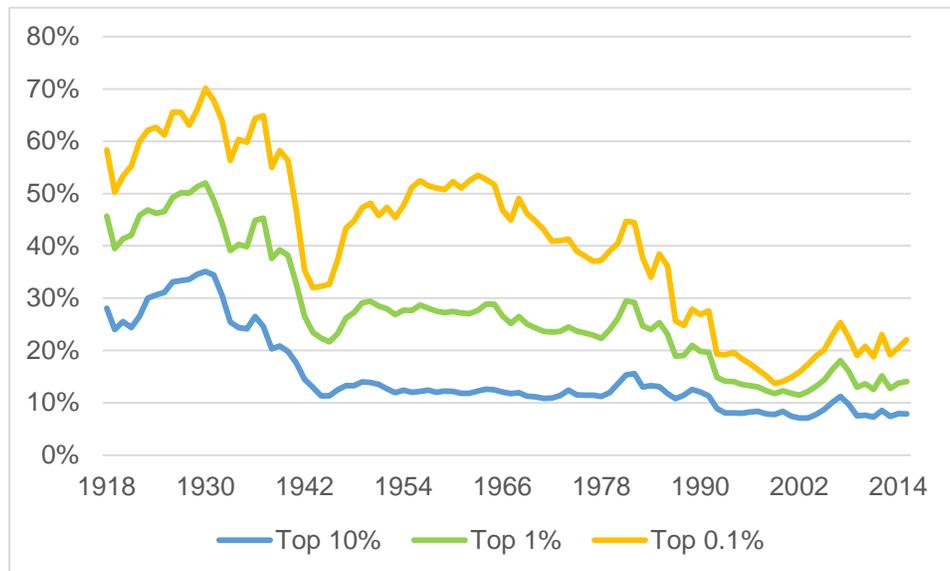
### Labor Income Versus Capital Income<sup>9</sup>

During the early 1900s, and for centuries before that, families with very high incomes derived most of their incomes from property. Data from Saez (see Chart 13) indicate that during the 1920s, capital income comprised 60-to-70 percent of household income for those in the top 0.1 percent of the U.S. income distribution. Then in the early 1930s, with a deepening of the Great Depression, capital income began to decline as a share of total income for high-income households. For the top 0.1 percent, capital's share of income fell from 70 percent in 1930 to 14 percent by 2000. Since the early 2000s, the share of capital income in the top 0.1 percent has begun to rise. However, at 20 percent in 2015, it was below where it was in the early 1990s and well below where it was 100 years ago.

These data suggest that capital accumulation and returns to capital cannot account for the increasing concentration of income that has occurred at the top of the income distribution since the early 1980s. Of course, any widening of income inequality in the lower half of the income distribution has nothing to do with capital since low-income households own very little property.

Another perspective on the relative insignificance of capital as a source of the recent rise in income inequality is provided in Chart 14. It shows trends since 1950 in labor's share of U.S. national income, as measured using data from the National Income and Product Accounts. From

**CHART 13**  
**CAPITAL INCOME AS A SHARE OF TOTAL INCOME AT HIGH INCOME LEVELS, UNITED STATES**

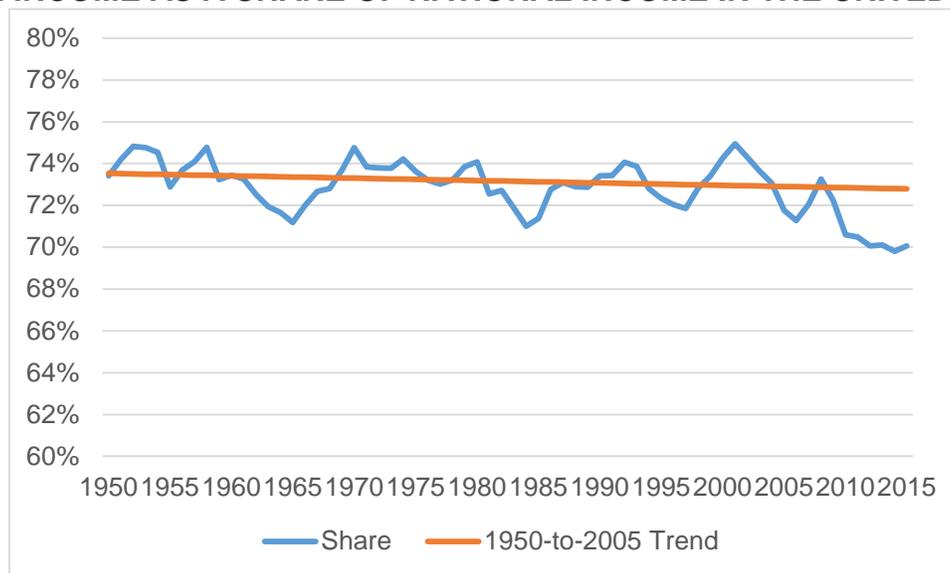


Note: Capital income is dividends, interest and rent; total income includes wages, capital income, and proprietors' income. Capital gains are not included.

Source: Emmanuel Saez (2016), Table A7.

<sup>9</sup> Capital income is income generated by an asset — such as owned property — rather than from work done using the asset.

**CHART 14**  
**LABOR INCOME AS A SHARE OF NATIONAL INCOME IN THE UNITED STATES**



Note: Labor income is employee compensation plus proprietors' income.

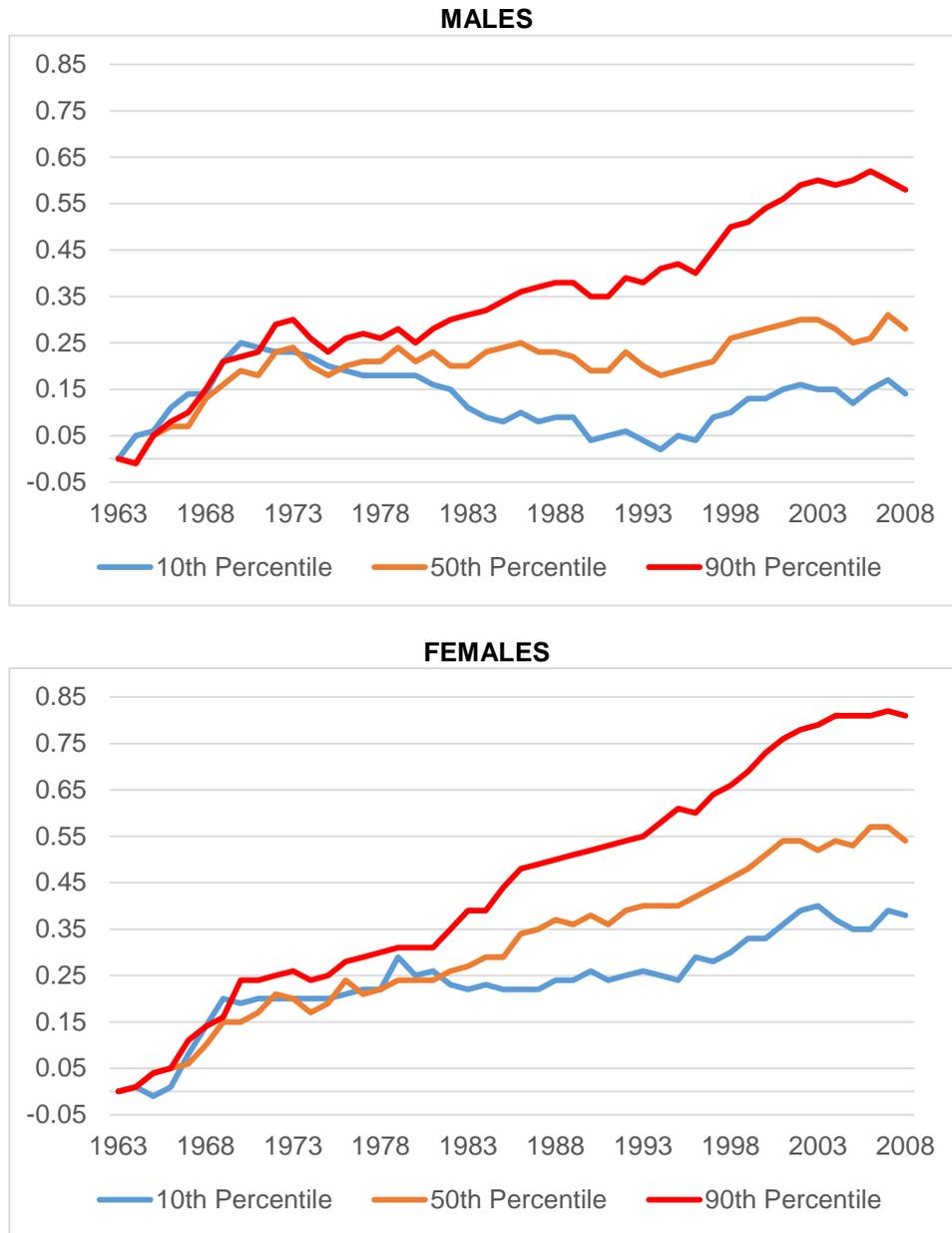
Source: Calculated from U.S. Department of Commerce, Bureau of Economic Analysis.

1950 through the mid-2000s, there was only a slight decline in labor's share, much too small a decline to account for a significant part of the increasing concentration of income at the top. A trend line using data from 1950 through 2005 indicates that the average rate of decline in labor's share over this period was only 0.011 percentage points per year. Chart 14 does show that labor's share began to deviate from trend and fall much more rapidly beginning in the mid-2000s. So, capital income may be a part of the story of widening income inequality since 2000, but not before then.

Data that focus exclusively on wage income, on the other hand, exhibit changes in dispersion that closely resemble the changes in the distribution of household income reviewed earlier. Chart 15, which comes from Acemoglu and Autor (2011), shows the cumulative logarithmic changes<sup>10</sup> in the real weekly earnings of full-time male workers at the 90th, 50th, and 10th percentiles for the period from 1963 through 2008. There is a continuous rise from around 1980 through the end of the period in the ratio of wages at the 90th percentile to median wages. Data for male workers also show a widening of wage inequality at the lower end of the distribution during the 1980s and the early part of the 1990s. Real median wages were essentially flat over this period, but real wages at the 10th percentile fell 20 percent. Beginning in the mid-1990s, median wages and wages at the 10th percentile both began to increase, with the rise at the 10th percentile slightly outpacing the median. Similar to what happened in the bottom half of the distribution of household income, shifts in the structure of male wages after 1994 partly reversed the widening of lower-end inequality that had occurred during the 1980s.

<sup>10</sup> Logarithmic scales are useful for quantifying the relative change of a value. In Chart 14, a change of 0.01 equals approximately 1 percent.

**CHART 15**  
**CUMULATIVE LOGARITHMIC CHANGE SINCE 1963 IN REAL WEEKLY EARNINGS**  
**OF FULL-TIME, YEAR-ROUND WORKERS BY SEX, UNITED STATES**



Note: On a logarithmic scale (left axis), a change of 0.01 equals approximately 1 percent.

Source: Acemoglu and Autor (2011), Figure 7.

Chart 15 also shows changes in the wage distribution for full-time female workers. Wages rose more for females over this period than for males. The median wage of females increased throughout the period, and female workers at the lower end of the distribution did not suffer a sharp decline in real wages during the 1980s. Changes in the dispersion of wages, however, were similar between men and women. The ratio of wages at the 90th-versus-50th percentile for females increased throughout the period, as it did for men. The ratio of the 50th-versus-10th percentile also increased substantially in the 1980s and early 1990s before stabilizing.

Since the data used by Acemoglu and Autor (2011) ended in 2008, the time series is updated in Chart 16 through 2016. This chart shows the cumulative percent change in real wages since 2000. For males, wages were stagnant from 2000 through 2016 at both the 10th and 50th percentiles, while wages continued to rise at the 90th percentile. Thus, wage inequality continued to rise at the high end of the wage distribution. Wages of females increased between 2000 and 2016 at each wage level, but substantial differences in the rate of change existed at the three percentiles featured. Wage inequality increased substantially between the 90th-and-50th percentiles and also increased between the 50th-and-10th percentiles.

Since the mid-1990s, there has been what Autor, et al. (2006, 2008) refer to as a “polarization” of the U.S. labor market. The demand for high-skill workers (e.g., those who perform nonroutine cognitive tasks) and the demand for low-skill workers performing nonroutine manual tasks both have increased, while the demand for middle-skill workers performing routine tasks that require a moderate amount of education has declined. Chart 17, from a recent OECD presentation by Katherine Mann, shows how over the period from 1995 through 2015, employment has increased in high-skill and low-skill occupations while large numbers of jobs requiring mid-level skills have disappeared. This polarization of employment has been observed throughout the advanced world.

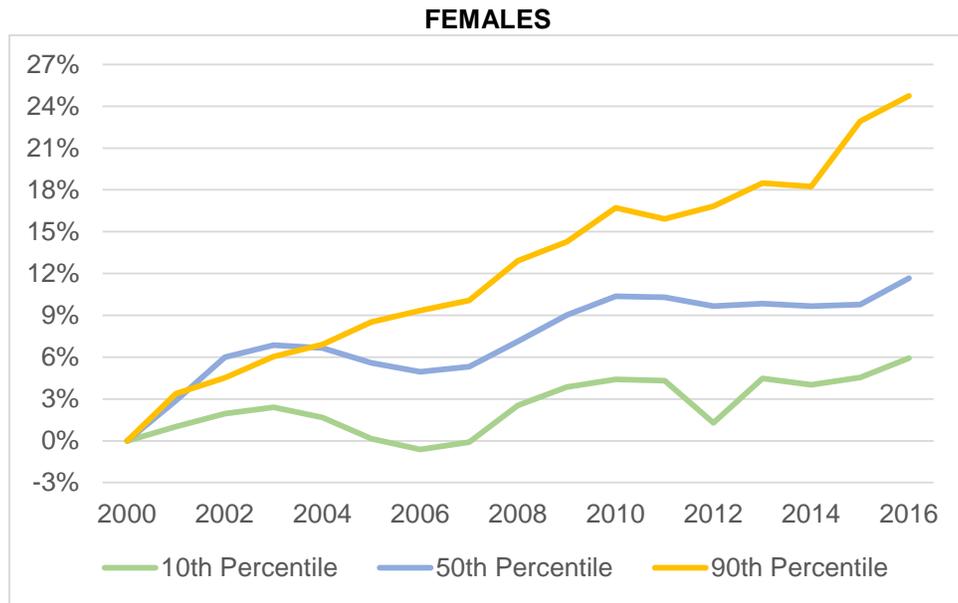
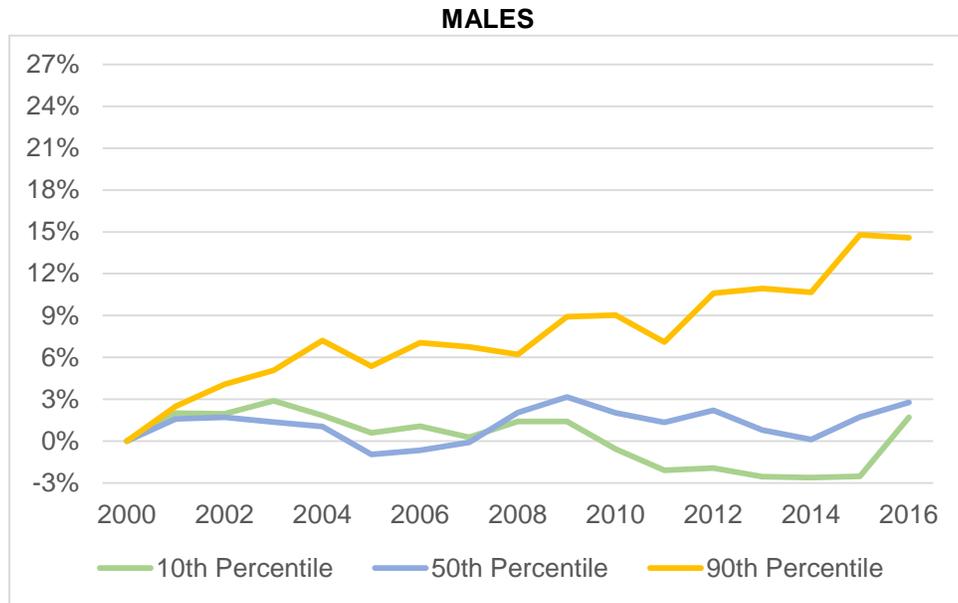
## **Causes of Rising Income Inequality**

### **Superstars and Supersalaries: The Top 1 Percent**

A particularly significant feature of the rise in U.S. income inequality has been the growing concentration of income at the very top of the distribution — the rising share of the top 1 percent. An increase in top income shares has also been observed in other advanced countries, especially other English-speaking countries such as the United Kingdom and Canada. However, the size of the increase in the top 1 percent income share has been much larger in the United States than in other countries. The top 1 percent share is now 5-to-10 percentage points higher in the United States than it is in the United Kingdom, continental Europe, and Japan, according to the World Wealth and Income Database.

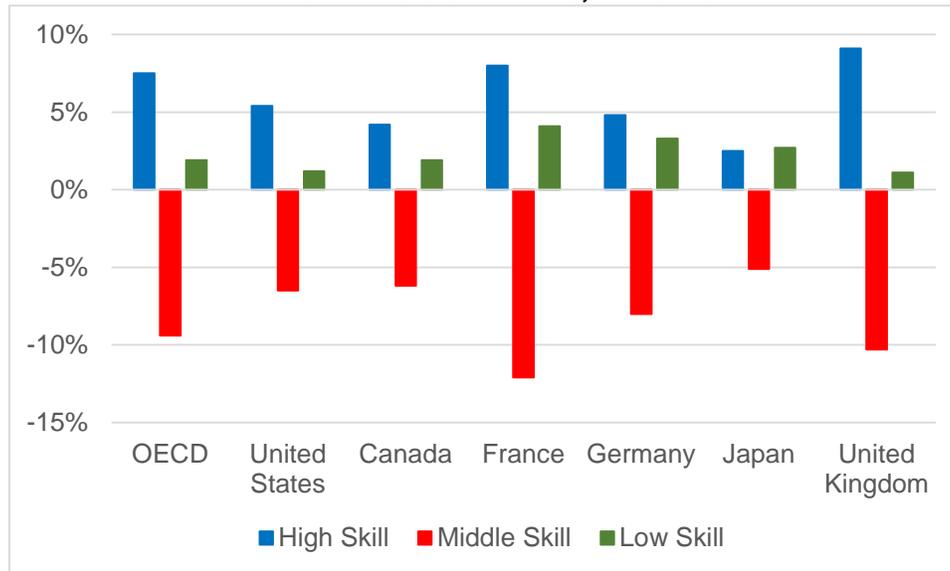
Other aspects of income inequality that are uniquely American are the disproportionately large contribution of the top 0.1 percent to growth in the top 1 percent income share and the importance of salaries and other forms of labor compensation to those very high incomes. Table 7 breaks down the top 0.1 percent share and its growth from 1979 to 2005 by the occupation of the primary earner. Many of the occupations that appear in the table are familiar and easy to anticipate: doctors, lawyers, and media and sports stars. What is more surprising is the dominant role played by management executives and financiers. Households with primary earners in

**CHART 16**  
**CUMULATIVE PERCENT CHANGE SINCE 2000 IN REAL WEEKLY EARNINGS**  
**OF FULL-TIME, YEAR-ROUND WORKERS BY SEX, UNITED STATES**



Source: Calculated from U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey.

**CHART 17**  
**CHANGE IN SHARE OF TOTAL EMPLOYMENT BY SKILL LEVEL**  
**IN SELECTED COUNTRIES, 1995 TO 2015**



Notes: The OECD figures are the averages of 24 countries of the Organisation for Economic Co-operation and Development. The data for Japan runs from 1995 to 2010.

Source: Mann (2017), p.14.

**TABLE 7**  
**SHARE OF UNITED STATES INCOME RECEIVED BY THE TOP 0.1 PERCENT**  
**OF INCOME EARNERS**

	<b>1979</b>	<b>2005</b>
TOTAL	2.83%	7.34%
Executives and Managers (nonfinancial)	1.37	3.42
Financial Professions	0.34	1.45
Lawyers	0.17	0.39
Arts, Media, and Sports	0.08	0.27
Medical	0.16	0.26
Not Working	0.16	0.26
Real Estate	0.05	0.25
Entrepreneur	0.14	0.25
Computer, Math, and Engineering	0.06	0.18
Business Operations (nonfinancial)	0.03	0.18
Other	0.27	0.43

Source: Bakija, Cole and Heim, U.S. Treasury (2012), Table 7.

executive management positions accounted for 47 percent of the top 0.1 percent share and a comparable percentage of the growth in the top share from 1979 to 2005. Households with primary earners in the financial services industry accounted for 20 percent of the 0.1 percent share and a quarter of its growth. The occupation “arts, media and sports,” on the other hand, accounted for only 4 percent of the income in the top 0.1 percent share.

The income at the 99.9th percentile in 2015 was a little over \$2 million. Of course, not every CEO, lawyer, doctor, or professional athlete makes \$2 million a year. Members of the top 0.1 percent are superstars within their professions. The emergence of supersalaries within these occupations was foreshadowed by Sherwin Rosen in a 1981 paper titled “The Economics of Superstars.” Rosen argued that modern technologies, especially communications technologies, would enable individuals within an occupational field to serve a much larger number of customers. This would lead to what has come to be called a “winner-take-all” market in which performers or service providers considered to be the very best in their field capture large shares of the total reward, with very little left for the remaining competitors.

In some occupations, an erosion of barriers to open bidding has contributed to the dispersion of earnings and the receipt of extraordinarily high rewards by a few individuals. In a free market system, income concentrates in the hands of scarce factors, with rewards to more “reproducible” factors covering only their opportunity costs. Moviegoers have always been drawn to see great actors and actresses. For much of its early history, however, the film industry was controlled by the film studios. The studios determined who would act in which films and controlled the distribution of movie revenues, including the actors’ salaries. The same was true for a long time in the music industry, with recording companies playing a large role in the distribution of music industry revenues. In sports, the salaries of professional athletes were controlled by owners using limits on mobility to prevent bidding wars. Many of the institutional barriers that had constrained the contracts of superstars have melted away. The result has been an increase in mobility among super talents, a more open bidding format for their services, and remuneration that is more in line with the massive incremental revenues they generate.

**Financial Professions.** In thinking about the importance of financial professions within the ranks of the top 0.1 percent, it is natural to consider the role played by U.S. financial deregulation. The deregulation of American finance that began early in the 1980s, and culminated in the repeal of the Glass-Steagall Act<sup>11</sup> in 1999, cleared the way for the creation and sale of derivatives and risk-management products, all of which greatly increased industry revenues. Many of these revenues accrued as income to the creators of new financial products and to the investment houses that marketed them. It seems more than a coincidence that the country with the most deregulated financial system in the world is also the country with the highest share of national income going to financial professionals. It is a matter of some debate as to how useful the modern tools of finance have actually been.

**Management Executives.** This occupational category accounted for almost half of the growth in the top 0.1 percent income share between 1979 and 2005. According to the Economic Policy Institute, the ratio of CEO-to-worker compensation was 30-to-1 in 1978, increased to 123-to-1 in

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<sup>11</sup> The Glass-Steagall Act refers to four provisions of the Banking Act of 1933 that separated commercial and investment banking.

1995, peaked at 383-to-1 in 2000, and was 296-to-1 in 2013. According to an article in a July 15, 2016 issue of fortune.com titled “This One Chart Shows How Obscene CEO Pay Has Become,” CEO pay increased 941 percent from 1978 to 2015, as compared with an increase of 321 percent for those at the 99.9th percentile of earners.

The spectacular rise in CEO compensation has been explained as being due to CEOs arguably being the individuals most responsible for the profitability of large corporations. CEO pay does vary directly with various measures of corporate size. However, growth in the size of large corporations cannot explain the torrid pace of CEO compensation growth. Further, CEO compensation in the United States is way out of line with CEO pay in the large corporations of other advanced nations. Economic theory predicts that in a competitive, well-informed labor market, a factor will be paid according to its contribution to a firm’s revenues. The truth is that it is difficult to assess CEO performance and the process of CEO pay determination is not exactly an impersonal market process. CEO pay is determined by a compensation committee whose members are appointed by the CEO himself. The phenomenon of skyrocketing CEO pay is one of the most perplexing issues in labor economics. Economists such as Thomas Piketty and Emmanuel Saez argue that the phenomenon may have more to do with an erosion of social norms than economic forces.

The rise of the top 1 percent, and of the top 0.1 percent in particular, probably does not have much to do with increased trade between the United States and developing countries such as Mexico and China. Explanations for the phenomena of supersalaries and winner-take-all markets involve advances in communications technologies, more open and competitive bidding in labor markets, and the erosion of social norms. Increased trade with developing countries may be important for U.S. income distribution, but the effects are likely to be confined to the lower 99 percent of the income distribution.

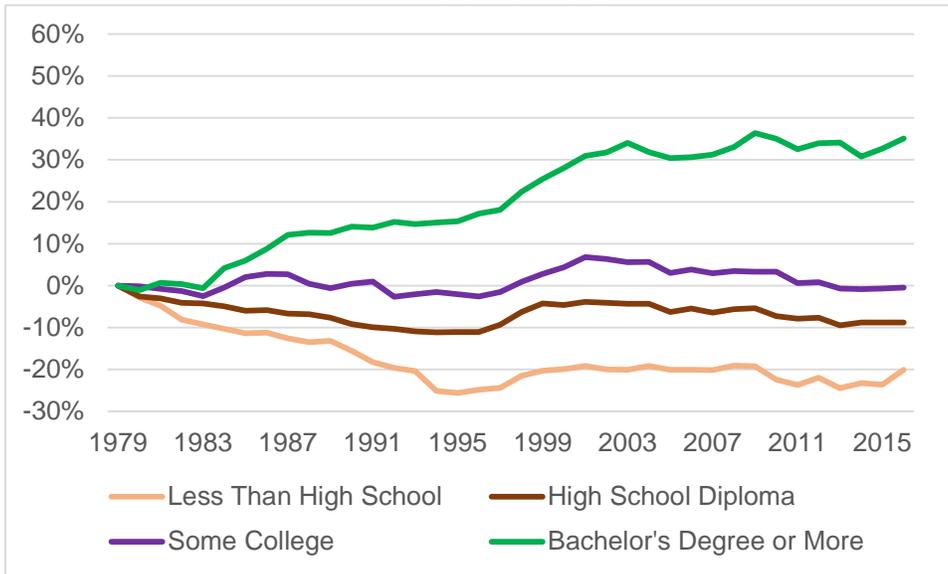
### **Earnings Inequality Among the Other 99 Percent: The Rising Return to Higher Education**

Two-thirds of the change in U.S. wage dispersion since 1980 can be accounted for by changes in the wage premium on postsecondary education (Autor 2014, p. 843). A big part of the story of rising wage inequality has to do with the fact that workers with a college education have been doing much better in the job market than have those with only a high school education. Prior to 1980, there was little difference in wage growth by educational attainment among females. From the mid-1960s through the early 1970s, more highly educated males had somewhat greater wage increases than other men, but the differential narrowed in the mid-to-late 1970s. Since the early 1980s, there has been a fanning out of real wage growth by level of education, with larger gains realized by workers with more years of schooling.

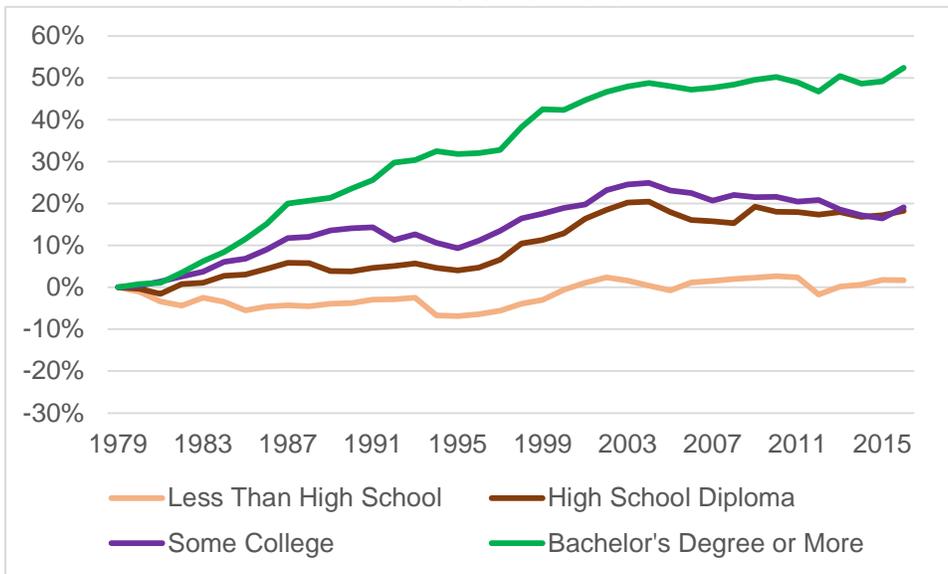
The first page of Chart 18, which provides more current data than used by Autor (2014), shows cumulative changes from 1979 to 2016 in the real weekly earnings of full-time U.S. workers broken down by sex and level of education. The real wages of male workers with at least a bachelor’s degree rose 35 percent. Men with less education experienced a decline in real wages, by 0.5 percent for those with some college (including an associate’s degree), by 8.8 percent for high school graduates, and by 20.1 percent for those without a high school diploma or the equivalent. Wage gains for women were greater than for men in each of the educational

**CHART 18**  
**CUMULATIVE PERCENT CHANGE IN REAL WEEKLY EARNINGS OF FULL-TIME, YEAR-ROUND WORKERS BY SEX AND EDUCATIONAL ATTAINMENT, UNITED STATES**

**MALES SINCE 1979**

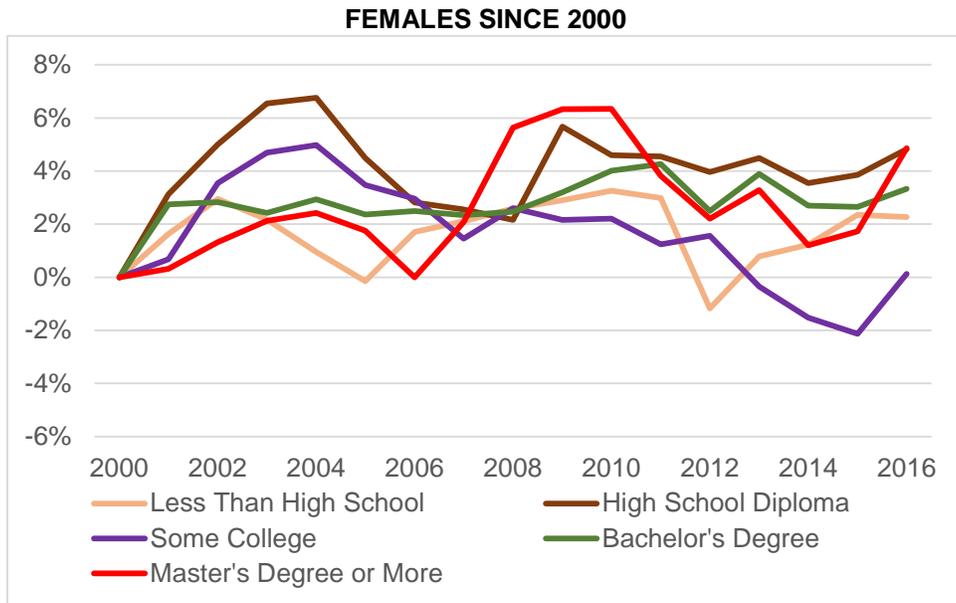
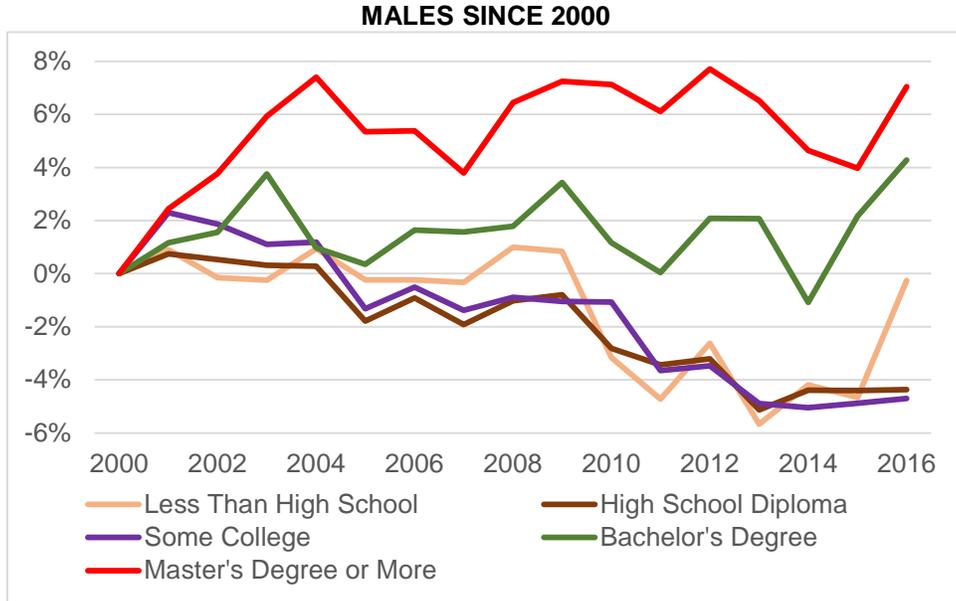


**FEMALES SINCE 1979**



(continued)

**CHART 18 (continued)**  
**CUMULATIVE PERCENT CHANGE IN REAL WEEKLY EARNINGS OF FULL-TIME, YEAR-ROUND WORKERS BY SEX AND EDUCATIONAL ATTAINMENT, UNITED STATES**



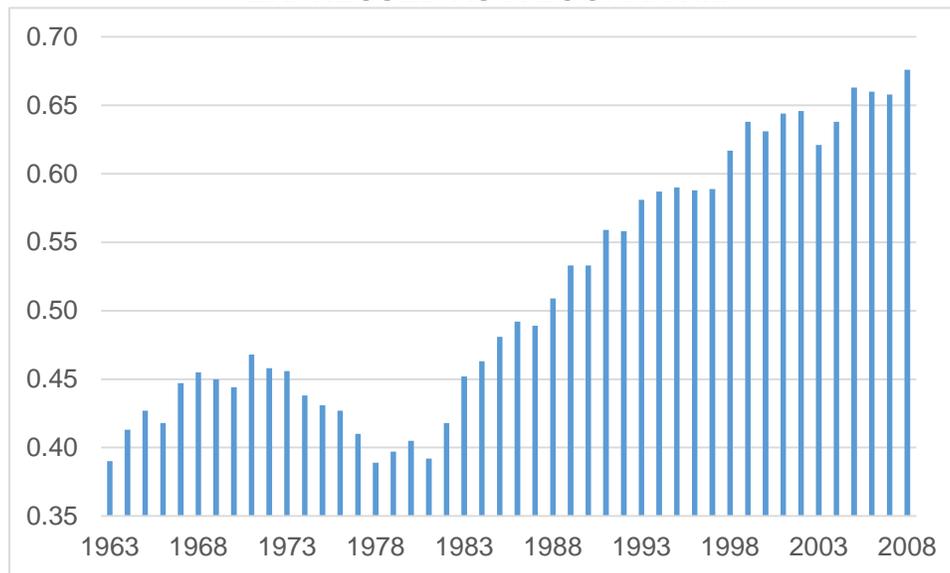
Source: Calculated from U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey.

categories, ranging from 1.7 percent for those without a high school diploma to 52.4 percent for those with at least a bachelor's degree.

The second page of Chart 18 focuses on the period since 2000 and splits those with at least a master's degree from those with a bachelor's degree. Among men, those with at least a four-year degree experienced an increase in real wages, while wages for others declined, continuing the pattern from the 1980s and 1990s. However, for men without a four-year degree, little difference was present in the percent change in wages by educational attainment — inconsistent with the earlier period. Among females, an education wage premium was not present from 2000 to 2016 — wage gains fluctuated with educational attainment between 2000 and 2016 but were not significantly different over the 2000-to-2016 period.

Chart 19, which comes from Acemoglu and Autor (2011), provides a view of long-run trends in a summary measure of the college wage premium. The measure shown is based on a fixed weighted average of real wages by sex, potential work experience, and level of education. College-educated workers are defined as those with four or more years of college plus half of those with at least 1 year of completed college. Those identified as having a high school education are those with a high school degree or less plus half of those with some college. The chart shows how after falling during the 1970s, the college-versus-high school wage premium began to rise steadily after 1980. By 2005, the college wage premium was at its highest level since 1915, the earliest year for which data are available.

**CHART 19**  
**COMPOSITION-ADJUSTED COLLEGE-TO-HIGH SCHOOL WEEKLY WAGE RATIO**  
**EXPRESSED AS A LOGARITHM**



Note: A logarithm of 0.01 is approximately equal to 1 percent. Thus, the average wage of college-educated workers in 2008 was approximately 68 percent higher than workers with a high school diploma.

Source: Acemoglu and Autor (2011), Figure 1.

### **The View Circa 1995 on Why the College Wage Premium Was Rising**

The consensus view circa 1995 regarding the upward trend in the return to higher education was presented in a 1999 survey article written by Lawrence Katz and David Autor. Looking back from the mid-1990s, the changes in the U.S. wage structure that had been taking place since 1980 appeared monotonic. There had been a large and persistent increase in the 90th-to-50th percentile wage differential and, until the mid-1990s, a concurrent widening of the 50th-to-10th percentile differential. Another salient feature of the changing wage distribution was that real wages at the bottom fell through the early 1990s. For example, as shown in Chart 18, the real weekly earnings of male workers who had not completed high school fell 20 percent from 1980 through the early 1990s. The explanation given by Katz and Autor for the observed changes in the U.S. wage distribution involved three factors: an erosion of labor market institutions that had been supporting low-skill and middle-skill wages, a deceleration in the growth of the college-educated working-age population, and an increase in the relative demand for highly educated workers.

Two changes in U.S. labor market institutions contributed to the rise in wage inequality. First, union membership began to decline in the early 1970s and continued to decrease throughout the 1980s. Union wage policy typically serves to compress wage differentials and create pay scales that, relative to a free market, assign greater weight to seniority and less weight to individual skill and productivity. Secondly, the inflation-adjusted minimum wage fell substantially during the 1980s. This played an important role in the absolute decline in the real hourly earnings of low-skill male workers.

Driven by the sheer size of the baby-boom cohort and the record high college enrollment rate within the cohort, the fraction of all U.S. hours worked that were supplied by college graduates rose rapidly from the mid-1960s through the early 1980s, by almost 1 percentage point per year (Autor 2014, p. 845). The resulting increase in the relative supply of college graduates was a primary factor in the decline of the college wage premium during the 1970s. Starting in 1982, the supply of college graduates in the workforce began to decelerate. The falloff in growth was the result of both the smaller size of cohorts following the baby boomers and a plateauing from the mid-1970s through the mid-2000s in the ratio of college-educated males relative to high school-educated males in young cohorts. Without a deceleration in the supply of college-educated workers, labor markets would not have sustained the strong upward trend in the college wage premium.

The relative supply of college-educated workers grew less rapidly after 1982, but it was still increasing. In a supply-and-demand framework, the relative demand for college-educated workers must have been rising even more rapidly for the college-versus-high school wage ratio to increase. This then begs the question of what caused the relative demand for college-educated workers to increase. Two primary explanations have been considered: (1) so-called “skill-biased technological change” (SBTC) — technological change that complements highly educated workers but substitutes for low-skill workers; and (2) increased trade with less-developed countries. In short, the issue is whether technology or trade caused the relative demand for highly educated workers to increase.

Katz and Autor (1999) review a substantial body of evidence and make the case that skill-biased technological change was the primary causal factor behind the increased share of skilled and college-educated labor in the economy. Strong indirect evidence comes from the fact that aggregate increases in the ratio of high-skill to low-skill labor were the result of increases within individual industries and establishments in the skill intensity of employment, not the result of a shift of labor and resources from low-skill intensive industries to high-skill intensive industries. This is precisely what you would expect to see in an economy where SBTC was occurring within industries throughout the economy. However, it is inconsistent with explanations, such as increased trade with developing countries, where the mechanism for skill upgrading at the macroeconomic level involves shifts in product demand between sectors with differing skill intensities.

More-direct evidence of SBTC comes from econometric and case studies showing a strong positive correlation between greater utilization of more skilled and educated workers and the implementation of new technologies. For example, there are strong correlations between industry-level indicators of technological change (e.g., investment in computers, increased use of computers by employees, and research and development [R&D] spending) and within-industry growth in the importance of skilled and highly educated workers in employment and labor costs. Technology indicators do a better job of explaining differences between industries in the pace of skill upgrading than do measures of import pressure or outsourcing activity. Plant-level studies of U.S. manufacturing also find strong positive correlations between within-plant skill upgrading and both R&D spending and the level of computer investment.

The position of Katz, Autor, and others was not that increased trade with less-developed countries could not potentially create significant income inequality within the United States, only that it had played a much smaller role than had technological change. At the time, U.S. trade with developing countries was simply too small to be having large effects. In the early 1990s, total imports of manufactured goods from developing countries amounted to 2½ percent of GDP. Studies done in the mid-1990s estimated that trade with developing countries could only account for an increase in the ratio of skilled-to-unskilled wages of 1-to-3 percentage points (Krugman 2008, p. 104). Of course, this was when imports from Mexico and China each represented only 0.4 percent of GDP. By 2015, these shares had increased to 1.5 and 2.6 percent, respectively.

### **More Recent View of Changes in the Distribution of Wages**

Two developments have led to a revision in thinking about what is causing increasing U.S. wage inequality. First, since the mid-1990s, dispersion in the lower half of the wage distribution has stopped widening and has even narrowed. There has been a “polarization” of the U.S. labor market where wage and employment gains are being realized by high-skill and low-skill workers while wages and employment in the middle part of the skill distribution has lagged (see Chart 17).

In a series of articles, Autor and his co-authors (Autor, et al. 2003, 2006, 2008 and Acemoglu and Autor 2011) have offered a more-nuanced view of skill-biased technological change to rationalize this new pattern of polarization. Computer software and machinery following instructions from computers are very good at replacing workers performing tasks that are routine and codifiable. These include middle-skill routine cognitive tasks (such as bookkeeping,

administrative, and clerical tasks that involve organizing and manipulating information) and repetitive production tasks performed by middle-skill manufacturing workers. On the other hand, computers complement rather than substitute for workers who perform nonroutine cognitive tasks, particularly abstract tasks involving problem solving and creativity. These kinds of tasks rely heavily on information, and computers make it easier and cheaper to access, organize, and manipulate information. Occupations that especially benefit from computers include professional, managerial, technical, and creative occupations. Workers in these occupations typically have advanced education.

Computers and computer-controlled machinery are not yet capable of replacing workers performing nonroutine manual tasks or tasks that require situational adaptability and face-to-face interaction. This includes truck drivers and other operatives, cooks, and landscapers. So far, these occupations have been spared from the onslaught of labor-saving technology. These fields generally require little formal education.

The second development of significance for U.S. wage and income inequality has been the rapid growth since the mid-1990s of trade with developing countries. There are now a number of studies using data from local labor markets that have found significant impacts on U.S. wage and employment generated by imports from, and the offshoring of activities to, less developed countries, especially Mexico and China. When listing the factors that are responsible for the deterioration of real wages and employment opportunities at the lower end of the U.S. labor market, Autor (2014, p. 849) now includes globalization along with computer-driven technological advance and declines in the penetration and bargaining power of unions. A subsequent section of this report summarizes recent studies of the impact of trade and offshoring on local U.S. labor markets.

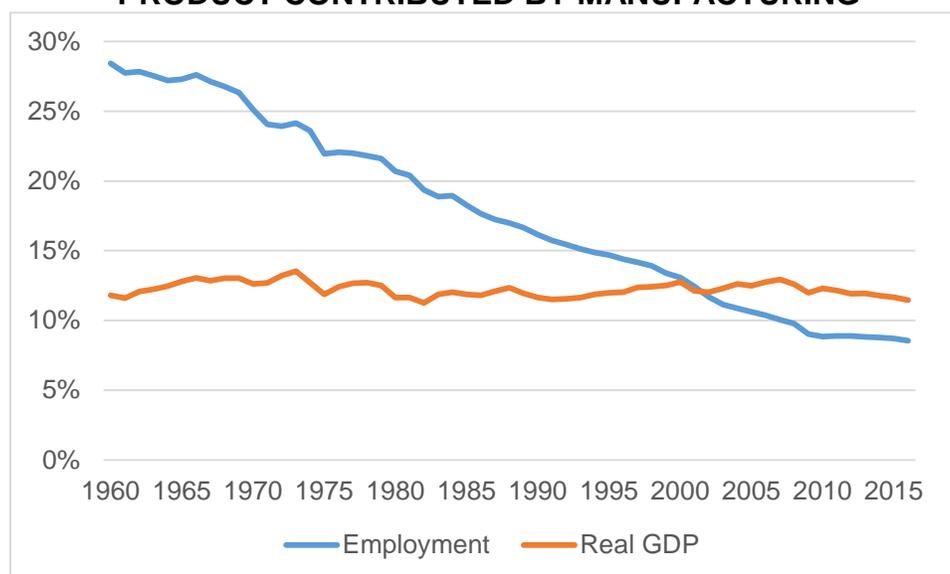
### **The Effect of Manufacturing on Income Inequality**

The share of total U.S. employment in industries that produce manufactured goods fell from 21 percent in 1980 to 9 percent in 2015. This was a period during which new competitors appeared in the global marketplace, especially the newly industrialized countries in eastern Asia. It was also a period during which the United States began to run chronic balance of trade deficits, particularly in manufactured goods. To many pundits and industry representatives, the relative decline in U.S. manufacturing employment was evidence of a corrosive downward trend in the country's international competitiveness. Economists, on the other hand, generally reacted to the decline in manufacturing employment with indifference. The falling share of manufacturing employment was not an indicator of weakness but was, in fact, a sign of economic success.

### **Fall in Manufacturing Employment as a Result of Rising Labor Productivity**

The relaxed attitude of economists to the decline in manufacturing's share of employment is based partly on a factual understanding that this has been going on for a long time, not only in the United States, but in other advanced countries. Chart 20 shows how manufacturing has been falling as a share of total U.S. employment for more than half a century. The rate of decline in recent decades has been no more rapid than the decline in previous decades. Table 8 shows how manufacturing employment has been falling as a share of total employment in many advanced countries. Even in Germany, known for its manufacturing excellence and strong export

**CHART 20**  
**SHARE OF UNITED STATES EMPLOYMENT AND REAL GROSS DOMESTIC PRODUCT CONTRIBUTED BY MANUFACTURING**



Sources: Calculated from U.S. Department of Labor, Bureau of Labor Statistics (employment) and U.S. Department of Commerce, Bureau of Economic Analysis (GDP).

**TABLE 8**  
**SHARE OF EMPLOYMENT CONTRIBUTED BY MANUFACTURING**  
**IN SELECTED ADVANCED COUNTRIES**

	1973	1990	2000	2012	Change, 1973 to 2012
United States	24.8%	16.8%	14.4%	10.3%	-14.5
Canada	22.0	15.8	15.3	10.2	-11.8
France	28.9	21.3	17.9	13.0	-15.9
Germany	36.7	31.6	23.9	19.8	-16.9
Japan	27.8	24.3	20.7	16.6	-11.2
Netherlands	25.3	19.1	14.8	10.2	-15.1
United Kingdom	32.1	22.1	14.8	9.8	-22.3

Source: U.S. Department of Labor, Bureau of Labor Statistics, International Labor Comparisons.

performance, the share of employment accounted for by manufacturing fell 17 percentage points from 1973 through 2012, an even larger decline than was experienced by the United States.

For economists, the essential explanation of and source of comfort in these manufacturing employment trends lies in a belief that they reflect large temporal increases in labor productivity within the manufacturing sector. U.S. manufacturing output has remained stable as a percentage of total GDP (see Chart 20). The situation in manufacturing seems analogous to what started happening in agriculture a hundred years earlier. In 1850, 55 percent of the U.S. workforce was engaged in farming. By 1950, that share had fallen to 12 percent. Today, about 2 percent of the

U.S. labor force is employed in the agricultural sector. Although employment has declined, U.S. agricultural production has increased at a rapid pace, enough to meet growing food demands from more prosperous domestic consumers and enough to provide the country with substantial exports. The invention and adoption of labor-saving machinery, along with advances in agricultural science, have made it unnecessary to employ so many people to produce our food. The evolution of production in manufacturing seems fundamentally similar to what happened in agriculture.

### **Thinness of the Manufacturing Productivity Boom**

The story behind the falling share of manufacturing employment is first, and foremost, a story of rising labor productivity. However, there are some more nuanced and concerning elements to the story. Baily and Bosworth (2014) are concerned that the constant share of aggregate manufacturing GDP despite the large drop in the manufacturing employment share that is visible in Chart 20 would not have been possible without huge increases in the production of computers and electronic products.

As seen in Table 9, real gains in manufacturing’s gross product were a little higher than the all-industry average in the 1991-to-2001 economic cycle, equal to the overall figure in the 2001-to-2009 economic cycle, and a little less than the total between 2009 and 2016.<sup>12</sup> This relative slowing of the manufacturing growth rate is directly tied to the computer and electronics manufacturing industry, whose growth rate has slowed from a phenomenally high 20 percent per year during the 1991-to-2001 cycle to a still above-average 4 percent per year in the current cycle. Excluding computers and electronics, manufacturing production has lagged behind the rest of the economy, though not by as much in the current cycle as in the prior cycle.

Manufacturing’s share of employment has fallen, but its share of GDP has generally remained steady. The implication is that labor productivity (output per worker) in manufacturing has increased more rapidly than overall labor productivity. Table 10 examines U.S. productivity growth. Two productivity measures are presented in the table: labor productivity and multifactor

**TABLE 9  
ANNUAL AVERAGE INFLATION-ADJUSTED GROWTH RATE  
OF U.S. GROSS DOMESTIC PRODUCT BY ECONOMIC CYCLE**

	<b>1991 to 2001</b>	<b>2001 to 2009</b>	<b>2009 to 2016</b>
Total of All Industries	3.7%	1.5%	1.9%
Manufacturing	4.1	1.5	1.4
Durable Goods	6.0	1.9	3.5
Computers and Electronic Products	19.8	12.7	4.0
Nondurable Goods	1.4	0.8	-0.7
Less Computers and Electronics:			
Manufacturing	3.1	0.4	1.0
Durable Goods	4.2	-0.4	3.3

Source: U.S. Department of Commerce, Bureau of Economic Analysis.

<sup>12</sup> The economic cycles are dated from the end of each recession.

**TABLE 10**  
**ANNUAL AVERAGE UNITED STATES PRODUCTIVITY GROWTH**  
**BY ECONOMIC CYCLE**

	1991 to 2001	2001 to 2009	2009 to 2015
Labor Productivity:			
Private Nonfarm	2.3%	2.5%	1.0%
Manufacturing	4.0	3.5	1.1
Computers and Electronics	16.8	6.1	1.5
Multifactor Productivity:			
Private Nonfarm	1.1	1.0	0.9
Manufacturing	1.3	1.4	-0.4
Computers and Electronics	11.1	7.6	1.4

Source: U.S. Department of Labor, Bureau of Labor Statistics.

productivity. Growth in multifactor productivity is measured by the difference between growth in output and the part of output growth that can be accounted for by the growth of inputs, capital, and labor. Multifactor productivity growth is assumed to reflect, and be driven by, technological change. Growth in labor productivity is the sum of growth in multifactor productivity and growth in output per worker that stems from increases in the ratio of capital to labor.

As expected from the previous discussion, the rate of growth in labor productivity in the manufacturing sector was greater than the rate of productivity growth in the general nonfarm economy during the 1991-to-2001 and 2001-to-2009 economic cycles. This was also true of growth in multifactor productivity, the component of productivity growth related to technological change. In both measures of productivity, the computer and electronics manufacturing industry posted extraordinary gains during these two cycles. Thus, the gains in manufacturing's productivity were due primarily to productivity advances within the computer and electronics industry.

In the current cycle, productivity gains in the computer and electronics industry have slowed to only a little above average. This has lowered manufacturing's labor productivity increase to barely above the overall figure; manufacturing's multifactor productivity has declined.

If productivity growth in the production of computers and electronics continues to slow and the United States suffers a decline in international competitiveness in this area of the economy, various effects would occur. In a global market system, whenever a country begins to lose its comparative advantage in a particular industry, the country's real exchange rate<sup>13</sup> depreciates. The exchange rate depreciation will serve to revive other areas of manufacturing (and other sectors that produce tradable goods and services) and allow the country to once again produce enough for export to pay for its imports. However, the adjustment will entail a decline in the country's terms of trade and a corresponding fall in real national income.

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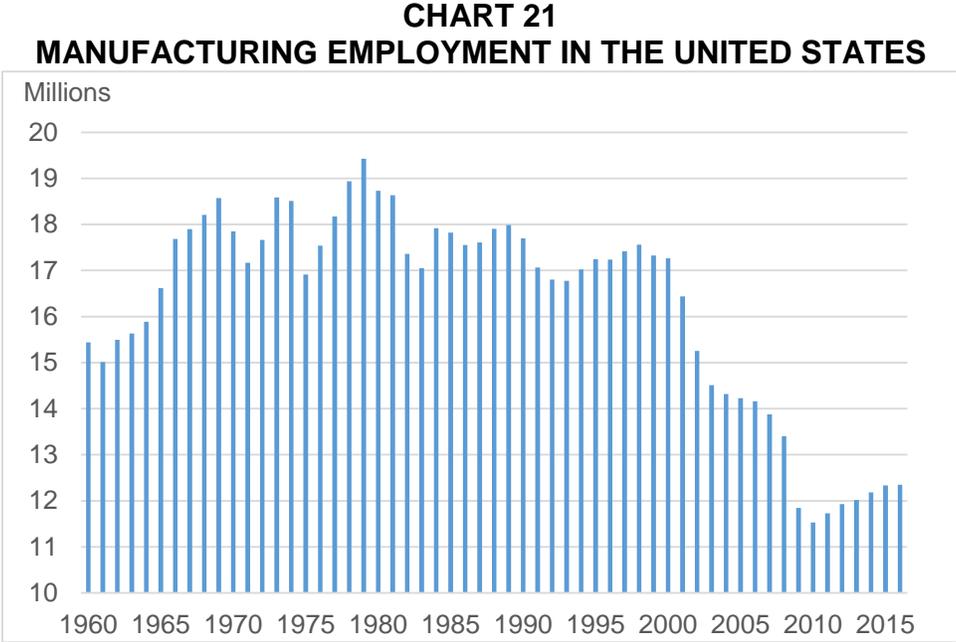
<sup>13</sup> The exchange rate is the ratio at which a unit of the currency of one country can be exchanged for that of another country.

**Implications of Declining Manufacturing Employment for Regional Income Inequality**

A second reason to be concerned about the recent fall in manufacturing’s share of total employment is that since 2000, the falling share has been associated with a sharp decline in the absolute level of manufacturing employment. From 2000 to 2015, U.S. manufacturing employment declined by 5 million jobs — about a 30 percent drop from its 2000 level. In contrast, from the mid-1960s through the late 1990s, the level of manufacturing employment was cyclical but suffered no long-term decline (see Chart 21).

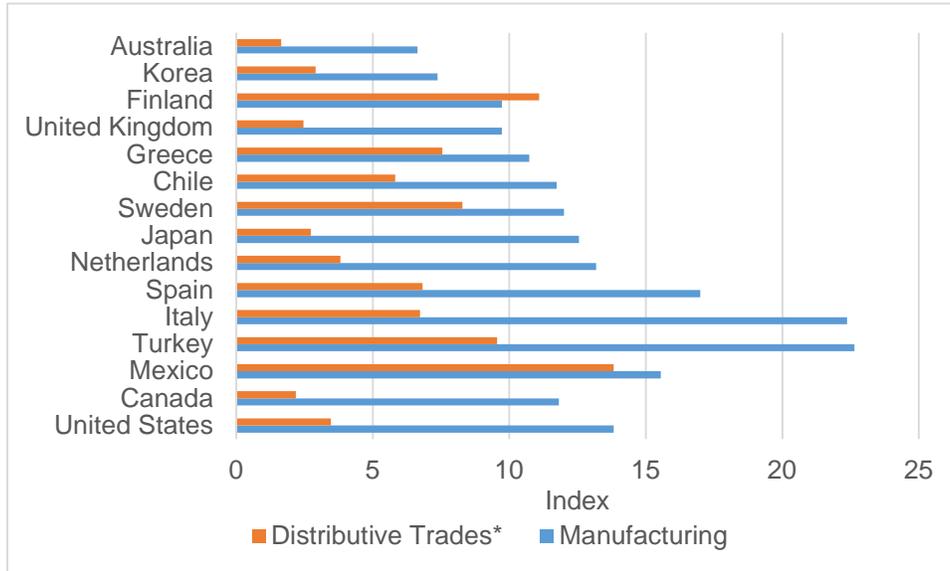
It is easier for an economy to adjust to a decline in a sector’s share of employment when total employment is growing and the sector is not going through an absolute contraction. Because manufacturing activity is more geographically concentrated than other economic activity (see Chart 22), full adjustment to an absolute employment contraction may require regional outmigration of jobs and households, a process that takes time. Recent research in labor economics has found that workers and families are less willing to move out of regions than was previously believed. A principal message from the work of David Autor is that the recent decline in U.S. manufacturing employment has been a “seismic” event for some parts of the country, even if the aggregate consequences were not large (Autor 2017).

In her 2017 OECD Economic Outlook presentation, Katherine Mann makes the point more generally that declines in manufacturing’s employment share have served to widen regional income inequality throughout the OECD. As shown in Chart 23, countries that have experienced the largest declines in manufacturing’s share of employment have also seen the largest increases in the dispersion of regional incomes.



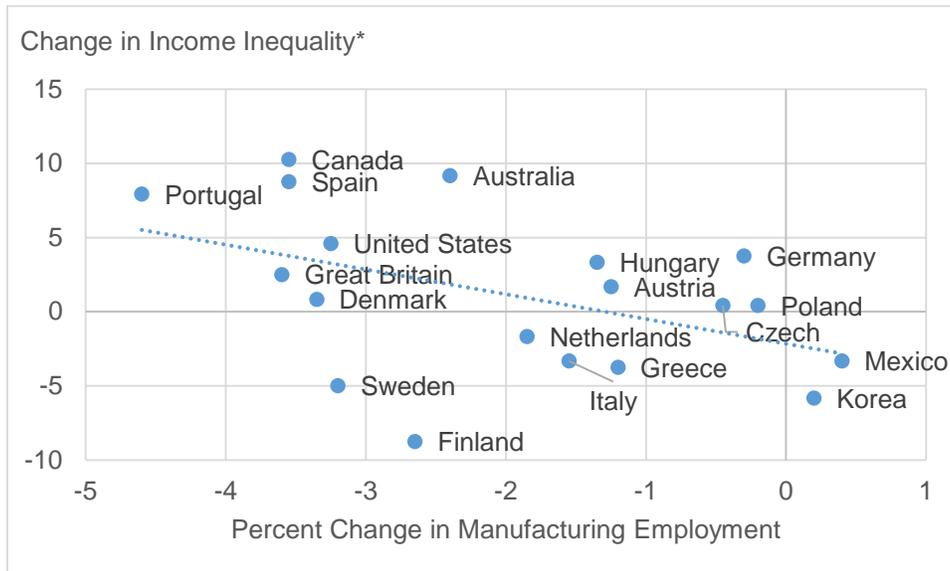
Source: U.S. Department of Labor, Bureau of Labor Statistics.

**CHART 22**  
**REGIONAL CONCENTRATION OF MANUFACTURING,**  
**AVERAGE FROM 2000 TO 2015 OR LATEST**



\* Includes distributive trade, repairs, transportation and storage, accommodation, and food services.  
 Note: Concentration is expressed as an index of the extent to which employment is concentrated in particular regions. The index ranges from zero (no concentration) to 100.

**CHART 23**  
**CHANGES IN MANUFACTURING EMPLOYMENT AND INCOME INEQUALITY**  
**FROM 2000 TO 2015 OR LATEST**



\* Based on the ratio of the 90th-to-50th percentile.

Source (Charts 21 and 22): Mann (2017).

## **NEGATIVE EFFECTS ON LOCAL LABOR MARKETS OF TRADE WITH DEVELOPING NATIONS AND OFFSHORING**

A number of empirical studies in recent years provide evidence of significant negative impacts on some local labor markets of increased U.S. trade with low-income countries, particularly China and Mexico. The negative effects include reductions in manufacturing employment and wages, increases in unemployment, and lowered workforce participation rates. From a national perspective, these negative effects are more than offset by the benefits from increases in trade.

A summary of three notable studies follows; a more detailed description of these studies is provided in Appendix 1. A fourth study specific to Mexico and NAFTA is discussed in a later section. After the summary of the three studies is a discussion of government programs that provide financial assistance and services to workers and firms that have suffered from import competition.

### **“The China Syndrome: Local Labor Market Effects of Import Competition in the United States”**

Autor, Dorn, and Hanson (2013) estimated the local labor market effects of rising import competition from China over the period from 1990 through 2007. The authors divided the time period of analysis into two parts: 1990 to 2000 and 2000 to 2007; U.S. imports of manufactures from China increased much more rapidly in the latter period. Looking at the 40 largest metropolitan areas of the United States using 10-year equivalent changes in Chinese imports over the period from 2000 through 2007, the metro areas of San Jose, CA, Providence, RI, and Los Angeles, CA had the highest rates of import exposure. The Phoenix metro area had import exposure at a rate slightly below the median.

The authors found that exposure to rising Chinese imports was associated with lower manufacturing employment, a lower overall ratio of employment to population, and lower wages. The decline in manufacturing employment was associated almost 1-for-1 with increases in unemployment and nonemployment. Negative employment impacts from rising Chinese imports were found for both college and noncollege adults, but the effects were more pronounced for noncollege adults. Rising import exposure also served to reduce local area nonmanufacturing employment slightly but had little effect on the local area population.

Comparing the magnitude of their estimated effects with observed declines in U.S. manufacturing employment, the authors found that rising exposure to Chinese import competition explained from 16-to-33 percent of the decline in U.S. manufacturing employment over the 1990-to-2000 period and from 26-to-55 percent of the decline over the 2000-to-2007 period.

### **“Untangling Trade and Technology: Evidence from Local Labour Markets”**

In a later paper, Autor, Dorn, and Hanson (2015) measured the separate contributions of trade and technology to changes in local area employment, unemployment, and labor force participation over the period from 1980 through 2007, specifically measuring local exposure to rising import competition from China. An important finding of the paper is that the measures of trade exposure and technology exposure were largely uncorrelated across regions.

The later findings on impacts from exposure to Chinese import competition were highly similar to those in the earlier paper. Over the 1990-to-2007 period, increased imports from China were found to have had a significant negative effect on local area ratios of employment to population. Employment declines were confined largely to the manufacturing sector, with negative but statistically insignificant employment impacts found outside of manufacturing. The reduction in employment was accounted for by reductions in labor-force participation rather than unemployment. Trade shocks had a disproportionately negative impact on the employment of workers without a college education. Trade shocks were equally as large for males and females and for younger and older workers. All occupations within manufacturing were negatively affected. Employment losses within manufacturing were divided equally between production workers and white-collar workers in managerial, professional, and clerical positions. However, increased trade exposure to imports from low-income countries did not explain the phenomenon of job polarization.

Looking at technological change, regions that were more specialized in routine-intensive occupations suffered employment losses in these occupations but experienced gains in employment in nonroutine abstract and manual-intensive occupations. These results match observed patterns of job polarization in the U.S. economy. The negative employment impacts observed for regions initially specialized in routine-intensive occupations were strongest among women and older workers.

Labor market impacts from increased trade with China began in the 1990s and accelerated during the 2000s. Impacts from technological change on manufacturing were strongest during the 1980s and then quickly decelerated. However, impacts from automation outside of manufacturing accelerated throughout the three decades.

#### **“Estimating the Impact of Trade and Offshoring on American Workers Using the Current Population Surveys”**

Ebenstein, Harrison, McMillan, and Phillips (2014) estimated the effects of both trade and offshoring on the wages of American workers over the 1983-to-2002 period. A major finding of the authors was that exposure to trade and offshoring through industry of employment had an insignificant effect on wages while exposure through occupation was negative and highly significant. The authors concluded that globalization had small effects on industry wage differentials but significant effects on occupation wage differentials. The largest effects from exposure to globalization were felt by workers performing routine tasks. Much of the drop in wages brought on by globalization occurred through a reallocation of workers from higher-wage manufacturing jobs to lower-paying jobs in other sectors and other occupations. Export activity and offshoring to high-income countries, on the other hand, served to raise the wages of domestic workers.

#### **Trade Adjustment Assistance and Active Labor Market Policies**

Trade adjustment assistance refers to government programs that provide financial assistance and services to workers and firms that have suffered from import competition. Workers who qualify for assistance may include not only those employed by firms who are in direct competition with imports, but also those employed by suppliers and downstream producers and in regions broadly affected by import competition. There are both efficiency and equity reasons for providing trade

adjustment assistance. To fully realize the gains from trade, economies must reallocate labor and other resources between sectors to maximize the value of national product at world prices. If immobilities and rigidities in labor markets inhibit workers from moving from sectors that are shrinking because of import competition to export and nontraded sectors that are expanding, programs that provide adjustment assistance may be efficiency enhancing. On equity grounds, trade adjustment assistance programs may provide at least partial compensation to those who suffer an economic loss because of international trade. There is also a political economy consideration that trade adjustment assistance programs, by helping to compensate the losers, may reduce political opposition to free trade.

The oldest and largest trade adjustment assistance program is in the United States. Trade adjustment assistance was proposed by President John F. Kennedy as part of a total package to open up free trade. His rationale was “When considerations of national policy make it desirable to avoid higher tariffs, those injured by that competition should not be required to bear the full brunt of the impact. Rather, the burden of economic adjustment should be borne in part by the federal government.” The Trade Adjustment Assistance (TAA) Program was created by Congress in 1962; it has been revised several times, with the latest reauthorization in 2015. Three components of the program, each administered by a federal agency, address different affected parties: workers, companies, and farmers.

For companies, financial assistance to manufacturers and service firms affected by import competition is offered, including professional guidance, business recovery plan development, and cost sharing for outside consulting services. Farmers can receive payments if price declines for their commodity were at least partly caused by imports.

Workers who have lost their jobs or suffered a reduction of hours and/or wages as a result of increased imports or shifts in production to locations outside the United States are eligible for the TAA program. Trade does not need to be the primary reason for unemployment. The annual budget for worker assistance is about \$900 million. The TAA offers several services to workers:

- Trade readjustment allowance (TRA). This provision extends unemployment compensation for those who have exhausted their unemployment compensation for up to a total of 130 weeks, for those who are enrolled in a training program.
- Training and re-employment services. Training subsidies, case management services, and job search and relation assistance are offered. Ninety percent of job search and relocation expenses are reimbursable, up to \$1,250.
- Refundable health insurance tax credit. This covers 72.5 percent of the premium.
- Re-employment TAA. This is a wage insurance program for those 50 and older who have obtained new employment at a lower wage. A cash payment of 50 percent of the differential is available, up to a two-year maximum of \$10,000.

The program for workers has been criticized as not being very effective, a criticism borne out by various research projects over the years. The latest study by Mathematica Policy Research in 2012 found that employment rates for TAA participants were not any higher after four years than for similar individuals who did not participate in the program. Earnings of TAA participants were lower. Moreover, only a minority found employment in the occupation for which they were trained. A cost-benefit analysis was negative, both for participants and for society as a whole.

A more recent trade adjustment assistance program is the European Globalisation Adjustment Fund (EGF), established in 2006 in the European Union (EU). The EGF supports workers who lose their jobs as a result of changing global trade patterns. As a rule, the EGF is used only when at least 500 workers have been laid off by a single company (including suppliers and downstream producers) or in a particular sector in a specific region. EU member nations first design their own labor market policies to provide unemployed workers with training and placement services. The nations then apply to the EGF for support of up to 65 percent of the total cost. The EGF has a maximum annual budget of 150 million euros for the period from 2014 through 2020.

In market economies, there are a myriad of changes, including the appearance of new companies, both domestic and foreign, and the introduction of new technologies and labor-saving machinery, which require ongoing adjustments in where people work and the skills they need to have. There are no significant and systematic differences between the re-employment experiences of workers who are laid off for trade-related reasons and those displaced for other reasons (Francois, et al., p. 231). These considerations provide a strong case for designing general rather than trade-specific policies to assist workers who suffer involuntary unemployment. General labor market assistance programs are much more common across advanced countries than are trade-specific programs, and they have substantially larger budgets.

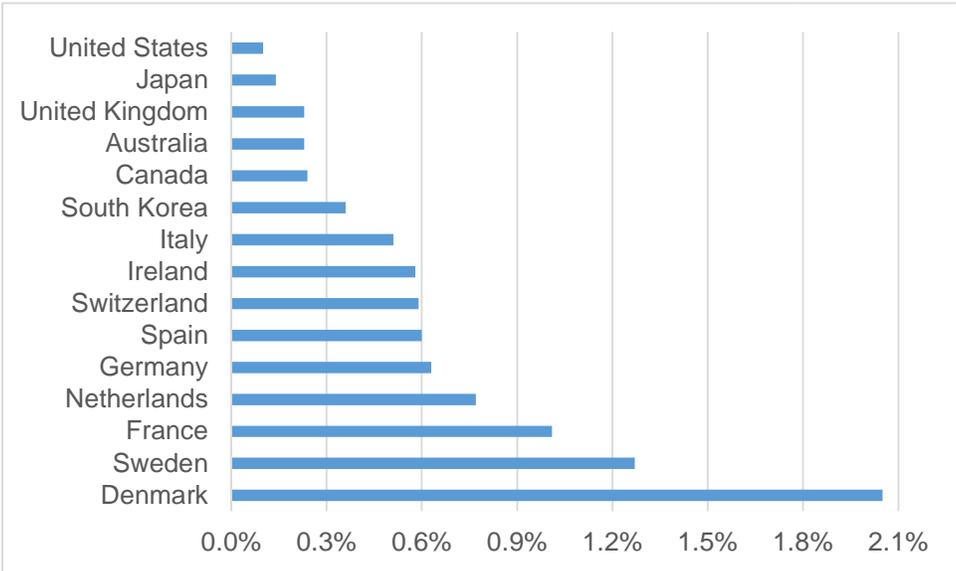
What is referred to as active labor market policy are programs that provide training (both general and vocational), job search and placement assistance, wage subsidies, and direct public sector employment to help integrate unemployed and disadvantaged workers into the work force. These are referred to as “activation” programs when full participation is obligatory in order for the individual to receive benefits. For example, there may be requirements that individuals attend intensive interviews with employment counselors, apply for job vacancies, and accept work if suitable job offers are made.

Chart 24 shows public expenditures on active labor market programs made by 15 OECD countries in 2015. The figures are expressed as a percent of GDP. Not surprisingly, the more socialist northern European countries devote relatively large shares of their GDP to labor market adjustment assistance. Public expenditures on active labor market programs in 2015 were 2.05 percent of GDP in Denmark, 1.27 percent in Sweden, 0.77 percent in the Netherlands, and 0.63 percent in Germany. English-speaking countries with more market-oriented economies, including the United States, the United Kingdom, Australia, and Canada, devote relatively few resources to labor market adjustment assistance. The United States, in particular, spends only 0.10 percent of its GDP on active labor market programs.

There have been many studies in both the United States and Europe of the effectiveness of active labor market programs. A review by Heckman et al. (1999) concludes that these programs have at best a modest impact on a participant’s labor market prospects and many programs do not pass a cost-benefit test. Heckman et al. speculate that the reasons the private and social gains from these programs are found to be small is that per capita expenditures are usually small compared to the needs of participants and that services are targeted to relatively unskilled and less able individuals. The return on training programs for these groups, for example, would be expected to

be low. A meta-analysis of studies of European active labor market programs conducted by Kluve (2010) found that program effectiveness depends on the type of program. Training programs appear to have modestly positive effects. Wage subsidies and job placement services (with sanctions for less than full participation) can be effective in increasing the participant’s future employment probabilities. Direct employment programs, on the other hand, frequently have a detrimental long-term employment effect.

**CHART 24**  
**PUBLIC EXPENDITURES ON ACTIVE LABOR MARKET POLICIES**  
**AS A SHARE OF GROSS DOMESTIC PRODUCT, 2015**



Source: Organisation for Economic Co-operation and Development (OECD).

## **THE NORTH AMERICAN FREE TRADE AGREEMENT**

Discussions between the United States, Mexico and Canada regarding free trade began in 1990. The North American Free Trade Agreement (NAFTA) was signed by the three nations in December 1992 and went into effect at the beginning of 1994. According to Wikipedia:

“The goal of NAFTA was to eliminate barriers to trade and investment between the U.S., Canada and Mexico. The implementation of NAFTA on January 1, 1994 brought the immediate elimination of tariffs on more than one-half of Mexico's exports to the U.S. and more than one-third of U.S. exports to Mexico. Within 10 years of the implementation of the agreement, all U.S.-Mexico tariffs would be eliminated except for some U.S. agricultural exports to Mexico that were to be phased out within 15 years. Most U.S.-Canada trade was already duty-free. NAFTA also sought to eliminate non-tariff trade barriers and to protect the intellectual property rights on traded products.”

NAFTA was one of the earliest free trade agreements negotiated between the United States and one or more other countries. However, trade agreements now are in place with 20 countries, most of which became effective between 2004 and 2012. In the Western Hemisphere, in addition to Canada and Mexico, agreements are in place with each of the six Central American nations, with three South American nations, and with the Dominican Republic. A number of other trade agreements currently are being negotiated.

### **Expectations**

At the time NAFTA went into effect, the Mexican economy was only one-tenth the size of the U.S. economy. Mexico accounted for less than 10 percent of U.S. exports and imports. Exports to Mexico represented only 0.6 percent of U.S. GDP. Additionally, while NAFTA would eliminate all tariff and nontariff trade barriers, the average U.S. tariff on imports from Mexico was only 4 percent (Hufbauer, et al. 2014, p. 10). In view of the factual context at the time of the agreement, it was never plausible that NAFTA would have dramatic effects on aggregate employment and wages in the United States.

A Congressional Budget Office (1993) report estimated that less than half a million U.S. workers might have to change jobs because of NAFTA, and these losses would be spread out over ten years. By comparison, nearly 20 million workers lost their jobs (and were not recalled) during the 1980s. Concerning wage effects, the CBO found from a survey of academic studies that NAFTA was expected to change U.S. real wages by no more than 1 percent. Altogether, the mainstream consensus from a large number of studies using a variety of models and methods of analysis was that the effects of NAFTA on the U.S. economy would be positive but small (Burfisher, et al. 2001, p.126).

Similarly, the effects of NAFTA on the Canadian economy were expected to be small, largely because the Canada-U.S. Free Trade Agreement had already gone into effect at the beginning of 1989. Increases in Canada's trade with Mexico were not expected to be large enough to have a significant effect on the Canadian economy.

In contrast, the consensus was that NAFTA could mean potentially much more for the Mexican economy. The United States accounted for more than 80 percent of Mexican exports. Exports to the U.S. represented 6 percent of Mexico's GDP. The average tariff rate on imports coming into

Mexico had already been reduced in previous policy reforms from 25 percent in 1985 to around 10 percent in 1988 (Kose, et al. 2004, p. 11). However, NAFTA would eliminate some significant remaining trade barriers, and it would provide a measure of assurance that Mexican markets would remain open to North American producers.

### **Effects on Trade Flows**

Most studies conclude that NAFTA has had significant effects on trade and investment flows between the member countries. However, most of the gains in trade flows have been between the United States and Mexico. An increase in trade between Canada and the United States predated NAFTA, due to the 1988 Canada-U.S. Free Trade Agreement. Similarly, exports from Mexico to Canada began to increase before 1994; as a percentage of the GDP of either country, the flows are small today. Exports from Canada to Mexico remain quite small relative to GDP.

### **United States**

In 2016, U.S. merchandise exports to the world totaled \$1.45 trillion, according to the International Monetary Fund (IMF). The import value was substantially higher at \$2.19 trillion, leaving a merchandise trade deficit of \$737 billion. Exports were only 66.4 percent of the value of imports. Between 1993, the year before NAFTA took effect, and 2016, the export value expressed as a percentage of GDP rose from 6.8-to-7.8 percent but the import share increased more, from 8.8-to-11.8 percent. Thus the trade deficit enlarged from 2.0-to-3.9 percent of GDP.

Merchandise trade is divided into nearly 100 commodities. The U.S. Census Bureau provides trade values by commodity for 1992 through 2016. The figures are gross values, not value added, and are subject to the limitations discussed earlier. Table 11 provides for major commodities the values of United States trade with the world in 2016. Three commodities — machinery, electric machinery, and vehicles — by far had the highest total (imports plus exports) trade values in 2016 and also had the largest trade deficits. Mineral fuel and oil had the next-highest total trade value and also the next-greatest trade deficit. The aircraft and spacecraft commodity was the only one with a substantial trade surplus.

Measured as the share of the total trade value of all commodities in each year, the change in each commodity share between 1993 and 2016 also is shown in Table 11. Among the commodities with the greatest trade value in 2016, U.S. exports rose the most over these 23 years in the mineral fuel and oil, aircraft and spacecraft, and pharmaceutical products categories. A substantial decline as a share of the total occurred in the machinery category; a decrease in electrical machinery also occurred. In some categories, such as pharmaceutical products, the share of imports changed in the same direction as exports. In other categories, the change was in opposite directions. Exports of mineral fuel and oil rose while imports declined. The opposite relationship was present in the electric machinery category.

### **Mexico**

In 2016, merchandise exports from Mexico totaled \$372 billion, according to the IMF. The import value was higher at \$410 billion, leaving a merchandise trade deficit of \$37 billion. Exports were 90.9 percent of the value of imports. Between 1993 and 2016, the export value expressed as a percentage of Mexico's GDP rose substantially from 7.1-to-16.3 percent. The import share also increased considerably, from 9.9-to-18.0 percent. The trade deficit narrowed

**TABLE 11**  
**UNITED STATES MERCHANDISE TRADE WITH THE WORLD BY COMMODITY**

Commodity (Number and Description)	2016 Value in Billions				1993-to-2016 Change in Share of Total		
	Exports	Imports	Total	Net	Exports	Imports	Total
TOTAL	\$1,451.0	\$2,187.8	\$3,638.8	\$-736.8			
Top 10 Based on Total Value:							
84 Machinery	190.6	308.9	499.5	-118.3	-5.9	-0.9	-3.1
85 Electric Machinery	167.1	330.9	498.0	-163.8	-1.9	1.8	0.3
87 Vehicles (Except Railway Or Tramway)	124.6	280.7	405.3	-156.1	-0.8	-1.8	-1.1
27 Mineral Fuel, Oil	93.7	153.9	247.6	-60.2	4.3	-2.6	0.5
88 Aircraft, Spacecraft	134.8	30.9	165.7	103.9	2.5	0.3	0.9
90 Instruments	82.0	79.7	161.7	2.3	0.8	0.6	0.6
30 Pharmaceutical Products	47.0	92.0	139.0	-45.1	2.4	3.7	3.2
71 Precious Metals	57.8	66.3	124.1	-8.5	1.2	0.7	0.8
98 Special Classification Provisions	40.1	69.0	109.1	-28.8	-0.4	0.8	0.3
39 Plastics	58.6	48.1	106.7	10.6	1.0	0.7	0.7
Others With a Trade Imbalance of at Least \$25 Billion:							
94 Furniture	11.0	59.1	70.1	-48.1	-0.1	1.3	0.8
61 Apparel, Knitted	2.6	44.0	46.6	-41.4	-0.2	0.2	0.1
62 Apparel, Not Knitted	2.3	37.4	39.7	-35.0	-0.4	-1.7	-1.1
12 Oil Seeds	27.7	2.3	30.0	25.4	0.7	0.0	0.2

Source: U.S. Department of Commerce, Census Bureau.

from 2.8-to-1.6 percent of GDP. Trade accounts for a larger share of the Mexican economy than the U.S. economy.

### **Canada**

In 2016, merchandise exports from Canada totaled \$390 billion, according to the IMF. The import value was higher at \$427 billion, leaving a merchandise trade deficit of \$37 billion. Exports were 91.3 percent of the value of imports. Between 1993 and 2016, the export value expressed as a percentage of Canada's GDP rose from 23.0-to-24.4 percent. The import share increased a little more, from 24.2-to-26.7 percent. The trade deficit expanded from 1.2-to-2.3 percent of GDP. Trade accounts for a larger share of the Canadian economy than the Mexican economy and a much greater share relative to the United States.

### **Trade Between the United States and Mexico**

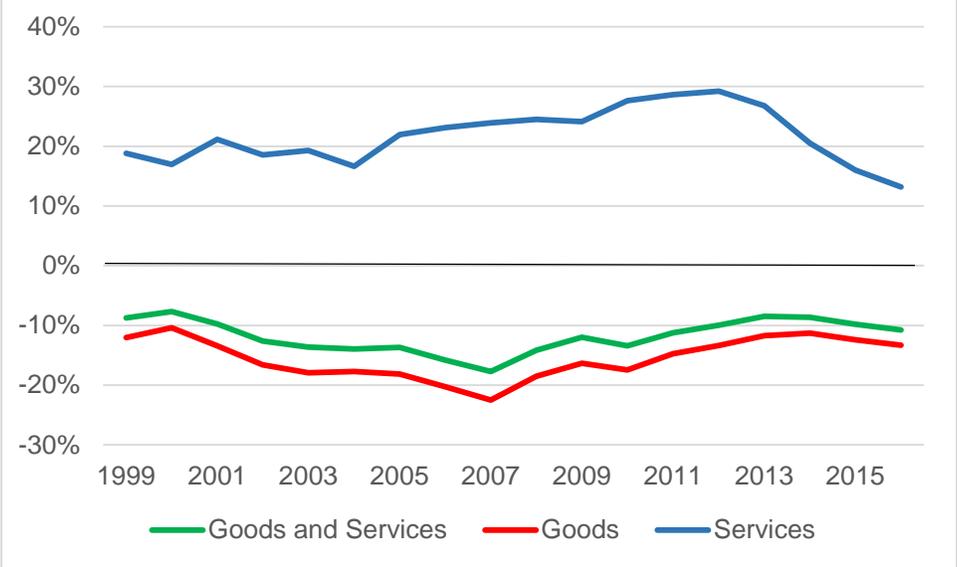
Bilateral trade data on services only extends back to 1999, so it is not possible to examine the effect of NAFTA on the trade of services with Mexico and Canada. The trade balances with Mexico from 1999 through 2016 are shown in Chart 25. A surplus in the trade of services offsets only a small portion of the deficit in the trade of goods. While the deficit in merchandise trade worsened from 2000 to 2007, it has since narrowed and is not much larger than in 2000.

The data on bilateral merchandise trade flows extend back to 1981, allowing a comparison of more than a decade of pre-NAFTA to more than two decades since then. Merchandise trade with Mexico, expressed as a percentage of U.S. GDP, is shown in Chart 26. U.S. merchandise exports to Mexico increased from 0.61 percent of GDP in 1993 to 1.24 percent in 2016. U.S. imports from Mexico grew even more rapidly, from 0.59 percent of GDP in 1993 to 1.58 percent in 2016. Thus, the U.S. trade balance with Mexico went from marginally positive in 1993 to -0.34 percent of GDP in 2016.

Expressed as a percentage of Mexican GDP, bilateral trade flows with the United States are much larger. Merchandise exports to the United States increased from 5.91 percent of GDP in 1993 to 13.27 percent in 2016. Imports from the United States advanced from 7.01 percent of GDP in 1993 to 8.35 percent in 2016. Thus, Mexico's trade balance with the United States went from -1.10 percent of GDP in 1993 to 4.92 percent of GDP in 2016.

The effects of NAFTA are made somewhat murky by the fact that Mexico undertook significant economic reforms during the mid-1980s, including unilateral reductions in trade barriers and a joining of the General Agreement on Tariffs and Trade (GATT) in 1986. Part of what was observed after 1994 may be a delayed response to previous policy changes rather than a NAFTA effect. As Hinojosa-Ojeda, et al. (2000) have noted, bilateral trade between the United States and Mexico began to grow rapidly in the late 1980s. The pattern of trade also began to change, with Mexico specializing in exports of manufactures based on the processing of intermediate inputs imported from the United States. In their view, NAFTA served to cement earlier trade reforms, but the period since NAFTA represents a continuation and maturation of trends in bilateral trade that had begun nearly a decade earlier.

**CHART 25**  
**UNITED STATES TRADE BALANCE WITH MEXICO,**  
**NET EXPORTS AS A SHARE OF TOTAL IMPORTS AND EXPORTS**



Source: U.S. Department of Commerce, Bureau of Economic Analysis.

**CHART 26**  
**BILATERAL MERCHANDISE TRADE, UNITED STATES AND MEXICO,**  
**AS A SHARE OF UNITED STATES GROSS DOMESTIC PRODUCT**



Source: International Monetary Fund.

The top four commodities of U.S. trade with Mexico in 2016 were the same as U.S. trade with the world, though the rank order was slightly different. Trade of plastics was relatively more important with Mexico. Three of the top 10 commodities of U.S. trade with the world — aircraft and spacecraft, pharmaceutical products, and precious metals — were not among the top 10 with Mexico, replaced by furniture, articles of iron and steel, and edible fruits and nuts.

Table 12 provides the values of bilateral trade by commodity between the United States and Mexico in 2016. The United States had a trade surplus in four of the top 10 commodities. The overall deficit resulted from the two machinery categories and especially the vehicles category. As discussed earlier, it is difficult to interpret these figures due to the integration of the manufacturing process between the two countries.

U.S. trade with Mexico as a share of U.S. trade with the world in 2016 also is shown in Table 12. Overall, 15.8 percent of U.S. exports were sent to Mexico. Among the leading commodities, the shares were highest for articles of iron and steel, plastics, and electric machinery. Mexico accounted for 13.4 percent of U.S. imports. The shares were highest in the edible fruits and nuts and vehicles categories.

Between 1993 and 2016, U.S. exports to Mexico as a share of the bilateral total increased in the mineral fuel and oil, machinery, and plastics categories, but decreased in the electric machinery category. The increase in mineral fuel and oil exports was associated with a decline in imports, but the direction of change in the other three categories was the same for exports and imports.

Relative to U.S. trade with the world, U.S. trade with Mexico increased substantially after 1993, for both imports and exports. Much of the increase occurred in the years immediately after NAFTA took effect, but additional gains have occurred since the end of the last recession. Among the leading commodities, the share of world exports going to Mexico particularly rose in the machinery, articles of iron and steel, and plastics categories. Imports from Mexico increased the most in the edible fruit and nuts, vehicles, and machinery categories.

The U.S. trade deficit with Mexico does not indicate that NAFTA was a bad trade deal for the United States. As discussed earlier, bilateral trade balances are a poor measure of the gains from international trade. Moreover, the trade figures are limited to merchandise trade and do not measure value added, combining trade in intermediate goods with trade in finished products.

### **Trade Between the United States and Canada**

The trade balances with Canada from 1999 through 2016 are shown in Chart 27. In recent years, a larger surplus in the trade of services combined with a somewhat smaller deficit in the trade of goods has resulted in overall balance in the trade with Canada. A small surplus occurred in 2016.

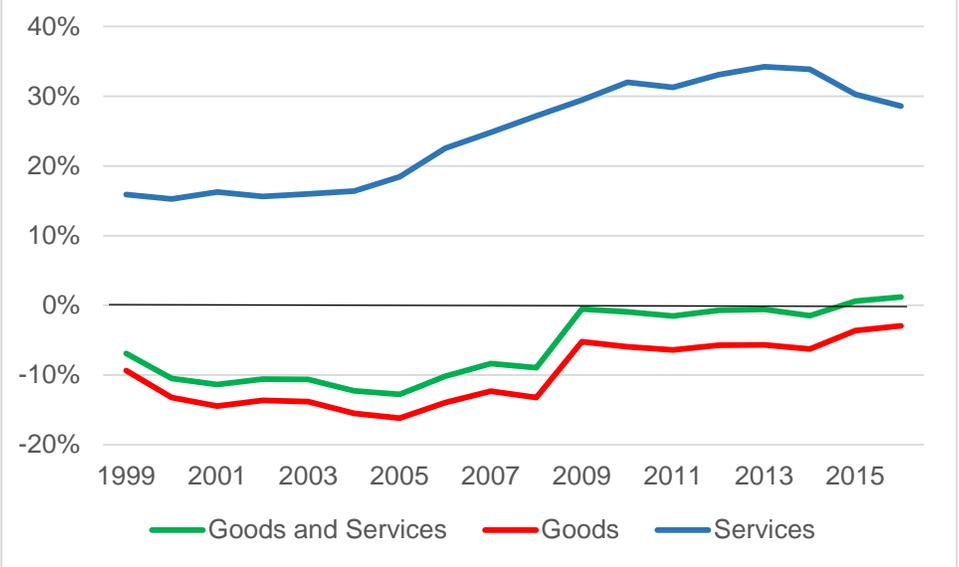
In contrast to the gains in merchandise trade between the United States and Mexico, no significant trend movement has occurred in the bilateral merchandise trade flows between the United States and Canada (see Chart 28). U.S. merchandise exports to Canada were 1.46 percent of U.S. GDP in 1993 and 1.43 percent in 2016. U.S. imports of goods from Canada were 1.65 percent of GDP in 1993 and 1.49 percent in 2016. Thus, the U.S. merchandise trade deficit with Canada narrowed from -0.19 percent of GDP in 1993 to -0.06 percent of GDP in 2016.

**TABLE 12**  
**UNITED STATES MERCHANDISE TRADE WITH MEXICO BY COMMODITY**

Commodity (Number and Description)	2016 Value in Billions				1993-to-2016 Change in Share		
	Exports	Imports	Total	Net	Exports	Imports	Total
TOTAL	\$229.7	\$294.1	\$523.8	\$-64.4			
Top 10 Based on Total Value:							
85 Electric Machinery	40.7	61.8	102.5	-21.1	-2.8	-6.7	-4.5
87 Vehicles (Except Railway Or Tramway)	21.4	74.8	96.2	-53.4	-1.9	10.2	5.2
84 Machinery	41.7	50.8	92.5	-9.1	3.8	8.2	5.9
27 Mineral Fuel, Oil	19.2	8.7	27.9	10.5	5.9	-9.3	-1.9
39 Plastics	16.2	4.7	20.9	11.4	2.0	0.7	0.9
90 Instruments	7.1	13.2	20.3	-6.2	-1.2	1.1	0.0
94 Furniture	2.4	11.1	13.6	-8.7	-1.0	1.2	0.3
98 Special Classification Provisions	6.8	5.8	12.5	1.0	-1.1	-1.4	-1.3
73 Articles of Iron and Steel	5.0	3.9	8.9	1.1	0.5	0.1	0.2
08 Edible Fruit and Nuts	0.8	5.9	6.7	-5.2	0.0	0.9	0.6
Share of World Value:							
TOTAL	15.8%	13.4%	14.4%		6.9	6.6	6.6
85 Electric Machinery	24.3	18.7	20.6		10.7	4.4	6.6
87 Vehicles (Except Railway Or Tramway)	17.2	26.7	23.7		6.4	19.5	15.3
84 Machinery	21.9	16.4	18.5		15.1	12.3	13.0
27 Mineral Fuel, Oil	20.5	5.6	11.3		10.0	-3.1	2.3
39 Plastics	27.6	9.9	19.6		12.5	5.7	8.8
90 Instruments	8.6	16.6	12.5		0.7	8.9	4.7
94 Furniture	21.8	18.9	19.3		0.4	6.0	3.6
98 Special Classification Provisions	16.8	8.4	11.5		5.4	-1.4	0.8
73 Articles of Iron and Steel	28.7	12.4	18.2		13.5	5.3	7.8
08 Edible Fruit and Nuts	5.5	38.9	22.9		1.4	21.2	12.9

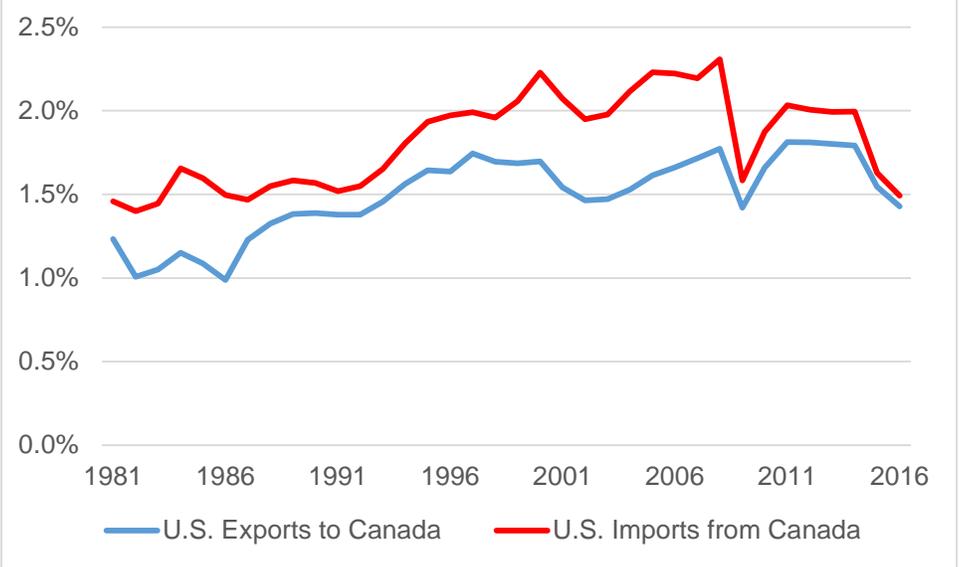
Source: U.S. Department of Commerce, Census Bureau.

**CHART 27**  
**UNITED STATES TRADE BALANCE WITH CANADA,**  
**NET EXPORTS AS A SHARE OF TOTAL IMPORTS AND EXPORTS**



Source: U.S. Department of Commerce, Bureau of Economic Analysis.

**CHART 28**  
**BILATERAL MERCHANDISE TRADE, UNITED STATES AND CANADA,**  
**AS A SHARE OF UNITED STATES GROSS DOMESTIC PRODUCT**



Source: International Monetary Fund.

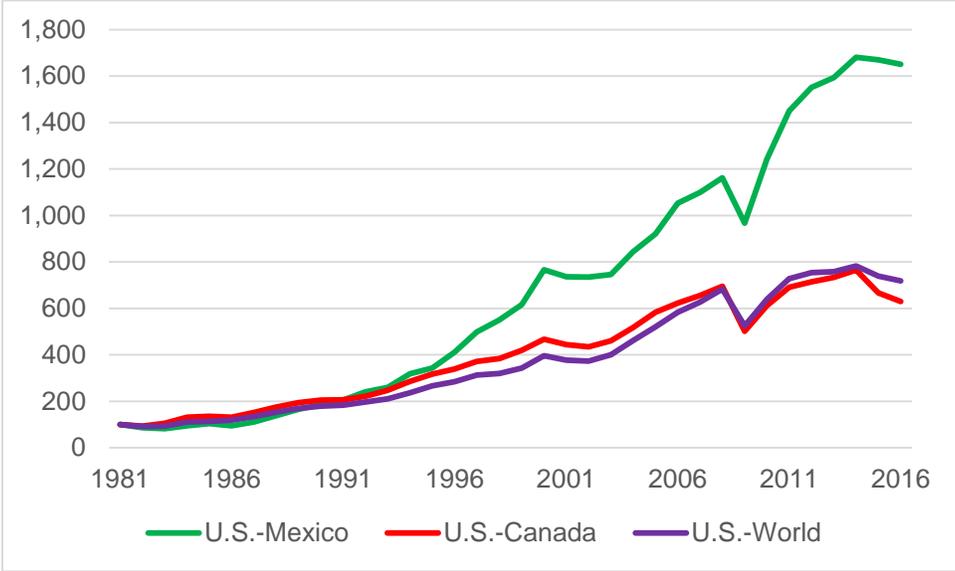
Expressed as a percentage of Canadian GDP, bilateral merchandise trade flows with the United States are much larger. Merchandise exports to the United States were 18.67 percent of GDP in 1993 and 18.63 percent in 2016. Imports of goods from the United States were 15.75 percent of GDP in 1993 and 13.95 percent in 2016. Thus, Canada’s merchandise trade balance with the United States went from 2.92 percent of GDP in 1993 to 4.68 percent of GDP in 2016.

Chart 29 shows how much more rapidly merchandise trade between the United States and Mexico has grown than trade between the United States and Canada. U.S.-Mexico bilateral merchandise trade in 2016 was 6.4 times what it was in 1993, compared to 2.6 times more for U.S.-Canada bilateral trade of goods. These figure for U.S. trade with the world was 3.4.

The top four commodities of U.S. trade with Canada in 2016 were the same as U.S. trade with the world, though the rank order was different. Vehicles and mineral fuel and oil were larger components of the total trade with Canada, while trade of machinery and especially electric machinery was of relatively lesser importance. Trade of plastics was relatively more important with Canada. Two of the top 10 commodities of U.S. trade with the world — pharmaceutical products and precious metals — were not among the top 10 with Canada, replaced by wood and articles of wood and paper and paperboard.

Table 13 provides the values of bilateral trade by commodity between the United States and Canada in 2016. The United States had a trade surplus in five of the top 10 commodities. The small overall deficit resulted primarily from the mineral fuel and oil category.

**CHART 29  
UNITED STATES MERCHANDISE TRADE WITH NEIGHBORING COUNTRIES  
AND THE WORLD EXPRESSED AS AN INDEX, 1980 = 100**



Source: International Monetary Fund.

U.S. merchandise trade with Canada as a share of U.S. merchandise trade with the world in 2016 also is shown in Table 13. Overall, 18.4 percent of U.S. exports of goods were sent to Canada. Among the leading commodities, the shares were highest for vehicles and paper and paperboard. Canada accounted for 12.7 percent of U.S. imports. The shares were highest in the wood and articles of wood, paper and paperboard, and mineral fuel and oil categories.

Between 1993 and 2016, U.S. exports to Canada increased as a share of the bilateral total in the mineral fuel and oil category, but dropped in the two machinery categories as well as in vehicles. The increase in mineral fuel and oil exports was associated with an increase in imports, and declines in machinery and vehicle exports also occurred in imports.

Relative to U.S. trade with the world, U.S. merchandise trade with Canada changed little in the years immediately after NAFTA took effect, but since then Canada's share has declined for both imports and exports. Among the leading commodities, the share of world exports going to Canada rose in the mineral fuel and oil category and the wood and articles of wood category. Imports from Canada climbed only in the mineral fuel and oil category.

### **Trade Between Mexico and Canada**

Trade values between Mexico and Canada are relatively small. Mexican merchandise exports to Canada were 0.21 percent of Mexican GDP in 1993 and 0.46 percent in 2016. Mexican imports of goods from Canada were 0.08 percent of GDP in 1993 and 0.25 percent in 2016. Thus, Mexico's merchandise trade surplus with Canada was 0.13 percent in 1993 and 0.21 percent of GDP in 2016.

Expressed as a percentage of Canadian GDP, bilateral merchandise trade flows with Mexico also are small. Merchandise exports to Mexico were 0.10 percent of GDP in 1993 and 0.36 percent in 2016. Imports of goods from the Mexico rose from 0.48 percent of GDP in 1993 to 1.66 percent in 2016. Thus, Canada's merchandise trade balance with Mexico went from -0.38 percent of GDP in 1993 to -1.30 percent in 2016.

### **Estimates of Trade of Intermediate and Finished Goods**

The OECD-WTO Trade in Value Added Database that was discussed earlier provides estimates of merchandise trade values divided into intermediate and finished goods. Estimates are available only for the 1995-to-2011 period. In 2011, finished goods accounted for only 40.7 percent of U.S. exports to the world and 41.0 percent of U.S. imports from the world. As a share of the sum of imports and exports, the deficit in finished goods of 13.5 percent was similar to the deficit in intermediate goods of 12.9 percent.

The split between finished and intermediate goods in bilateral trade with Canada and Mexico was considerably different from that of trade with the rest of the world. Finished goods made up lesser shares of U.S. imports from Canada (30.0 percent) and Mexico (38.3 percent) than from the rest of the world (43.4 percent). In contrast, the share of finished goods among U.S. exports to Canada (43.8 percent) and Mexico (47.4 percent) was higher than to the rest of the world (39.3 percent). In finished goods, the U.S. trade balance was positive with Canada and barely negative with Mexico (-2.3 percent of the sum of imports and exports, compared to -18.1 percent with the

**TABLE 13**  
**UNITED STATES MERCHANDISE TRADE WITH CANADA BY COMMODITY**

Commodity (Number and Description)	2016 Value in Billions				1993-to-2016 Change in Share		
	Exports	Imports	Total	Net	Exports	Imports	Total
TOTAL	\$266.8	\$277.8	\$544.6	\$-11.0			
Top 10 Based on Total Value:							
87 Vehicles (Except Railway Or Tramway)	48.4	57.9	106.4	-9.5	-3.3	-9.1	-6.4
27 Mineral Fuel, Oil	16.8	53.9	70.7	-37.1	5.0	8.6	6.7
84 Machinery	40.2	19.2	59.4	21.0	-4.5	-1.1	-2.6
85 Electric Machinery	24.0	7.3	31.4	16.7	-3.5	-1.9	-2.5
39 Plastics	12.3	10.4	22.8	1.9	1.1	1.7	1.5
98 Special Classification Provisions	7.0	15.3	22.3	-8.3	-0.6	1.7	0.5
88 Aircraft, Spacecraft	7.6	6.1	13.7	1.5	1.7	1.0	1.4
44 Wood And Articles Of Wood	2.1	9.8	12.0	-7.7	-0.4	-2.0	-1.3
90 Instruments	8.3	3.1	11.4	5.2	-0.1	0.3	0.2
48 Paper and Paperboard	4.7	5.9	10.6	-1.1	-0.0	-3.5	-1.9
Share of World Value:							
TOTAL	18.4%	12.7%	15.0%		3.2	-6.5	-5.3
87 Vehicles (Except Railway Or Tramway)	38.9	20.6	26.3		-10.6	-18.7	-16.5
27 Mineral Fuel, Oil	17.9	35.0	28.5		4.5	13.5	8.2
84 Machinery	21.1	6.2	11.9		-1.1	-3.9	-4.3
85 Electric Machinery	14.4	2.2	6.3		-5.6	-4.2	-6.2
39 Plastics	21.0	21.7	21.3		-4.1	-3.4	-3.8
98 Special Classification Provisions	17.5	22.2	20.5		-4.4	-9.2	-6.0
88 Aircraft, Spacecraft	5.6	19.7	8.2		2.0	-0.3	1.9
44 Wood And Articles Of Wood	23.6	52.9	43.3		7.9	-20.2	-3.2
90 Instruments	10.1	3.9	7.0		-4.4	-1.1	-3.3
48 Paper and Paperboard	31.9	38.2	35.1		4.6	-33.1	-17.1

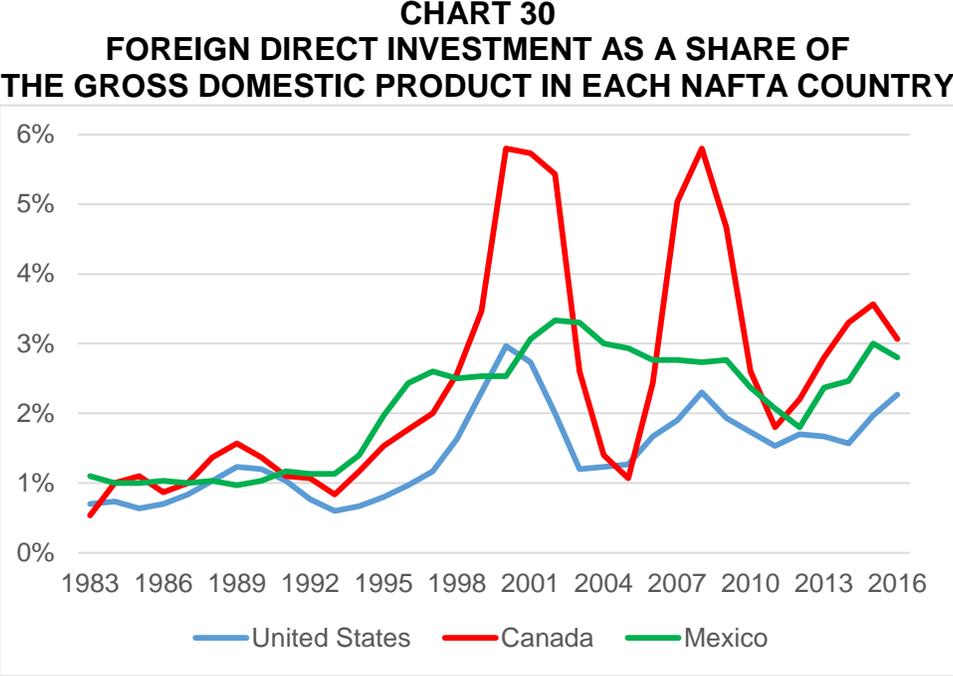
Source: U.S. Department of Commerce, Census Bureau.

balance of the world). In intermediate goods, the trade balance was substantially negative with both of its neighbors: -23.5 percent of the sum of imports and exports with Canada and -20.7 percent with Mexico versus -9.8 percent with the balance of the world.

Another way of examining the issue is to use the OECD-WTO’s estimates of domestic versus foreign value added. For U.S. exports to the world in 2011, the U.S. domestic share was estimated to be 85.0 percent. The domestic share was lower for U.S. exports to Canada (82.0 percent) and Mexico (79.8 percent) than to the balance of the world (86.3 percent), a reflection of the high volume of trade in intermediates between the NAFTA countries. For U.S. imports from the world, the U.S. domestic value added was 4.6 percent of the total value. The domestic share was higher for U.S. imports from Canada (10.0 percent) and Mexico (11.7 percent) than to the balance of the world (2.7 percent), again a reflection of the high volume of trade in intermediates between the NAFTA countries.

**Effects on Investment Flows**

NAFTA has also served to increase foreign direct investment (FDI). Since investment flows are volatile from year to year, a three-year moving average is displayed in Chart 30. There was a clear move upward in inward FDI in each country following the passage of NAFTA. The three countries with the largest FDI positions in Mexico are the United States (57 percent), Spain (12 percent), and the Netherlands (10 percent).



Note: The figures displayed are three-year moving averages expressed as of the third year (e.g. the 2016 value is the average of 2014, 2015 and 2016).

Source: Economist Intelligence Unit.

### **Effects on Income and Employment**

Not surprisingly, studies using models with post-NAFTA data that try to evaluate the agreement's impact on aggregate U.S. income and employment find small effects. Romalis (2007) produced a study of the welfare (real national income) effects of NAFTA, estimating an econometric trade model using worldwide data with 5,000 commodities. His estimated model suggests that NAFTA had substantial effects on trade volumes but almost no welfare effects. His analysis is notable in that it predicts that NAFTA has increased North American output in highly protected sectors by driving out imports from nonmember countries. This effect is known in international trade theory as "trade diversion." If trade diversion is sufficiently strong, preferential trading agreements such as NAFTA can conceivably reduce the welfare of member countries by inducing members to switch their sourcing of imports from low-cost nonmember countries to higher-cost member countries that have preferential tariff status.

Caliendo and Parro (2015) constructed a computable general equilibrium (CGE) model with explicit input-output sectoral linkages and trade in intermediate goods and used the model with estimated elasticities to evaluate the impact of NAFTA's tariff reductions. They found that U.S. intrabloc trade increased 41 percent but U.S. welfare rose only 0.1 percent. The effects were smaller in Canada, at 11 percent for intrabloc trade and -0.1 percent for welfare. In Mexico, intrabloc trade advanced 118 percent and welfare increased 1.3 percent. The estimated welfare impacts are even smaller if the model does not take into account input-output linkages and trade in intermediate goods.

Effects of NAFTA on U.S. aggregate employment are also likely to have been so small as to be overshadowed by other events. Hufbauer, et al. (2014, p. 12) offer a set of straightforward calculations that explain why these effects would be difficult to find in the data:

"Between 1994 and 2013, U.S. imports from Mexico expanded from \$48 billion to \$302 billion. In recent years (2009 through 2013), the expansion has averaged about \$27 billion annually. The direct and indirect U.S. labor equivalent of every billion dollars of imports is currently about 7,500 workers. What these numbers imply is that in recent years additional imports from Mexico displaced about 203,000 jobs annually... These are painful numbers for displaced workers. However, in the overall picture of involuntary job churn, the contribution of Mexican imports is small. From the beginning of 2009 to the end of 2011, about 13 million workers were "dislocated" (meaning victims of mass layoffs), indicating an annual dislocation of about 4 million workers... At most, 5 percent of dislocated workers can be traced to imports from Mexico."

Of course, when assessing the aggregate employment consequences of trade, it is misleading to focus simply on jobs lost because of imports. Trade also involves exporting, which creates jobs. Gains in real national income also support additional consumer spending which raises employment throughout the economy. Finally, it is worth repeating that a substantial portion of trade between the United States and Mexico is two-way trade involving intermediate goods. The integration of North American manufacturing made possible through this trade strengthens the competitiveness of U.S. firms in world markets.

While the impacts of NAFTA on the U.S. economy have almost certainly been small, impacts on individual industries and local communities may well be large. The next section addresses local economic impacts of NAFTA.

Mexico's participation in NAFTA was a final move in a series of economic reforms that began in the mid-1980s. Mexico took unilateral steps to liberalize its foreign trade and investment, privatize state-owned enterprises, and achieve fiscal balance. One would have expected these broad market-friendly reforms to have caused a surge in economic growth and that it would be difficult to sort out the partial contribution of NAFTA to that higher rate of growth.

Indeed, Mexico's exports to the United States and the world have grown rapidly, creating an employment and population boom in northern Mexican states. Mexico's receipts of inward foreign direct investment have moved up sharply since 1994. As noted in Kose, et al. (2004), studies using industry-level and firm-level data find that NAFTA has significantly raised total factor productivity in Mexico. Analyses based on CGE models suggest that the elimination of tariffs and trade barriers in NAFTA should have raised the steady-state level of Mexican GDP by 2 percent. An effect of similar magnitude is found in a CBO report using an econometric regression model. If impacts from inward flows of foreign direct investment are also considered, estimates of the effect of NAFTA on Mexican GDP rise to over 3 percent.

Despite these predicted gains, Mexico's growth experience since the mid-1980s has been lackluster, as noted by Hanson (2010). From 1985 through 2008, the average annual rate of growth in per capita real GDP in Mexico was 1.1 percent. In a comparison with 17 countries in Latin America, eastern Europe and eastern Asia, Mexico had the second-lowest growth rate, second only to Venezuela. Using more up-to-date data and a different set of comparison countries does not change the conclusion. Among 23 countries that had a similar per capita GDP to Mexico in 1990<sup>14</sup>, Mexico's gain ranked 18th. Mexico's increase in real per capita GDP between 1990 and 2016 was 33.7 percent, just half the rate of the world.

The position of economists is that Mexico has been helped by greater integration with world markets in general, and with the U.S. economy in particular, but that the country continues to struggle with deep structural problems. In the view of Hanson (2010), particularly problematic are underdeveloped financial markets and a lack of private credit for firms and households, stemming in part from weak legal protections for creditors; a relatively large and unproductive informal sector in which firms remain small to avoid government regulations and evade payroll taxes; monopoly power in key input markets including electricity and telecommunications; and a primary and secondary education system that produces relatively few graduates and in which those who do graduate come out with poor math and reading skills. In addition to these internal issues, Hanson believes that Mexico has had the misfortune of having to compete with China in a similar range of manufactured products. Each country has a comparative advantage in low-skill, labor-intensive export assembly. Hufbauer et al. (2014) believe that Mexico has also suffered greatly from economic and social chaos related to the drug cartels. Since intense conflict in the drug wars did not emerge until 2006, Hanson believes this is too late to explain the long previous period of sluggish growth in the Mexican economy.

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<sup>14</sup> The GDP figure are adjusted for purchasing power parity. The source of the data is the World Bank's World Development Indicators database.

## **LOCAL EFFECTS OF NAFTA**

Three papers that discussed local effects of increased U.S. trade with less-developed nations were discussed in an earlier section of the paper. A fourth paper specifically analyzed the effects from NAFTA.

### **“Looking for Local Labor-Market Effects of NAFTA”**

McLaren and Hakobyan (2016) estimated the effect of NAFTA tariff reductions on the wages of American workers. Conceptually, a worker could have been hurt by NAFTA either because of employment in an industry that faced reductions in tariff protection and/or because of living in a region where a large number of workers were employed in industries vulnerable to NAFTA tariff reductions.

The authors found that NAFTA had large negative effects on wages for a significant minority of American workers, especially high-school dropouts. Wages of those workers without a high school diploma who were employed in the most-protected industries fell 17 percentage points compared to the wages of similar workers in industries that were initially unprotected. NAFTA-vulnerable locations also experienced significantly slower wage growth. For the most-vulnerable locations, wage growth over the 1990-to-2000 period for a high-school dropout was 8 percentage points slower than for a worker with similar characteristics living in an area with no initial protection. These local labor market impacts apply to workers who were not employed in tradable goods industries. These workers were nonetheless harmed by NAFTA presumably because of job competition from workers displaced from contracting tradable goods industries or because of local multiplier effects related to the effect of declining local incomes on the demand for nontraded services. Estimates of NAFTA-related wage impacts were small and statistically insignificant for college-educated workers.

The authors tested their results by incorporating growing import competition from China. Since this had little effect on the results, the authors concluded that trade with China and with NAFTA countries have had separate and distinguishable effects on U.S. wages.

### **Effects in Arizona**

Arizona, and other border states, have benefitted more from NAFTA than the nation as a whole. Other than its border location, two factors contribute to Arizona’s greater net positive effect:

- Since Arizona had limited manufacturing other than high-technology electronics and aircraft when NAFTA went into effect, the state was little affected by the shifting of production from the United States to Mexico.
- Maquila relationships were already in place when NAFTA took effect, putting the state in a position to benefit from the increase in trade between the United States and Mexico.

According to Griswold of the Cato Institute (2003), “About 25,000 mostly well-paying jobs in Arizona are directly tied to exports to Mexico and Canada, and thousands more jobs in transportation, banking, and finance are indirectly connected. NAFTA has stimulated the growth of tourism in the Southwest and created investment opportunities for small and medium-sized Arizona companies to reach new markets.”

More recently, U.S. Senator John McCain (2017) in a written statement said that “the facts clearly show that NAFTA has delivered enormous economic benefits to the citizens of my home state since it went into effect in 1994. In just two decades, Arizona’s exports to Canada and Mexico have increased by \$5.7 billion, or 236 percent. Today, international trade supports more than one-in-five jobs in Arizona, which pay roughly 18 percent higher salaries. Imports to the state have also lowered the cost of raw materials, allowing Arizona companies to remain competitive and reducing costs for Arizona consumers. Free trade stimulates economic growth, creates higher paying jobs, reduces the cost of goods and services, and deepens our relationship with key allies around the world.”

McCain went on to state that “The free flow of trade has been the foundation of U.S. economic policy for decades, and a major factor in our prosperity and greatness. We should not have to relearn the lessons of history. Retreating from NAFTA and other international trade agreements will harm our ability to compete in today’s global economy, raise costs for consumers, threaten jobs, and undermine our relations with our closest neighbors.”

U.S. Senator Jeff Flake compiled a list of stories from Arizonans regarding the positive impacts from NAFTA. Agriculture, distribution, and finance were among the industries represented. Business associations and economic development agencies also responded favorably.

In a submission to the *Arizona Republic*, Hamer (president and CEO of the Arizona Chamber of Commerce and Industry) and Molera (2017) discussed the positive effects of NAFTA, and trade more generally. This followed a positive endorsement of NAFTA by the editorial board of the *Arizona Republic* (2017).

In Studley and Hamer (2017), the CEOs of the Michigan and Arizona Chambers of Commerce note the importance of NAFTA to their states’ economies. They suggest that “cutting off U.S. manufacturers’ access to foreign markets and increasing the costs of everyday products here at home runs completely counter to the administration’s stated goal of achieving 3 percent economic growth.”

## **THE RENEGOTIATION OF NAFTA**

In the United States, Congress since the 1970s has granted the President “fast track authority” for brokering international trade agreements. Congress can approve or deny such an agreement, but cannot amend it. The law specifies a number of steps that must be undertaken at specific times, which are summarized below.

On May 18, 2017, the Trump Administration formally announced its intention to renegotiate NAFTA. On July 17, the Office of the U.S. Trade Representative released a report “Summary of Objectives for the NAFTA Renegotiation.” This report acknowledges the advantages realized from NAFTA, including market access and increased trade, specifically citing agriculture. However, it also cites trade deficits, closing of U.S. factories, and the loss of jobs.

Discussions among the three NAFTA countries began on August 16. The talks are being held in a number of rounds, with the location rotating among the three countries. The talks are expected to last through the first quarter of 2018.

In the July 17 report, the objectives of the United States were grouped into 22 categories. While the objectives were generally described as being vague, more clarity was provided in the fourth round of talks that took place in October. At the end of that round, Robert Lighthizer, the U.S. Trade Representative, indicated that the United States had two broad objectives:

“First, we wanted to update a 23-year-old agreement to reflect our modern economy. Obvious areas for modernization included intellectual property, digital trade, anticorruption, technical standards, financial services, and others.

Our President has been clear about our second objective. NAFTA has resulted in a huge trade deficit for the United States and has cost us tens of thousands of manufacturing jobs. The agreement has become very lopsided and needs to be rebalanced. We of course have a five-hundred billion dollar trade deficit. So for us, trade deficits do matter. And we intend to reduce them.”

The first broad objective focuses on developments that have occurred since the original NAFTA was implemented. It includes the passing of rules to govern the trade of services, such as telecommunications, financial advice, and digital goods (such as e-books). Another basic objective is to move regulations on the treatment of workers and the environment from side agreements to the main agreement. While the first broad objective generally is not controversial, progress among the three countries during the first four rounds of talks was slow.

The second broad objective was not specified in detail by the United States until October. Agreement among the three nations on this broad objective will be much more difficult to attain.

Moreover, it is unclear whether attaining the second broad objective would be beneficial on net to the United States. For example, 83 percent of the total trade deficit with Mexico in 2016 was in the vehicles category. Automotive manufacturing is integrated across the three NAFTA countries; the official bilateral trade deficits are highly misleading. Disrupting this manufacturing

process could end up raising the cost of U.S. auto manufacturers, who then could lose market share to automotive companies based in other countries, such as Japan and Korea.

Further, the focus on Mexico as being a major component of the U.S. trade deficit is misguided. As seen in Table 6, the merchandise trade deficit with Mexico as a percentage of total merchandise trade with Mexico is relatively small. Mexico accounted for only 9 percent of the total merchandise trade deficit of the United States in 2016, about the same share as Japan. Trade with China was responsible for 46 percent of the deficit.

Prior to the fifth round of talks in November, the United States released an updated version of “Summary of Objectives for the NAFTA Renegotiation.” Trade in goods is the first item listed. Within that category, the first objective is to “improve the U.S. trade balance and reduce the trade deficit with the NAFTA countries.”

During the fifth round of talks, further progress was made on technical details related to updating the agreement. However, progress was nil on the contentious items. According to Robert Lighthizer:

“While we have made progress on some of our efforts to modernize NAFTA, I remain concerned about the lack of headway. Thus far, we have seen no evidence that Canada or Mexico are willing to seriously engage on provisions that will lead to a rebalanced agreement. Absent rebalancing, we will not reach a satisfactory result.”

Canada’s foreign minister Chrystia Freeland indicated that the United States put forward “extreme proposals” that “we simply cannot agree to.” She further stated that “some of the proposals that we have heard would not only be harmful for Canada but would be harmful to the U.S. as well.”

Among the many disagreements are proposals by the United States that would substantially affect North American automakers, that would add a sunset clause, and that would scrap a dispute resolution mechanism. In addition, the United States has recently placed tariffs on certain goods exported by Canada and Mexico to the United States.

The sixth round of talks are scheduled for late January; a seventh round is planned.

#### **Legal Process If a New Agreement Is Reached**

If these discussions result in an agreement among the three nations, U.S. law specifies that 180 days must pass before the President can sign the new agreement. During this time, the Administration must send a report to Congress on the potential changes to U.S. trade law, provide details to the U.S. International Trade Commission (ITC, an independent, quasijudicial federal agency with broad investigative responsibilities on matters of trade), and post the text of the new agreement on the website of the U.S. Trade Representative.

After the President signs the agreement, another lengthy period of at least 105 days must pass before the bill covering the trade agreement is introduced in Congress. During this period, a public description of the changes to U.S. law necessary to bring the United States into

compliance with the trade agreement must be published, the ITC must publish a report on the economic impacts, Congress must be provided with the final legal text of the agreement, and the Administration must submit a review of impacts on employment and the environment as well as plans for implementation and enforcement.

Once the bill is introduced into Congress, it must first go to the House Ways and Means Committee, which has 45 legislative working days (not calendar days) to vote. Assuming the bill passes out of the committee, the full House of Representatives has another 15 legislative days to vote. Assuming the full House approves the bill, it next goes to the Senate Finance Committee, which has 15 legislative days to hold a vote. If it passes, the bill goes to the full Senate, which has another 15 legislative days to vote. If the bill passes Congress, the Administration must tell Congress that measures necessary to comply with the agreement have been taken 30 days before formally entering the agreement.

During this lengthy period, Canada and Mexico each will follow their own rules in order for the agreement to be ratified. The upcoming presidential election in Mexico on 1 July 2018 and U.S. congressional elections in November 2018 could cause delays.

### **Effects if NAFTA is Terminated**

If an agreement is not reached between the three countries and the United States pulls out of NAFTA, each country would be negatively affected economically and unintended consequences could result. Campoy (2017) summarizes four categories of negative effects for the United States:

- Higher tariffs. According to Campoy, “NAFTA essentially reduced tariffs between the three countries to zero. Without it, tariffs would revert to levels under the World Trade Organization. That’s an average 7.5% tariff on American goods coming into Mexico, and as much as 150% for certain products such as meat and poultry. Mexican products, in turn, would have to pay an average 3.5% to enter the US.”
- Broken supply chains. Many manufacturers, including the automotive industry, have a supply chain that spans the three nations.
- Higher prices for goods imported from Mexico.
- Damaged relations between the countries that could extend beyond trade.

An unintended consequence could be an increase in immigration to the United States from Mexico due to the negative economic effects in Mexico of ending NAFTA.

Higher tariffs and broken supply chains would increase costs and raise prices for U.S. consumers. The price of U.S. goods in Mexico also would increase, which could cause demand to decline and in turn have a negative effect on U.S. employment.

A November 2017 report by BMO Capital Markets — see Porter (2017) — analyzed the effects of a termination in NAFTA. It assumed that the earlier Canada-U.S. Free Trade Agreement would not be revived and that the three NAFTA countries would revert to WTO-level tariffs. The conclusion is that the termination would be a clear net negative for Canada, with its GDP 1 percent smaller after five years. The magnitude of the negative effect would be less on the United States at 0.2 percent of GDP after five years. The consumer, in all three countries, would be the largest net loser, due to higher prices.

Regarding the U.S. merchandise trade deficit, Porter notes that “positive or negative balances are not necessarily reflections of the success of trading relationships. Rather, they depend on a myriad of factors, including: a country’s stage of development, attractiveness to foreign investors, fiscal and monetary policies, currency level, and the domestic savings rate. None of these are primarily influenced by features of trade agreements.” The report concludes that “it is deeply unfortunate that we are even considering this possibility” (the termination of NAFTA).

From a tariff standpoint, three effects in each of the three countries are cited:

- Foreign-imposed tariffs would reduce demand in domestic industries that export intensively within the NAFTA bloc.
- Domestically imposed tariffs would raise costs for domestic industries that import intensively from within the NAFTA bloc.
- Domestically imposed tariffs would spur import substitution. Thus, the trade balance with other countries could worsen.

The report by BMO Capital Markets includes estimates of the effects by U.S. state if NAFTA is terminated. The states are evaluated based on the amount of vulnerable exports expressed as a share of GDP, which is dependent on two measures:

- The value of goods exported to Canada and Mexico as a share of each state’s GDP.
- The share of the exports to Canada and Mexico that are vulnerable. Vulnerability is estimated by industry. Exports with moderate-to-high vulnerability include textiles, clothing and leather; transportation equipment; computers and electronics; agriculture; and electrical equipment and appliances.

In 15 states, the vulnerable exports are at least 1.0 percent of GDP. Five of these states are in the South, four are in the Great Lakes region, and three are along the border with Mexico (Arizona, New Mexico, and Texas). Only two states on the border with Canada are among the 15 most vulnerable. Michigan is the most vulnerable state, followed by Texas. Arizona ranks ninth — its value of exports to Canada and Mexico as a share of GDP ranks 10th and the share of these exports that are vulnerable rank tied for 14th.

A second report released in November 2017, by the U.S. Chamber of Commerce, also estimates the effects of a termination of NAFTA by U.S. state (Murphy, 2017). For each state, the number of jobs at risk (the number of jobs supported by trade with Canada and Mexico), the value of exports to the NAFTA countries, and the share of total exports that go to other NAFTA countries are provided. This report lists the 12 states predicted to be most affected, but the ranking is not based on any of these measures and the report does not specify on what basis the ranking is made.

The correlation of the most-affected states is not particularly high between the two studies, with only six states among the top 12 in each study. This includes Michigan as the most vulnerable in each study; Arizona ranks ninth in both studies.

Using the figure for jobs supported by trade with NAFTA countries from the U.S. Chamber of Commerce report, the percentage of total employment in each state was calculated. This

percentage does not vary much by state, with 31 states having a share between 6.8-and-7.0 percent and 46 states with a share between 6.1-and-7.0 percent. In contrast, the share of vulnerable exports from the BMO Capital Markets study ranges from 0.0-to-4.7 percent.

## REFERENCES

- Acemoglu, Daron and David H. Autor, 2011, "Skills, Tasks and Technologies: Implications for Employment and Earnings," *Handbook of Labor Economics*, Vol. 4b, Chap. 12, pages 1043-1171, <http://www.sciencedirect.com/science/handbooks/15734463/4/part/PB>.
- Autor, David H., 2014, "Skills, Education, and the Rise of Earnings Inequality Among the 'Other 99 Percent'," *Science*, Vol. 344, No. 6186, pages 843-851, <http://science.sciencemag.org/content/344/6186>.
- Autor, David H., 2017, presentation made at "Trade, Jobs, and Inequality," a panel discussion sponsored by The Graduate Center of the City University of New York, April, <http://www.bradford-delong.com/2017/04/trade-jobs-and-inequality-cuny.html>.
- Autor, David H., David Dorn, and Gordon H. Hanson, 2013, "The China Syndrome: Local Labor Market Effects of Import Competition in the United States," *American Economic Review*, Vol. 103, No. 6, pages 2121-2168, <https://www.aeaweb.org/issues/317>.
- Autor, David H., David Dorn, and Gordon H. Hanson, 2015, "Untangling Trade and Technology: Evidence from Local Labour Markets," *Economic Journal*, Vol. 125 (May), pages 621-646, <http://onlinelibrary.wiley.com/doi/10.1111/eoj.2015.125.issue-584/issuetoc>.
- Autor, David H., Frank Levy, and Richard J. Murnane, 2003, "The Skill Content of Recent Technological Change: An Empirical Exploration," *Quarterly Journal of Economics*, Vol. 118, No. 4, pages 1279-1333, <https://academic.oup.com/qje/issue/118/4?browseBy=volume>.
- Autor, David H., Lawrence F. Katz, and Melissa S. Kearney, 2006, "The Polarization of the U.S. Labor Market," *AEA Papers and Proceedings*, Vol. 96, No. 2, pages 189-194, <https://economics.mit.edu/faculty/dautor/published>.
- Autor, David H., Lawrence F. Katz, and Melissa S. Kearney, 2008, "Trends in U.S. Wage Inequality: Revising the Revisionists," *The Review of Economics and Statistics*, Vol. 90, No. 2, pages 300-323, <http://www.mitpressjournals.org/toc/rest/90/2>.
- Baily, Martin N. and Barry P. Bosworth, 2014, "U.S. Manufacturing: Understanding Its Past and Its Potential Future," *Journal of Economic Perspectives*, Vol. 28, No. 1, pages 3-26, <https://www.aeaweb.org/issues/328>.
- Bakija, Jon, Adam Cole, and Bradley T. Heim, 2012, "Jobs and Income Growth of Top Earners and the Causes of Changing Income Inequality: Evidence from U.S. Tax Return Data," Office of Tax Analysis, U.S. Department of the Treasury, April, <http://web.williams.edu/Economics/wp/BakijaColeHeimJobsIncomeGrowthTopEarners.pdf>.
- Bernanke, Ben, "The Global Saving Glut and the United States Current Account Deficit," text of March 10, 2005 speech, <https://www.federalreserve.gov/boarddocs/speeches/2005/200503102/default.htm>.

Braun, Steven, John Coglianesi, Jason Furman, Betsey Stevenson, and Jim Stock, 2014, "Understanding the Decline in the Labor Force Participation Rate in the United States," *VOX CEPR's Policy Portal*, August 18, <http://voxeu.org/article/decline-labour-force-participation-us>.

Burfisher, Mary E., Sherman Robinson, and Karen Thierfelder, 2001, "The Impact of NAFTA on the United States," *Journal of Economic Perspectives*, Vol. 15, No. 1, pages 125-144, <https://www.aeaweb.org/issues/132>.

Caliendo, Lorenzo and Fernando Parro, 2015, "Estimates of the Trade and Welfare Effects of NAFTA," *The Review of Economic Studies*, Vol. 82, No. 1, pages 1-44, <https://academic.oup.com/restud/issue/82/1>.

Campoy, Ana, 2017, "What Would Happen If Trump Did Pull the US Out of NAFTA?" *Quartz*, April 27, <https://qz.com/969953/what-would-happen-if-trump-pulls-out-of-nafta/>.

Council of Economic Advisors, 2016, "The Long-Term Decline in Prime-Age Male Labor Force Participation, June," [https://obamawhitehouse.archives.gov/sites/default/files/page/files/20160620\\_cea\\_primeage\\_male\\_lfp.pdf](https://obamawhitehouse.archives.gov/sites/default/files/page/files/20160620_cea_primeage_male_lfp.pdf).

Dedrick, Jason, Kenneth Kraemer, and Greg Linden, 2008, "Who Profits from Innovation in Global Value Chains? A Study of the iPod and Notebook PCs," paper presented at the Sloan Industry Studies Annual Conference, Boston, MA, in May, [http://web.mit.edu/is08/pdf/Dedrick\\_Kraemer\\_Linden.pdf](http://web.mit.edu/is08/pdf/Dedrick_Kraemer_Linden.pdf).

Ebenstein, Avraham, Ann Harrison, Margaret McMillan, and Shannon Phillips, 2014, "Estimating the Impact of Trade and Offshoring on American Workers Using the Current Population Surveys," *The Review of Economics and Statistics*, Vol. 96, No. 4, pages 581-595, <http://www.mitpressjournals.org/toc/rest/96/4>.

Editorial Board, 2017, "Fix NAFTA, Don't Kill It," *Arizona Republic*, March 8, <http://www.azcentral.com/story/opinion/editorial/2017/03/08/nafta-trade-arizona-fix/98921546/>.

Feenstra, Robert C., 2008, "Offshoring in the Global Economy," *The Ohlin Lectures, 2008*, presented at the Stockholm School of Economics on September 17-18, <https://mitpress.mit.edu/books/series/ohlin-lectures>.

Francois, Joseph, Marion Jansen, and Ralf Peters, 2011, "Trade Adjustment Costs and Assistance: The Labour Market Dynamics," in *Trade and Employment: From Myths to Facts* (M. Jansen, R. Peters, and J.M. Salazar-Xirinachs, eds), co-sponsored by the International Labour Organization and the European Union, pages 213-252, [http://www.ilo.org/wcmsp5/groups/public/%40ed\\_emp/documents/publication/wcms\\_162297.pdf](http://www.ilo.org/wcmsp5/groups/public/%40ed_emp/documents/publication/wcms_162297.pdf).

Goldberg, Pinelopi K. and Nina Pavcnik, 2007, "Distributional Effects of Globalization in Developing Countries," *Journal of Economic Literature*, Vol. 45, No. 1, pages 39-82, <https://www.aeaweb.org/issues/68>.

- Griswold, Daniel, 2003, "NAFTA Benefits Arizona," CATO Institute Commentary, July 2, <https://www.cato.org/commentary/nafta-benefits-arizona>.
- Hakobyan, Shushanik and John McLaren, 2016, "Looking for Local Labor Market Effects of NAFTA," *The Review of Economics and Statistics*, Vol. 98, No. 4, pages 728-741, <http://www.mitpressjournals.org/toc/rest/98/4>.
- Hamer, Glenn and Jaime Molera, "Don't Dismantle Trade with Mexico and Canada. Modernize It," *Arizona Republic*, April 29, <http://www.azcentral.com/story/opinion/op-ed/2017/04/29/nafta-trade-mexico-and-canada/100859712/>.
- Hanson, Gordon H., 2010, "Why Isn't Mexico Rich?" *Journal of Economic Literature*, Vol. 48, No. 4, pages 987-1004, <https://www.aeaweb.org/issues/182>.
- Heckman, James J., Robert J. Lalonde, and Jeffrey A. Smith, 1999, "The Economics and Econometrics of Active Labor Market Programs," Chapter 31 in *Handbook of Labor Economics* (Orley Ashenfelter and David Card, eds.), Vol. 3A, pages 1865-2097, <https://www.sciencedirect.com/science/handbooks/15734463/3/part/PA>.
- Hinojosa-Ojeda, Raul, David Runsten, Fernando De Paolis, and Nabil Kamel, 2000, "The U.S. Employment Impacts of North American Integration After NAFTA: A Partial Equilibrium Approach," unpublished manuscript, North American Integration and Development Center, School of Public Policy and Social Research, UCLA, January, <http://dspace.africaportal.org/jspui/bitstream/123456789/679/4/The%20US%20Employment%20Impacts%20of%20North%20American%20Integration%20After%20NAFTA%20A%20Partial%20Equilibrium%20Approach>.
- Hufbauer, Gary Clyde and Jeffrey J. Schott, 2005, *NAFTA Revisited: Achievements and Challenges*, Washington, D.C.: Peterson Institute for International Economics, October, <https://piie.com/bookstore/nafta-revisited-achievements-and-challenges>.
- Hufbauer, Gary Clyde, Cathleen Cimino, and Tyler Moran, 2014, "NAFTA at 20: Misleading Charges and Positive Achievements," Policy Brief No. 14-13, Washington, D.C.: Peterson Institute for International Economics, <https://piie.com/publications/policy-briefs/nafta-20-misleading-charges-and-positive-achievements>.
- Katz, Lawrence F. and David H. Autor, 1999, "Changes in the Wage Structure and Earnings Inequality," *Handbook of Labor Economics*, Vol. 3a, Chap. 26, pages 1463-1555, <http://www.sciencedirect.com/science/handbooks/15734463/3/part/PA>.
- Klueve, Jochen, 2010, "The Effectiveness of European Active Labor Market Programs," *Labour Economics*, Vol. 17, No. 6, pages 904-918, <https://www.sciencedirect.com/science/journal/09275371/17/6>.

Koopman, Robert, Zhi Wang, and Shang-Jin Wei, 2008, “How Much of Chinese Exports is Really Made in China? Assessing Domestic Value-Added When Processing Trade is Pervasive,” NBER Working Paper No. 14109, Cambridge, MA: National Bureau of Economic Research, <http://www.nber.org/papers/w14109>.

Koopman, Robert, William Powers, Zhi Wang, and Shang-Jin Wei, 2010, “Give Credit Where Credit is Due: Tracing Value Added in Global Production Chains,” NBER Working Paper No. 16426, Cambridge, MA: National Bureau of Economic Research, <http://www.nber.org/papers/w16426>.

Kose, M. Ayhan, Christopher M. Towe, and Guy M. Meredith, 2004, “How Has NAFTA Affected the Mexican Economy? Review and Evidence,” IMF Working Paper WP/04/59, Washington: International Monetary Fund, <http://www.imf.org/en/Publications/WP/Issues/2016/12/30/How-Has-Nafta-Affected-the-Mexican-Economy-Review-and-Evidence-17284>.

Krugman, Paul R., 1995, *Peddling Prosperity: Economic Sense and Nonsense in an Age of Diminished Expectations*, W.W. Norton and Company, <http://www.krugmanonline.com/books/peddling-prosperity.php>.

Krugman, Paul R., 2008, “Trade and Wages, Reconsidered,” *Brookings Papers on Economic Activity*, Spring, pages 103-37, <https://www.brookings.edu/bpea-articles/trade-and-wages-reconsidered/>.

Mann, Katherine, 2017, “Better, But Not Good Enough,” *OECD Economic Outlook* presentation made in Paris, June 7, [www.oecd.org/eco/economicoutlook.htm](http://www.oecd.org/eco/economicoutlook.htm).

McCain, John, 2017 “Statement by Senator John McCain On President Trump’s Commitment To Renegotiate NAFTA,” January 26, <https://www.mccain.senate.gov/public/index.cfm/2017/1/statement-by-senator-john-mccain-on-president-trump-s-commitment-to-renegotiate-nafta>.

Murphy, John G., 2017, “Which States Would Be Hit Hardest by Withdrawing From NAFTA?” U.S. Chamber of Commerce, November, <https://www.uschamber.com/above-the-fold/which-states-would-be-hit-hardest-withdrawing-nafta>.

Office of the United States Trade Representative, 2017, “Summary of Objectives for the NAFTA Renegotiation,” July 17, <https://ustr.gov/sites/default/files/files/Press/Releases/NAFTAObjectives.pdf>.

Office of the United States Trade Representative, 2017, “Closing Statement of USTR Robert Lighthizer at the Fourth Round of NAFTA Renegotiations,” October, <https://ustr.gov/about-us/policy-offices/press-office/press-releases/2017/october/closing-statement-ustr-robert>.

Organisation for Economic Co-operation and Development, 2002, “Intra-Industry and Intrafirm Trade and the Internationalisation of Production,” *OECD Economic Outlook*, Vol. 71, pages 159-

170, [http://www.oecd-ilibrary.org/economics/oecd-economic-outlook-volume-2002-issue-1\\_eco\\_outlook-v2002-1-en;jsessionid=5dqpcaml6e19t.x-oecd-live-02](http://www.oecd-ilibrary.org/economics/oecd-economic-outlook-volume-2002-issue-1_eco_outlook-v2002-1-en;jsessionid=5dqpcaml6e19t.x-oecd-live-02).

Organisation for Economic Co-operation and Development, OECD-WTO Trade in Value Added Database, [http://www.oecd-ilibrary.org/trade/data/oecd-wto-statistics-on-trade-in-value-added\\_data-00648-en](http://www.oecd-ilibrary.org/trade/data/oecd-wto-statistics-on-trade-in-value-added_data-00648-en).

Paris School of Economics, *World Wealth and Income Database*, <http://wid.world/>.

Porter, Douglas, 2017, “The Day After NAFTA: Economic Impact Analysis,” BMO Capital Markets, November, <https://economics.bmocapitalmarkets.com/economics/reports/20171127/BMO%20Economics%20Special%20Report%20-%20The%20Day%20After%20NAFTA.pdf>.

Reinsdorf, Marshall B., 2010, “Terms of Trade Effects: Theory and Measurement,” *The Review of Income and Wealth*, Vol. 56, No. S1, pages S177-S205, <http://onlinelibrary.wiley.com/doi/10.1111/roiw.2010.56.issue-s1/issuetoc>.

Romalis, John, “NAFTA’s and CUSFTA’s Impact on International Trade,” 2007, *Review of Economics and Statistics*, Vol. 89, No. 3, pages 416-435, <http://www.mitpressjournals.org/toc/rest/89/3>.

Rosen, Sherwin, 1981, “The Economics of Superstars,” *American Economic Review*, Vol. 71, No.5, pages 845-858, <http://home.uchicago.edu/~vlima/courses/econ201/Superstars.pdf>.

Saez, Emmanuel, 2016, “Striking it Richer: The Evolution of Top Incomes in the United States,” UC Berkeley, June 30, <https://eml.berkeley.edu/~saez/>.

Studley, Richard K. and Glenn Hamer, 2017, “For Border States Michigan and Arizona, NAFTA Is Essential,” *RealClear Politics*, November 15, [https://www.realclearpolitics.com/articles/2017/11/15/for\\_border\\_states\\_michigan\\_and\\_arizona\\_nafta\\_is\\_essential\\_135551.html](https://www.realclearpolitics.com/articles/2017/11/15/for_border_states_michigan_and_arizona_nafta_is_essential_135551.html).

U.S. Congressional Budget Office, 1993, *A Budgetary and Economic Analysis of the North American Free Trade Agreement*, Washington, D.C., July, <https://www.cbo.gov/publication/20868>.

Wilson, Christopher, 2016, “A Regional Manufacturing Platform,” working paper related to *Growing Together: Economic Ties between the United States and Mexico*, sponsored by the Mexico Institute at the Wilson Center, <https://www.wilsoncenter.org/article/growing-together-economic-ties-between-the-united-states-and-mexico>.

## APPENDIX 1: REVIEW OF SELECTED ECONOMETRIC STUDIES

### **Autor, Dorn, and Hanson (2013), “The China Syndrome: Local Labor Market Effects of Import Competition in the United States”**

The authors estimate the local labor market effects of rising import competition from China over the period from 1990 through 2007, identifying these effects by taking advantage of cross-section variation in the representation of import-competing industries in local area economies. Units of observation consist of 722 “commuting zones” (CZs), combinations of counties in both metropolitan and nonmetropolitan areas. Local labor market exposure to import competition is measured by the change in Chinese imports divided by the total number of workers in the local region, where national imports are apportioned to regions according to a region’s initial share of national employment in a given manufacturing industry. Differences in industry employment structure are based on county-level employment data for 397 individual manufacturing industries. Variation in the overall share of manufacturing in total local area employment explains only one-quarter of the variation in the authors’ measure of import exposure by local labor markets. The main source of variation in exposure is variation within the manufacturing sector in the mix of industries depending on their individual import exposure.

The authors break up the time period of analysis into two parts: 1990 to 2000 and 2000 to 2007. U.S. imports of manufactures from China increased much more rapidly in the latter period. Using ten-year equivalent changes, the value for the measure of import exposure for the median CZ was \$2,110 per worker for the 2000-to-2007 period as compared with \$890 for the 1990-to-2000 period. Looking at the 40 largest CZs using ten-year equivalent changes in Chinese imports over the 2000-to-2007 period, the three CZs with the highest rates of import exposure were San Jose, CA at \$7,320 per worker, Providence, RI at \$4,990 per worker, and Los Angeles, CA at \$3,590 per worker. The Phoenix metro area CZ had import exposure at a rate of \$1,900 per worker, slightly below the median in the distribution of all CZs.

The authors relate exposure to rising imports to changes in CZ employment levels, wages, unemployment rates, and labor-force participation rates. They find that exposure to rising Chinese imports is associated with lower manufacturing employment, a lower overall ratio of employment to population, and lower wages. Based on their econometric findings, if two CZs are compared — one at the 25th percentile of measured exposure and the other at the 75th percentile — using the growth in Chinese imports over the 2000-to-2007 period, the more exposed CZ would be expected to experience a 4.5 percent greater decline in the number of manufacturing employees, a 0.8 percent lower employment-to-population ratio, and a 0.8 percent larger decline in average weekly earnings. Rising import exposure serves to reduce local area nonmanufacturing employment slightly and has little effect on the local area population. Thus, the decline in manufacturing employment is associated almost 1-for-1 with increases in unemployment and nonemployment. Negative employment impacts from rising Chinese imports are found for both college and noncollege adults, but the effects are more pronounced for noncollege adults.

Comparing the magnitude of their estimated effects with observed declines in U.S. manufacturing employment, the authors find that rising exposure to Chinese import competition

can explain from 16-to-33 percent of the decline in U.S. manufacturing employment over the 1990-to-2000 period and from 26-to-55 percent of the decline over the 2000-to-2007 period.

The authors repeat their analysis using measures of exposure to import competition from other low-income regions, including Mexico and Central America. In an ordinary least squares (OLS) regression that considers imports from Mexico and Central America separately from China, the authors find a positive relationship between exposure to imports from Mexico and Central America and U.S. manufacturing employment. This finding would be consistent with known complementarities between Mexican and U.S. manufacturing production. In a two-stage least squares (2SLS) estimation, however, the coefficient on imports from Mexico and Central America becomes negative and significant. The authors suspect that this flip in sign arises because of a high correlation between predicted CZ-level exposure to imports from Mexico and Chinese imports.

**Autor, Dorn, and Hanson (2015), “Untangling Trade and Technology:  
Evidence from Local Labour Markets”**

This paper uses county-level data to measure the separate contributions of trade and technology to changes in local area employment, unemployment, and labor force participation. Much of the data and methodology are similar to that used in Autor, et al. (2013). Units of observation are 722 commuting zones in U.S. metropolitan and non-metropolitan areas. Variables to be explained are local area decadal changes in employment-related labor market variables over the 1980-to-2007 period. Trade as an explanatory variable refers specifically to local exposure to rising import competition from China, measured in the same way as in the earlier paper.

The role of technology as a determinant of changes in local labor markets is assessed by measuring for each commuting zone the degree to which the CZ was historically specialized in routine, codifiable job activities that are well suited to computerized automation. Following previous work by Autor and Dorn, individual occupations are rated as either routine or nonroutine. Examples of routine-intensive occupations are blue-collar occupations characterized by repetitive production activities and white-collar occupations such as bookkeeping and clerical work. Data on occupations by industry are used to measure the routine-intensity of work by industry. Commuting zones are then scored based on historical shares of industry employment, with high scores reflecting the fact that a large fraction of employment at the beginning of a decade was in routine-intensive occupations.

An important finding of the paper is that the measures of trade exposure and technology exposure are largely uncorrelated across commuting zones. CZs with high employment shares in routine-intensive occupations include both regions with large capital-intensive manufacturing operations, such as the Great Lakes and the Southeast, and regions with a large share of workers in white-collar office and clerical occupations, as found in New York, Chicago, Dallas, and other CZs with important finance and banking sectors. Trade-exposed CZs, on the other hand, tend to be regions specialized in labor-intensive manufacturing. The population-weighted correlation between the measures of trade exposure and technology exposure is -0.02 for the 1990-to-2000 period and 0.01 for the 2000-to-2007 period. Because the two measures are uncorrelated, it is possible to identify separately the effects of trade and technology on local labor markets. It also means that the findings of Autor, et al. (2013), which only used a trade exposure variable,

continue to stand — that the significant impacts found for trade are not picking up effects from an omitted technology variable.

The findings in Autor, et al. (2015) on impacts from exposure to Chinese import competition are highly similar to those in Autor, et al. (2013). Over the 1990-to-2007 period, increased imports from China are found to have had a significant negative effect on local area ratios of employment to population. Employment declines are confined largely to the manufacturing sector, with negative but statistically insignificant employment impacts found outside of manufacturing. As in the earlier paper, the reduction in employment is accounted for by reductions in labor-force participation rather than unemployment. Looking at individual groups within the manufacturing sector, trade shocks have had a disproportionately negative impact on the employment of noncollege workers. On the other hand, trade shocks are equally as large for males and females and for younger and older workers. Looking at impacts by occupational group, all occupations within manufacturing are negatively affected. Employment losses within manufacturing are divided equally between production workers and white-collar workers in managerial, professional and clerical positions. Increased trade exposure to imports from low-income countries does not explain the phenomenon of job polarization.

Analysis of the local labor market impacts of technological change are carried out for the 1980-to-2007 period. The authors find that CZs more specialized in routine-intensive occupations suffer employment losses in these occupations but experience gains in employment in nonroutine abstract and manual-intensive occupations. These results match observed patterns of job polarization in the U.S. economy. Looking at individual demographic groups, the negative employment impacts observed for CZs initially specialized in routine-intensive occupations are strongest among women and older workers.

The authors are able to do their analysis by decade and speak to the timing of trade and technology impacts. Labor market impacts from increased trade with China begin in the 1990s and accelerate during the 2000s. Impacts from technological change on manufacturing are strongest during the 1980s and then quickly decelerate. However, impacts from automation outside of manufacturing accelerate throughout the three decades.

**Ebenstein, Harrison, McMillan, and Phillips (2014), “Estimating the Impact of Trade and Offshoring on American Workers Using the Current Population Surveys”**

This paper estimates the effects of both trade and offshoring on the wages of American workers using observations on individual workers from the Current Population Survey. The sample used is from the Current Population Survey Merged Outgoing Rotation Groups for the 1983-to-2002 period, which provides data with consistent industrial and occupational classifications for over 3.4 million workers. Log wages are regressed on personal characteristics such as education, age, and sex and on lagged measures of exposure to international trade and offshoring.

The analysis is done once using industry-based measures of exposure to globalization and then again using occupation-based measures. Exposure to international trade at the industry level is measured using separate variables for imports and exports expressed as a percentage of domestic industry production. Exposure to offshoring is measured using industry-level information on foreign affiliate employment as a percentage of total employment of U.S. multinational firms,

with separate measures for foreign affiliate employment in low-income versus high-income countries. In the occupation-based analysis, occupation-specific measures of exposure to trade and offshoring are created by taking a weighted average of industry-level measures with weights being the percentage of national employment in an occupation occurring in a given industry.

As always, a potential concern in the analysis is that impacts from globalization may be confused with impacts from technological change. Imports from, and the offshoring of activities to, low-income countries are likely to prove most threatening to domestic workers who perform routine tasks. Yet these are precisely the kind of tasks most vulnerable to computerized automation. To control for the effects of labor-saving technological change, the authors include in their regressions the price of investment goods and computer use rates by industry and occupation.

A major finding of the authors is that exposure to trade and offshoring through industry of employment has an insignificant effect on wages while exposure through occupation is negative and highly significant. The authors conclude that globalization has had small effects on wage differentials by industry but significant effects on wage differentials by occupation. The largest effects from exposure to globalization are felt by workers performing routine tasks. The regression estimates indicate that a 10 percent increase in occupational exposure to imports is associated with a 3 percent decline in real wages for workers who perform routine tasks. Offshoring to low-income countries also has significant wage effects. Each 10 percent increase in occupational exposure to overseas employment in low-income countries leads to a 0.7 percent decline in the real wages of domestic workers performing routine tasks. Export activity and offshoring to high-income countries, on the other hand, serve to raise the wages of domestic workers. For routine workers, a 10 percent increase in export shares is associated with a 6.7 percent increase in wages. A 10 percent increase in affiliate employment in high-income countries is associated with a 0.5 percent increase in wages.

Using a panel sample from the CPS, the authors find that much of the drop in wages brought on by globalization has occurred through a reallocation of workers from high-wage manufacturing jobs to lower-paying jobs in other sectors and other occupations. For workers changing occupations, trade has led to a real wage loss of 12-to-17 percentage points.

**McLaren and Hakobyan (2016), “Looking for Local Labor-Market Effects of NAFTA”**  
The authors estimate the effect of NAFTA tariff reductions on the wages of American workers using more than 10 million observations on individual workers from Integrated Public Use Microdata Series (IPUMS) samples of the 1990 and 2000 decennial census. Wages are explained using personal characteristics of workers (level of education, age, and sex) and reductions in U.S. tariffs on imports from Mexico, as provided for in the free-trade agreement. Tariff reductions are allowed to affect wages through two channels: the industry in which the individual is employed and the geographic area (the “conspuma” — a collection of neighboring counties that make up Consistent Public-Use Microdata Areas) where the worker resides. A worker may be hurt by NAFTA either because he works in an industry that is set to face reductions in tariff protection and/or because he lives in a conspuma where a large number of workers are employed in industries vulnerable to NAFTA tariff reductions.

Because NAFTA provided for a gradual elimination of tariffs, with the phase-out period extending beyond 2000 in many cases, the authors include as explanatory variables both initial tariff rates in 1990 and changes in tariff rates from 1990 through 2000. The IPUMS data identify 89 separate tradable goods industries. Tariff rates for these industries are calculated using a weighted average of rates for more numerous trade classifications. A location's average tariff rate is calculated by averaging individual industry tariffs using the local industrial employment mix, with adjustments for Mexico's revealed comparative advantage (giving more weight to industries in which Mexico is an important exporter). These location-specific tariffs measure the extent to which a local area labor market is vulnerable to NAFTA tariff reductions. Conspicuous with the highest tariff rates are in Georgia, North Carolina, South Carolina, Indiana, and southern Virginia.

NAFTA is found to have had large negative effects on wages for a significant minority of American workers, especially high-school dropouts. Wages of high-school dropouts employed in the most-protected industries fell 17 percentage points compared to the wages of similar workers in industries that were initially unprotected. NAFTA-vulnerable locations also experienced significantly slower wage growth. For the most vulnerable locations, wage growth of high-school dropouts was 8 percentage points slower over the 1990-to-2000 period than wage growth of a worker with similar characteristics living in an area with no initial protection. These local labor-market impacts apply to workers who were not employed in tradable goods industries. These workers were nonetheless harmed by NAFTA presumably because of job competition from workers displaced from contracting tradable goods industries or because of local multiplier effects related to the effect of declining local incomes on the demand for nontraded services. Estimates of NAFTA-related wage impacts were small and statistically insignificant for college-educated workers.

In tests for robustness, the authors add variables related to growing import competition from China. The inclusion of China variables had little effect on their results. The authors conclude that trade with China and NAFTA have had separate and distinguishable effects on U.S. wages.

# THE PRODUCTIVITY AND PROSPERITY PROJECT

The Productivity and Prosperity Project: An Analysis of Economic Competitiveness (P3) is an ongoing initiative begun in 2005, sponsored by Arizona State University President Michael M. Crow. P3 analyses incorporate literature reviews, existing empirical evidence, and economic and econometric analyses.

Enhancing productivity is the primary means of attaining economic prosperity. Productive individuals and businesses are the most competitive and prosperous. Competitive regions attract and retain these productive workers and businesses, resulting in strong economic growth and high standards of living. An overarching objective of P3's work is to examine competitiveness from the perspective of an individual, a business, a region, and a country.

## THE CENTER FOR COMPETITIVENESS AND PROSPERITY RESEARCH

The Center for Competitiveness and Prosperity Research is a research unit of the L. William Seidman Research Institute in the W. P. Carey School of Business, specializing in applied economic and demographic research with a geographic emphasis on Arizona and the metropolitan Phoenix area. The Center conducts research projects under sponsorship of private businesses, nonprofit organizations, government entities and other ASU units. In particular, the Center administers both the Productivity and Prosperity Project, and the Office of the University Economist.

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