PIIE PETERSON INSTITUTE FOR INTERNATIONAL ECONOMICS

POLICY BRIEF

17-16 The Payoff to America from Globalization: A Fresh Look with a Focus on Costs to Workers

Gary Clyde Hufbauer and Zhiyao (Lucy) Lu

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Gary Clyde Hufbauer, *Reginald Jones Senior Fellow at the Peterson Institute for International Economics since 1992, was the Maurice Greenberg Chair and Director of Studies at the Council on Foreign Relations (1996–98), Marcus Wallenberg Professor of International Finance Diplomacy at Georgetown University (1985–92), senior fellow at the Institute (1981–85), deputy director of the International Law Institute at Georgetown University (1979–81), deputy assistant secretary for international trade and investment policy of the US Treasury (1977–79), and director of the international tax staff at the Treasury (1974–76). He has coauthored numerous books on international trade, investment, and tax issues, including* Figuring Out the Doha Round *(2010),* Global Warming and the World Trading System *(2009),* Economic Sanctions Reconsidered, *3rd Edition (2007), and* NAFTA Revisited: Achievements and Challenges *(2005).* **Zhiyao (Lucy) Lu** *is research analyst at the Peterson Institute for International Economics.*

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Since the end of the Second World War (WWII), the world has gone through an enormous expansion in international trade and investment, generating unprecedented gains in wealth for the United States and its economic partners. Yet there has always been some legitimate disagreement among economists about how to measure not only the gains but also the losses in employment and wages, especially in advanced countries that trade with countries that have lower labor costs and fewer environmental and worker protection regulations.

This Policy Brief, drawing on a previously published study by Bradford et al. (2005) (summarized below), concludes that the payoff to the United States from trade expansion—stemming from policy liberalization and improved transportation and communications technology—from 1950 to 2016 is roughly $2.1 trillion (measured in 2016 dollars). It further concludes that US GDP per capita and GDP per household accordingly increased by $7,014 and $18,131, respectively (both measured in 2016 dollars). Disproportionate gains probably accrue to poorer households.[1]

Clearly, increased trade since WWII has generated significant gains to the United States. But liberalization still has a long way to go; the potential gains from future policy liberalization could be as large as roughly $540 billion for the United States by the year 2025. This figure translates to an additional increase of $1,670 in GDP per capita and $4,400 in GDP per household of 2.64 persons respectively (measured in 2016 dollars).

1. A recent cross-section study of 27 European countries and 13 other large countries (including the United States) by Fajgelbaum and Khandelwal (2016) estimated that trade has increased real income by 63 percent for poorer consumers who are at the 10th income percentile and by 28 percent for richer consumers who are at the 90th income percentile. The reason for the difference is that trade has significantly lowered the cost of manufactured goods and processed foods, which account for a very large share of expenditures by poorer consumers. But trade has had a much weaker impact on the cost of services, which account for a large share of expenditures by richer consumers. See *Does Foreign Trade and Investment Reduce Average US Wages and Increase Inequality? (Part 2)*, available at https://piie.com/blogs/trade-investment-policy-watch/does-foreign-trade-and-investment-reduce-average-us-wages-and (accessed on April 24, 2017).

But expanded trade results in losers as well as winners, and losers are seldom compensated. This Policy Brief devotes a section to quantify these losses and to discuss how workers adjust to greater trade exposure. The section first estimates the impact on jobs and the private costs of workers adversely affected by trade, as defined by the Trade Adjustment Assistance (TAA) program. In discussing job numbers, two ideas, explained in further detail in section VI, are important to note. First, the impact of trade on jobs is measured as an estimated number of jobs affected by imports and supported by exports, which are statistical concepts: the calculated number of jobs that either correspond to replacing a given volume of imports with domestic production or that correspond to producing a given volume of exports. Second, "jobs" refer to positions, and the term is not synonymous with "workers," who are people; when this Policy Brief refers to a number of jobs affected by imports, that does not mean the same number of workers are affected. That said, the calculations in this Policy Brief suggest that increased trade in the manufacturing sector (imports and exports) led to a *net* figure of around 156,250 US jobs per year adversely affected during the period 2001 to 2016.[2] Of these, about 100,000 were manufacturing jobs and the rest were mainly indirect services jobs. Calculations also suggest that the *gross* private costs of adversely affected workers from 2003 to 2015 are estimated to average between $28 billion and $40 billion per year, which is much smaller than gains from expanded trade since 2003.

The payoff to the United States from trade expansion from 1950 to 2016 is roughly $2.1 trillion.

Following the estimate on private costs is a discussion on improved programs for all displaced workers regardless of the cause. The Policy Brief proposes an expanded Earned Income Tax Credit (EITC) program that covers severe losers among displaced workers (whatever the reason for displacement), supplemented by a more generous Unemployment Insurance (UI) for all displaced workers. These improved adjustment assistance programs are estimated to cost about $30.2 billion a year. They should be implemented both to address the economic harm to losers and to alleviate political hostility to globalization.

The final section concludes and calls for more liberalization accompanied by improved programs for displaced workers.

I. BACKGROUND: CAUSES OF EXPANDED TRADE

Increased trade in the world has not happened by accident. The expansion has been spurred by eight rounds of multilateral trade negotiations under the auspices of the General Agreement on Tariffs and Trade (GATT) and the World Trade Organization (WTO). Regional pacts, such as the European Union, the North American Free Trade Agreement (NAFTA), and many other free trade agreements (FTAs) have further deepened trade and investment liberalization between member countries. Meanwhile, technological advances in transportation and communications have drastically slashed the economic distance between countries. The result is an expansion of international trade from 24.2 percent of world GDP in 1960 to 58.3 percent in 2015, and an explosion in the net inflows of foreign direct investment from 0.5 percent of world GDP in 1970 to 2.9 percent in 2015.[3]

Trade has expanded both because of liberalization policy (the outcome of multilateral, regional, and bilateral agreements, as well as unilateral policy changes) and technological advances (falling transportation and communication costs).[4] Post-WWII growth of international trade has significantly boosted national income (measured by GDP) in the United States and elsewhere, and therefore GDP per capita and GDP per household. Four different channels through which expanded trade flows (*both* exports and imports of goods *and* services) increase income are: *comparative advantage*, which allows each country to specialize in what it produces best; *economies of scale*, which allows firms and industries to spread fixed costs (especially the costs of research and development and proprietary know-how) by selling to a larger market; *technological spillovers*, which speeds the spread of product and process innovation around the world; and *import competition*, which curtails the monopoly power of firms, increases

2. The 156,250 number represents just 0.8 percent of the workers who involuntarily lose their jobs in a typical year. Specifically, in 2016, 19.9 million workers were laid off or discharged (i.e., involuntary separations). See Bureau of Labor Statistics, *Job Openings and Labor Turnover*, January 2017, available at https://www.bls.gov/news.release/archives/jolts_03162017.pdf (accessed on April 27, 2017).

3. Trade and investment data are from the World Bank (accessed on January 27, 2017).

4. Adler and Hufbauer (2009) applied a simple partial equilibrium analysis and a computable general equilibrium (CGE) model to evaluate the sources of growth in US merchandise trade over 1980–2006. They concluded that tariff liberalization accounted for 45 percent of the trade growth *above and beyond* the pace of GDP growth, liberalization of nontariff barriers accounted for 44 percent, and the decline in transportation costs contributed the remaining 11 percent. They did not evaluate how much falling communication costs contributed to the "extra" trade growth.

the variety offered to consumers, and shifts resources from less-productive to more-productive firms.[5]

The International Monetary Fund (IMF) defines globalization as "the increasing integration of economies around the world, particularly through trade and financial flows."[6] Thus, the word "globalization" in this Policy Brief is used interchangeably with economic "integration." Additionally, globalization "sometimes also refers to the movement of people (labor) and knowledge (technology) across international borders."[7] Following the IMF's terminology, the four major aspects of globalization are: trade, capital flows, movement of people, and dissemination of knowledge (technology). While international trade and investment are closely linked, and while some degree of labor mobility and knowledge diffusion are essential for cross-border transactions in trade and capital flows, this Policy Brief focuses on the international trade aspect of globalization.[8] Henceforth, references to globalization or integration refer to increased trade flows. As mentioned, trade expansion stems both from policy liberalization and technological advances.[9] Therefore, the calculated benefits from increased trade, or enhanced integration, come from these two sources.[10]

II. PAYOFF FROM POLICY LIBERALIZATION AND TECHNOLOGICAL ADVANCES

Bradford et al. (2005) estimated gains from trade expansion between the end of WWII and 2003 for the United States economy as well as for average US individuals and for statistical households of 2.58 persons (table 1).[11] The authors based their findings on reports in the academic literature. They applied four different methods to perform the calculations. The methods differ in terms of coverage and design, and table 2.2 in Bradford et al. (2005) should be consulted for a detailed explanation.[12] This section summarizes the output elasticity method. The other three methodologies are summarized in appendix A.

The most important estimate in Bradford et al. (2005) is based on a study by the Organization for Economic Cooperation and Development (OECD 2003) that examined sources that drive economic growth in advanced countries. OECD authors estimated a pooled cross-country and time-series regression to investigate the impact of identified variables on growth (measured by per capita income/output). Variables in the OECD study were expressed in natural logarithmic form, enabling the coefficients on independent variables to be interpreted as elasticities.[13] Unlike other methodologies reviewed by Bradford et al. (2005), the OECD study did not identify specific channels through which increased trade affects output per capita. To be on the safe side, Bradford et al. (2005) assumed that the OECD approach captured all aspects of trade that might increase or decrease output.[14]

Among several identified variables, the OECD study found that the long-term coefficient on two-way trade exposure (adjusted for country size) was consistently around 0.2, and the relationship was statistically significant.[15] In other words, holding everything else constant, a 10 percent

5. This Policy Brief does not speculate on what percentage of trade-induced output gains resulted from each channel. However, a large portion of trade-induced gains are reflected in lower consumer prices resulting from the import competition channel.

6. International Monetary Fund, *Globalization: Threat or Opportunity*? April 12, 2000. Available at http://www.imf.org/external/np/exr/ib/2000/041200to.htm#II (accessed on April 12, 2017).

7. Ibid.

8. Complementary research shows that foreign direct investment (FDI) makes a large and independent contribution to the gains from globalization. The work of Theodore Moran and Lindsay Oldenski (2013) indicates that 12 percent of total US productivity gains between 1987 and 2007 can be attributed to productivity spillovers from inward FDI.

9. In this Policy Brief, liberalization, or trade liberalization, refers to liberalization policy in international trade that promotes trade between countries.

10. This Policy Brief does not speculate on the extent to which technology diffusion by itself, without associated trade flows, could raise national income.

11. In Bradford et al. (2005), gains from globalization are expressed in three forms: total GDP, GDP per capita, and GDP per household of 2.58 persons, all measured in 2003 dollars.

12. Some methods only count gains from policy liberalization (the outcome of multilateral, regional, and bilateral agreements, plus unilateral policy changes), while others include deeper trade integration resulting from better transportation and communication technologies. Some methods measure the impact of liberalization only in merchandise trade (not including services), or in the manufacturing sector (not including agriculture, mining, and services). Other methods measure the impact in both merchandise and services.

13. Elasticity values are expressed as a ratio of two percentage changes, for example the percentage change in quantity demanded for a given percentage change in the price charged.

14. Sources that drive trade growth include policy liberalization and technological advances. The OECD study reflects both factors without distinguishing between them. Therefore, the estimated gains from expanded trade derived from the output elasticity method are the consequence of both policy and technology.

15. Trade exposure is usually measured as (X + M) / GDP. However, as country size has a strong influence on trade exposure, the OECD study used a slightly different indicator of trade exposure, {(X / GDP) + (1 – X / GDP) * [M / (GDP – X + M)]}. In the empirical analysis conducted by the OECD, this indicator was adjusted for country size by regressing it on population size and taking the estimated residuals from the regression as the adjusted trade exposure.

Table 1 Summary of results: Payoff from past US trade expansion

Methodology	Methodology source	Percent of 2003 GDP	2003 trillion dollars	2003 dollars per capita	2003 dollars per household
Output elasticity (1950–2003)	OECD (2003)	13.2	1.5	5,000	12,900
Sifting and sorting (1947–2003)[a]	Bernard et al. (2003)	8.6	0.9	3,200	8,400
Smoot-Hawley CGE (1947–2003)[a]	Bradford and Lawrence (2004b)	7.3	0.8	2,800	7,100
Intermediate imports (1960–2001)	Richardson (2004)	9.6	1.1	3,635	9,377

Memorandum:	
2003 GDP (trillions of 2003 dollars)	11
2003 population (millions)	291
2003 persons per US household	2.58
2003 GDP per capita (2003 dollars)	37,748
2003 GDP per household (2003 dollars)	97,390

CGE = computable general equilibrium model; FTA = free trade agreement; OECD = Organization for Economic Cooperation and Development

a. Includes estimate of gains due to increased product variety between 1972 and 2001, 2.8 percent of GDP (Broda and Weinstein 2004).

Source: Table 2.1, Bradford et. al (2005).

increase in trade exposure leads to a 2 percent increase in per capita income in the long run.[16]

Bradford et al. (2005) applied the 0.2 coefficient to changes in US trade exposure during each decade since 1950 to calculate the payoff from past integration. The calculations suggest that the United States gained roughly $1 trillion (measured in 2003 dollars) from expanded trade over a period of 54 years. In other words, the United States was $1 trillion richer in 2003 because of past policy liberalization at home and abroad, and improved transportation and communications technology. Gains in output per capita and GDP per household were $5,000 and $12,900, respectively (table 1).[17]

III. THE PAYOFF FROM PAST TRADE EXPANSION: AN UPDATE

This section updates the Bradford et al. (2005) estimates of US gains from deeper trade integration to 2016 by using the "dollar ratio" method; unless otherwise stated, all dollar amounts are measured in 2016 dollars. Hufbauer, Schott, and Wong (2010) surveyed 13 empirical studies that related the induced growth in GDP to the triggering growth in two-way trade. For this purpose, they devised two coefficients: the ratio between induced dollar GDP gains and the dollar two-way trade gains resulting from liberalization and/or technology advances ("dollar ratios"), and the ratio between induced percentage GDP gains and the percentage increase in two-way trade resulting from the same forces ("percentage ratios").[18] Hufbauer and Lu (2016) augmented the earlier survey by adding three recent analyses of the link between initial trade growth and induced GDP growth (table 2).

This Policy Brief prefers the dollar ratio to avoid confusion caused by *percent increases* versus *percentage increases* that result from applying the percentage ratio. In response to skepticism over the high dollar ratios reported in some of the empirical studies listed in table 2, dollar ratios that exceed 0.5 (shown by an asterisk) are excluded from this analysis.[19] The average dollar ratio of the remaining 12

16. OECD (2003) stated its empirical results by saying that a 10 *percentage-point* increase in trade exposure leads to an increase in output per capita by 4 *percent*. Bradford et al. (2005) assumed that the typical trade exposure level was 50 percent of GDP. It should be noted that, since trade exposure is often expressed as a ratio, *percent* increases and *percentage-point* increases should not be confused. A 10 *percentage-point* increase in country A's trade exposure, illustrated for example by an increase from 50 percent to 60 percent, indicates a 20 *percent* increase. Therefore, a 10 *percentage-point* increase in trade exposure, which equates to a 20 *percent* increase, leads to a 4 *percent* increase in GDP per capita. Hence, a 10 *percent* increase in trade exposure leads to a 2 *percent* increase in per capita output.

17. Note that the OECD output elasticity method suggests more gains in the postwar period up to 2003 than the calculations from the other three methods presented in Bradford et al. (2005). This is because the output elasticity method reflects gains both from policy reforms and technological innovation. Moreover, the method measures the effect of liberalization and technology on both goods and services trade. See table 2.2 in Bradford et al. (2005) for more detail.

18. See *Appendix A: Methodology for Reciprocity Measure and GDP Gains* in Hufbauer, Schott, and Wong (2010).

19. One potential argument is that such cross-country analysis does not apply to the United States because it is a large advanced economy at a technological frontier that has

Table 2 Ratios of GDP growth and two-way trade growth from regression and computable general equilibrium (CGE) models

Study	Covered trade (base year)	Model type	Dollar ratio
Petri and Plummer (2016)	TPP (2030)	CGE	0.18
US International Trade Commission (2016)	TPP (2032)	CGE	0.56*
Centre for Economic Policy Research (2013)	TTIP (2027)-US	CGE	0.22
Centre for Economic Policy Research (2013)	TTIP (2027)-EU	CGE	0.27
OECD (2003)	Developed countries (2000)	Regression	0.48
Cline (2004)	Various developing countries	Regression	1.09*
Freund and Bolaky (2008)	Global economic performance (2000)	Regression	0.7*
Anderson, Martin, and van der Mensbrugghe (2006)	Global liberalization (2008)	CGE	0.13
Brown, Kiyota, and Stern (2005)	Free Trade Area of the Americas (FTAA) (1997)	CGE	0.91*
Brown, Deardorff, and Stern (2001)	Uruguay Round (1995)	CGE	0.48
Decreux and Fontagne (2009)	Goods, services, and trade facilitation (2020)	CGE	0.37
Decreux and Fontagne (2008)	Goods and services (2025)	CGE	0.96*
Francois, van Meijl, and van Tongeren (2005)	Doha Round (2001)	CGE	0.11
Gilbert (2009)	Uruguay Round (2004)	CGE	0.06
Gilbert (2009)	Transportation costs (2004)	CGE	0.39
Scollay and Gilbert (2001)	APEC liberalization (1995)	CGE	0.12
Lodefalk and Kinnman (2006)	Doha Round (2001)	CGE	0.12
Simple average after eliminating the excluded studies (shown by *)			**0.24**

TPP = Trans-Pacific Partnership; TTIP = Transatlantic Trade and Investment Partnership; APEC = Asia Pacific Economic Cooperation forum; OECD = Organization for Economic Cooperation and Development

Note: The dollar ratio is the ratio of the dollar increase in GDP over the dollar increase in two-way trade.

Sources: In addition to the studies in the table, UN Comtrade Database, 2009, via World Integrated Trade Solution; IMF, *World Economic Outlook*, April 2009, www.imf.org.

studies is 0.24. This implies that a $1 billion increase in two-way trade increases GDP by $240 million.

The updated calculations for 2003–16 are based on this dollar ratio. The ratio is applied to trade growth in excess of GDP growth to calculate gains from trade expansion during 2003–16. For example, suppose Country A's GDP grew by 15 percent in the period 2000 to 2005 (or an average of 3 percent a year), and its two-way total trade value increased by 25 percent (or an average of 5 percent a year) during the same period. Assuming economic expansion by itself causes "all boats to rise" by the same percentage, the "extra" trade growth above and beyond the GDP growth was 10 percent over 5 years or an average of 2 percent a year. If Country A's total two-way trade increased from $1,000 billion to $1,250 billion during 2000 and 2005, then economic expansion by itself could explain an increase of 15 percent (or an average of 3 percent a year for five years), or $150 billion. The remaining "extra" trade growth of 10 percent (or an average of 2 percent a year for five years) was $100 billion. Applying the dollar ratio at 0.24, Country A's trade expansion during 2000 and 2005 contributed $24 billion to its GDP growth.

Table 3 presents US two-way trade values in 2003 and 2016, measured in 2016 prices.[20] Total two-way trade increased by 49.5 percent, or $1,644 billion, from 2003 to 2016. Over this same period, US real GDP increased by 25.5 percent.[21] Assuming economic expansion by itself causes

low levels of protection for merchandise trade. As a partial response to this criticism, the calculations in this Policy Brief exclude studies that exhibit high dollar ratios. Dollar ratios derived from recent studies on potential trade expansion between developed economies (the Trans-Pacific Partnership and the Transatlantic Trade and Investment Partnership) are in line with the adjusted average number at 0.24.

20. The implicit price deflator for GDP was 111.440 in 2016 and 86.735 in 2003 (2009 = 100). In 2003, exports were $1,040.3 billion and imports were $1,543.9 billion (both measured in nominal values). GDP deflators come from the Bureau of Economic Analysis, Table 1.1.9. Implicit Price Deflators for Gross Domestic Product; trade data come from the Bureau of Economic Analysis, Table 1.1.5. Gross Domestic Product (available at https://www.bea.gov/itable/, accessed on January 27, 2017).

21. GDP in 2003 (measured in nominal values) was $11,510.7 billion, or $14,789 billion at 2016 prices, and GDP in 2016 was $18,567 billion. Data come from the Bureau of Economic Analysis, Table 1.1.5. Gross Domestic Product (available at https://www.bea.gov/itable/, accessed on January 27, 2017).

Table 3 US two-way trade value, billions in 2016 dollars

Year	Exports	Imports	Two-way trade
2003	1,337	1,984	3,320
2016	2,232	2,732	4,964

Note: Numbers may not add up due to rounding.

Sources: Bureau of Economic Analysis and authors' calculations.

Table 4 Payoff from US trade expansion, 2003–16, measured in 2016 dollars

"Extra" increase in two-way trade, billions of dollars	797
Dollar ratio	0.24
Induced gains in GDP, billions of dollars	191
US population as of December 31, 2016, millions	324
Induced gains in GDP per capita, dollars	590
Persons per US household, average 2011–15	2.64
Induced gains in GDP per household, dollars	1,557

Sources: US Census Bureau and authors' calculations.

Table 5 Payoff from US trade expansion, 1950–2016, measured in 2016 dollars

	1950–2003 payoff	2003–16 payoff	Total payoff from 1950–2016	Percent of 2016 levels
Gains in GDP, billions of dollars	1,864	191	2,056	11
Gains in per capita output, dollars	6,424	590	7,014	12
Gains in per household output, dollars	16,574	1,557	18,131	12
Memorandum:				
2016 GDP (trillions of dollars)	18.6			
2016 end-of-year population (millions)	324			
2016 persons per US household[1]	2.64			
2016 GDP per capita (dollars)	57,305			
2016 GDP per household (dollars)	151,286			

1. Average number of persons per household during 2011 and 2015 is used as a proxy for the 2016 level.

Note: Numbers may not add up due to rounding.

Sources: Bureau of Economic Analysis, United States Census Bureau, Bradford et. al. (2005), and authors' calculations.

"all boats to rise" by the same percentage, GDP growth between 2003 and 2016 could explain a rise of 25.5 percent in two-way trade, or $847 billion.[22] The remaining "extra" trade growth of $797 billion reflects a combination of trade liberalization (the tail end of NAFTA and Uruguay Round reforms) and better transportation and communications.

Applying the dollar ratio of 0.24 to this "extra" trade growth above and beyond the pace of GDP growth suggests that it contributed $191 billion to GDP growth over the period from 2003 to 2016. This translates to an additional $590 in GDP per capita and an additional $1,557 GDP per statistical household of 2.64 persons (table 4). Combined

22. US two-way trade in 2003 (measured in 2016 dollars) was $3,320 billion. $3,320 * 25.5%= $847 billion.

Table 6 Output elasticity: Benefits of increased trade exposure, 1950–2016

Period ending	Benefit in 2003 dollars (billions)	Benefit in 2016 dollars (billions)
1960	33	42
1970	156	200
1980	935	1,201
1990	32	41
2003	294	378
2016	n.a.	191
Total	—	2,054

n.a = not applicable

Note: Numbers may not add up due to rounding.

Sources: Table 2.3, Bradford et al. (2005), and authors' calculations.

with the earlier Bradford et al. (2005) results using the OECD output elasticity method, the calculation suggests that, since WWII, transportation and communication advances, together with lower barriers to international trade, have generated an increase of roughly $2.1 trillion in US GDP. This represents an additional $7,014 GDP per capita, or $18,131 per household in 2016 (table 5 on page 6).[23]

One point worth noting is that, compared to previous decades, increased trade since 2003 has not delivered substantial gains (table 6). This result may be a combination of the lack of fresh policy liberalization on a large scale (the failure of the Doha Round), the Great Recession and the ensuing slowdown in global growth as well as trade flows, and the rise in "micro-protection" (small-scale barriers to trade) following the 2008 financial crisis. The decade that experienced the greatest gains from increased trade was 1970 to 1980. A major source of gains during that decade came from policy liberalization resulting from GATT negotiations between 1950 and 1970, which concentrated on reducing tariffs.[24] The decade that experienced the smallest gains was 1980 to 1990, despite the Tokyo Round (1973–79), which cut the customs duties in the world's nine major industrial markets by one-third on average.[25] Significant overvaluation of the US dollar and the induced protectionism during the Reagan administration had a significant negative impact on US trade during that decade.

It is difficult to separate the benefits summarized in table 6 between gains owing to policy liberalization and gains owing to technological advances. However, gains prior to 1980 probably had a dominant policy component, given the dramatic reduction of tariffs and the elimination of exchange controls in the first three decades following WWII. After the turn of the century, the pace of policy liberalization slowed, and probably most gains since 2000 were attributable to technology, especially the Internet.

IV. MORE ROOM FOR FUTURE LIBERALIZATION

Gains from past integration are estimated to be large and positive. But liberalization in trade still has a long way to go. Average world tariffs on manufactured goods, while low, are still significant, some 5.6 percent in 2015 (figure 1). US tariffs on manufactures are lower than the world average, at 3.0 percent, but still 0.9 percentage point higher than the average level applied by all OECD countries. Tariffs in developing countries, such as China, remain high and have barely been reduced in recent years.

For manufactured goods and other merchandise, logistics costs today pose a greater barrier than tariffs. Such costs include corrupt and inefficient customs bureaucracies, inadequate ports and airports, and poor intermodal connections between ships, airports, railroads, and highways. Better trade facilitation is essential to reduce these assorted costs. The Trade Facilitation Agreement (TFA), signed by WTO members in December 2013 at the Bali Ministerial Conference and finally ratified in February 2017, could decrease trade costs significantly and thereby increase both trade and output. But the TFA needs to be implemented country-by-country to achieve these benefits.

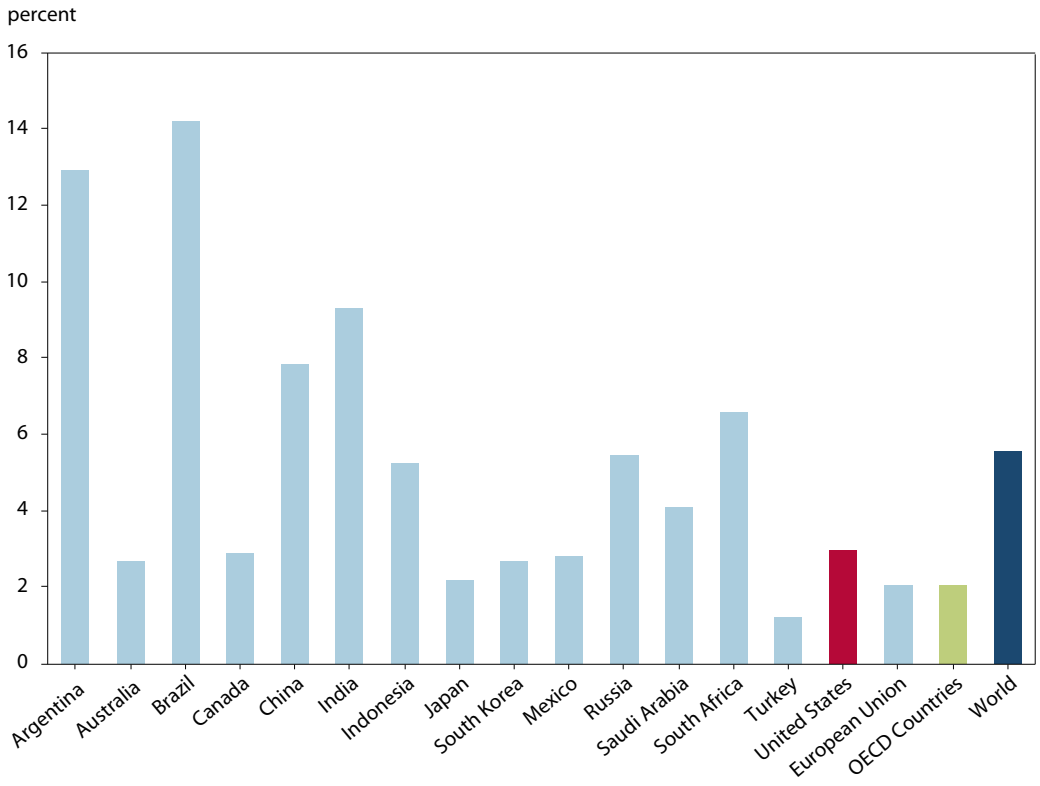
The WTO (2015) estimated that fully implementing the TFA would decrease global trade costs by 14.3 percent on average. Simulations with a dynamic computable general equilibrium (CGE) model suggested that annual global exports of goods could rise by 2 to 3 percent if TFA is implemented, and global GDP could be 0.3 to 0.5 percent higher per year over 2015–30. Simulations with a gravity model indicated a much stronger boost to global exports of goods, some 9 to 29 percent annually, again if TFA is implemented.

23. The statistical household size was slightly larger in 2016 than in 2003.

24. Gains due to liberalization usually require at least 10 years to be fully realized. GATT negotiations that took place between 1950 and 1970 were: Torquay Round (1950–51), Geneva Round (1956), Dillon Round (1960–61), and Kennedy Round (1964–67). The first three rounds covered tariffs, and the Kennedy Round covered tariffs as well as an agreement on antidumping. See *The GATT years: from Havana to Marrakesh*, World Trade Organization, available at https://www.wto.org/english/thewto_e/whatis_e/tif_e/fact4_e.htm#rounds (accessed on February 8, 2017).

25. See *The GATT years: from Havana to Marrakesh*, World Trade Organization, available at https://www.wto.org/english/thewto_e/whatis_e/tif_e/fact4_e.htm#rounds (accessed on February 8, 2017).

Figure 1 Average effective applied tariff rates on manufactured products, major economies, 2015



OECD = Organization for Economic Cooperation and Development
Note: Data for India and Indonesia are 2013 rates. Data for Mexico and Saudi Arabia are 2014 rates.
Source: World Integrated Trade Solution (WITS) database.

Importantly, services trade plays a far larger role in the global economy than it did decades ago. Trade in services, expressed as a share of world GDP, increased dramatically from 6.2 percent in 1975 to 13.0 percent in 2015.[26] However, tariff equivalent barriers remain much higher on services trade than on manufactured goods. High barriers measured in tariff equivalent terms are confirmed by the OECD's Services Trade Restrictiveness Index (STRI), as shown in figure 2.[27] According to Hufbauer et al. (2015), which draws on estimates from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII), national barriers on services trade ranged from 16 percent to 90 percent *ad valorem* equivalent (figure 2).[28] Services accounted for 24.7 percent of total US two-way trade in 2015, even though US barriers on services trade averaged 44.7 percent *ad valorem* equivalent (figure 2).[29] If barriers are reduced, the potential growth of services trade is enormous, thanks to Internet technology.

V. THE PAYOFF FROM FUTURE LIBERALIZATION

Bradford et al. (2005) drew on three studies to estimate unrealized payoff from future policy liberalization. Results are presented in table 7.

This Policy Brief updates these estimates of the payoff to the United States from future liberalization through 2025 using a quantitative assessment on Asia-Pacific integration conducted by Peter Petri, Michael Plummer, and Fan Zhai in 2012. Petri et al. (2012) estimated gains from Asia-Pacific integration with a CGE model.[30] Two features of their model

26. Trade data come from the World Bank.

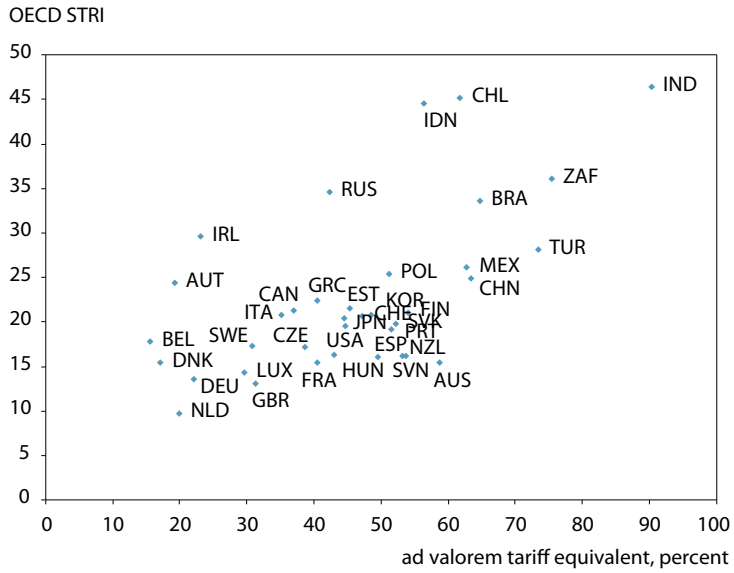
27. The World Bank's Services Trade Restrictiveness Index is similar to the OECD's STRI.

28. High ad valorem tariff equivalent barriers, calculated by CEPII and shown on the horizontal axis, are confirmed by the OECD's STRI, shown on the vertical axis.

29. US services trade data come from the US Census Bureau, available at https://www.census.gov/foreign-trade/statistics/historical/gands.pdf (accessed on January 30, 2017).

30. One should consult Petri et al. (2012) and the website

Figure 2 CEPII ad valorem equivalents and the OECD STRI



AUS = Australia; AUT = Austria; BEL = Belgium; BRA = Brazil; CAN = Canada; CHE = Switzerland; CHL = Chile; CHN = China; CZE = Czech Republic; DEU = Germany; DNK = Denmark; ESP = Spain; EST = Estonia; FIN = Finland; FRA = France; GBR = United Kingdom; GRC = Greece; HUN = Hungary; IDN = Indonesia; IND = India; IRL = Ireland; ITA = Italy; JPN = Japan; KOR = South Korea; LUX = Luxembourg; MEX = Mexico; NLD = Netherlands; NZL = New Zealand; POL = Poland; PRT = Porgutal; RUS = Russian Federation; SVK = Slovakia; SVN = Slovenia; SWE = Sweden; TUR = Turkey; USA = United States; ZAF = South Africa.

CEPII = Centre d'Etudes Prospectives et d'Informations Internationales; OECD = Organization for Economic Cooperation and Development; STRI = Services Trade Restrictiveness Index.

Notes: Ad valorem equivalents estimate the cost of trade restrictions as a percent of the price of the good or service being sold. The OECD STRI measures the restrictions a country's legal code places on the services trade, but it does not estimate a price effect. Numbers above represent simple averages of the sector estimates given in the sources. The STRI, reported on a scale of 0 (completely open) to 1 (completely closed), has been scaled up to a scale of 0 to 100.

Source: Figure 1, Hufbauer et al. (2015).

deserve attention. First, different from conventional CGE models, the model used by Petri et al. (2012) is new, developed by Zhai (2008), and incorporates firm heterogeneity as a factor that explains international trade patterns. Second, the authors modeled trade agreements at a detailed level and projected templates of the Trans-Pacific Partnership (TPP) and the Regional Comprehensive Economic Partnership (RCEP) agreements based on existing trade pacts. Each agreement was modeled by changing five sets of parameters: utilization rates of tariff preferences, tariffs, nontariff barriers, costs of rules of origin, and barriers to foreign direct investment.[31]

Model results indicated significant benefits from a Free Trade Area of the Asia-Pacific (FTAAP).[32] Potential US income gains from the FTAAP and the increase in US exports are estimated to be $266.5 billion and $575.9 billion (both measured in 2007 dollars), respectively, over the baseline scenario in 2025. Since the model assumes a fixed capital account balance, the effects on total exports and total imports are similar. Therefore, this Policy Brief assumes the FTAAP will generate $575.9 billion additional US imports in 2025. Collectively, the FTAAP could potentially produce an increase of $1,151.8 billion (in 2007 dollars) in US two-way trade in 2025. Applying the dollar ratio at 0.24 implies an income gain of $276.4 billion (in 2007 dollars)

asiapacifictrade.org for details of model specifications and assumptions.

31. The model did not contemplate complete elimination of services barriers.

32. Asia-Pacific Economic Cooperation (APEC) economies proposed the idea of a Free Trade Area of the Asia-Pacific in 2006.

Table 7 Summary of results: Payoff from future US trade expansion

Methodology	Methodology source	Percent of 2003 GDP	2003 trillion dollars	2003 dollars per capita	2003 dollars per household
Global free trade CGE	Brown, Deardorff, and Stern (2003)	5.5	0.6	2,000	5,000
Market fragmentation	Bradford and Lawrence (2004a)	4.1	0.5	1,500	4,000
US-world FTA	Rose (2005) and OECD (2003)	12.0	1.3	4,500	11,600

Memorandum:

2003 GDP (trillions of 2003 dollars)	11
2003 population (millions)	291
2003 persons per US household	2.58
2003 GDP per capita (2003 dollars)	37,748
2003 GDP per household (2003 dollars)	97,390

CGE = computable general equilibrium model; FTA = free trade agreement

Source: Table 2.1, Bradford et. al. (2005).

from the FTAAP in 2025. This estimate is close to the CGE model result of $266.5 billion in Petri et al. (2012).

Taking the simple average of the two estimates of income gains, the FTAAP could produce gains of $271.5 billion in 2007 dollars, or $311 billion in 2016 dollars, to the United States in 2025.[33] US two-way trade in goods and services with APEC economies accounted for 58 percent of its total trade in 2015.[34] Scaling up the income gains from the FTAAP to US commerce with the rest of the world, the United States might potentially gain roughly $540 billion (in 2016 dollars) from future trade liberalization in 2025. Measured in 2016 dollars this increase equates to an additional increase of $1,670 in GDP per capita and $4,400 in GDP per household of 2.64 persons, respectively. These figures are roughly comparable to the lower estimates summarized by Bradford et al. (2005) reported in table 7.

It should be noted that these are potential gains solely due to policy liberalization. Technological progress in transportation and communications could generate significant additional benefits for the United States. Of special note, internet technology is rapidly making more service activities tradable internationally. Jensen (2011) has documented this phenomenon on the basis of trade between US metropolitan areas. Baldwin (2016) has sketched the third wave of globalization based on teleporting. The potential expansion of international trade in services, enabled by technology, could dramatically augment the benefits from policy liberalization alone.

VI. WORKER ADJUSTMENT TO GREATER TRADE EXPOSURE

Previous sections estimated the payoff from past policy liberalization and technological advances as well as potential gains from future liberalization. The large and positive results echo traditional trade theories that international trade benefits the economy as a whole in the long run. However, the expansion of trade can adversely affect jobs and workers. Gains from international trade are seldom redistributed in a manner that ensures that every worker is better off. This section discusses how workers and society adjust to greater trade exposure.

Before exploring detailed calculations, it is worth clarifying the difference between four concepts: jobs affected by imports, jobs supported by exports, workers adversely affected by imports, and displaced workers. Note that in this Policy Brief the term "jobs" refer to positions, and "workers" refer to persons. The terms overlap but are not identical.

The calculated number of jobs affected by imports or supported by exports does not equate to the calculated number of workers displaced by imports or workers hired to produce exports. The reason why these numbers are not interchangeable is because they are both statistical concepts: the calculated number of US jobs that either correspond to replacing a given volume of imports with domestic production, or that correspond to producing a given volume of exports.

Jobs that are affected by imports might be replaced by other jobs within the same firm, or alternative jobs within

33. The implicit price deflator for GDP was 111.440 in 2016 and 97.337 in 2007 (2009 = 100). Data come from the Bureau of Economic Analysis (accessed on January 30, 2017).

34. The 21 APEC members are: Australia, Brunei Darussalam, Canada, Chile, China, Hong Kong, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, Philippines, Russia, Singapore, Chinese Taipei, Thailand, the United States, and Vietnam. Services trade data come from the Bureau of Economic Analysis, and goods trade data come from the International Trade Center (accessed on January 30, 2017). Data on US services trade with Papua New Guinea is not available.

the same city or region. Alternative job opportunities are likely for positions that are indirectly affected by imports because these positions are widely dispersed throughout the economy. In other words, import-affected jobs do not necessarily translate into unemployed workers. In fact, many of the calculated jobs may represent hypothetical domestic production, not actual domestic production that was shut down because of import competition. Likewise, jobs supported by exports do not necessarily mean additional employment. Instead, jobs may be shifted from producing for the domestic market to producing for the export market.

For job calculations, imports are assumed to have a negative impact while exports are assumed to have a positive impact. To be clear: This Policy Brief does not claim that "imports are bad and exports are good." When some jobs are lost or never created in import-competing sectors, other jobs are created elsewhere in the economy. Likewise, when jobs are created in the export sectors, workers may be diverted from production elsewhere in the economy. Larger imports and exports *both* benefit the US economy through multiple channels described elsewhere.[35] Assumptions for the job calculations are made to arrive at figures for jobs affected by trade, not to judge the merits of international commerce.

The concept of workers adversely affected by imports is spelled out in Section 222 of the Trade Act of 1974, which established the Trade Adjustment Assistance (TAA) program.[36] Regulations published in the Federal Register detail the determination of eligibility for adjustment assistance:[37]

> "(b) ***Requirements for determinations***. After reviewing the relevant information necessary to make a determination, the certifying officer shall make findings of fact concerning whether:
>
> (1) A significant number or proportion of the workers in such workers' firm (or an appropriate subdivision of the firm) have become, or are threatened to become, totally or partially separated;
>
> (2) Sales or production, or both, of such firm or subdivision have decreased absolutely; and
>
> (3) Increases (absolute or relative) of imports of articles like or directly competitive with articles produced by such workers' firm or an appropriate subdivision thereof contributed importantly to such total or partial separation, or threat thereof, and to such decline in sales or production. For purposes of this paragraph and part, the term contributed importantly means a cause which is important but not necessarily more important than any other cause."

In short, adversely affected workers are those who lose their jobs (total separation) or whose work hours and therefore wages are reduced (partial separation and/or decreased sales and production) as a result of import competition.

Different from workers adversely affected by imports are displaced workers. These are defined by the Bureau of Labor Statistics (BLS) as "persons 20 years and over who lost or left jobs because their plant or company closed or moved, there was insufficient work for them to do, or their position or shift was abolished."[38] Workers are often displaced for reasons other than trade—in particular, industrial automation and firm closures owing to domestic competition.[39] Available data do not, however, separate workers displaced by trade from other displaced workers. To a large extent, workers adversely affected by imports (as defined for TAA) are also displaced workers, but the concepts are not the same. A worker does not have to be displaced to be eligible for TAA.

In summary, the concept "displaced workers" covers a much broader range than "workers displaced by imports." Moreover, "workers adversely affected by imports" probably covers a broader range than "workers displaced by imports." These distinctions are important to bear in mind when assessing the impact of enlarged trade.

35. See box 2.1 in Bradford et al. (2005).

36. See "Sec. 222. Group Eligibility Requirements," available at https://legcounsel.house.gov/Comps/93-618.pdf (accessed on February 21, 2017). The TAA is a federal program that was first enacted in 1975. The US Department of Labor's Employment and Training Administration's Office of Trade Adjustment Assistance determines whether a petition meets the legal standard. After a group of workers is certified, each worker in the group then individually applies for services and benefits through his or her local American Job Center. Program benefits and services are administrated by the states through agreements between the secretary of labor and each state governor. For more details on the TAA petition process, see "Trade Adjustment Assistance Application Process," Employment and Training Administration, United States Department of Labor, available at https://www.doleta.gov/tradeact/petitions.cfm (accessed on March 14, 2017).

37. For more information, see "29 CFR 90.16 - Determinations and certifications of eligibility to apply for adjustment assistance," Cornell University Law School, available at https://www.law.cornell.edu/cfr/text/29/90.16 for more information (accessed on February 9, 2017).

38. See BLS glossary, available at https://www.bls.gov/bls/glossary.htm (accessed on February 10, 2017).

39. Individual workers are often unaware whether their jobs disappeared because of trade pressure, technological innovations, or simply bad management (World Bank 2017). A study by Ball State University (Hicks and Devaraj, 2015) indicated that trade only accounted for 13.4 percent of total US job losses over 2000–2010, while productivity increases due to technological improvements accounted for 82.8 percent, and the expansion of domestic demand resulted in a job gain of 1.2 percent.

(A) Impact on jobs and workers

Jobs affected by increased manufactured imports

The following estimates focus on jobs affected by imports in the manufacturing sector because this is the sector that draws the greatest political attention.[40] Appendix B extends the analysis to imports of all merchandise (manufacturing, mining, and agricultural) and services.

The number of jobs affected by increased imports are calculated based on the relationship between employment and output. The BLS reports employment requirements matrices annually.[41] Each matrix includes 206 sectors based on the North American Industry Classification System (NAICS). For each sector, the BLS reports the number of direct and indirect jobs supported by $1 million of sector output (measured in 2009 dollars).[42]

Each BLS employment requirements matrix includes data on 76 manufacturing sectors. Average direct and indirect jobs in manufacturing, agriculture, mining, and services sectors per $1 million of aggregate manufactured output (corresponding to an equal value of imports) are calculated as the weighted average of jobs supported per $1 million output of each manufacturing sector. The weight each manufacturing sector carries depends on that sector's share in total manufactured imports.[43] The calculation indicates the following relationship: A $1 billion increase (measured in 2016 prices) in US manufacturing output corresponding to the composition of US manufactured imports would increase the average number of direct and indirect US jobs by 7,923 over the period 2001 to 2014.[44] Of these, 3,160 are direct jobs (40 percent), 1,873 are indirect jobs in the manufacturing sector (24 percent), and the remaining 2,890 are indirect jobs in the nonmanufacturing sector (agriculture, mining, and mainly services) (36 percent). The overall calculation falls in the same ballpark as a calculation reached by Acemoglu et al. (2014) using a very different methodology.[45]

The arithmetic that follows assumes that every dollar spent in the United States on manufactured imports decreases US manufacturing output by one dollar, with a consequent impact on direct and indirect jobs.[46] US manufactured imports rose from $1,278 billion in 2001 to $1,906 billion in 2016 (both measured in 2016 prices).[47]

40. The manufacturing sector is defined as NAICS 31–33.

41. See "Employment Requirements Matrix," available at https://www.bls.gov/emp/ep_data_emp_requirements.htm (accessed on February 21, 2017).

42. The BLS employment requirements matrix has several limitations. See https://www.bls.gov/emp/ep_data_emp_requirements.htm for more detail. The biggest weakness is that the data do not report on a full-time equivalent basis. Persons holding two or more jobs may count two or more times in the employment data.

43. The weight assigned to each manufacturing sector is the average of 2001 and 2014 import shares. Shares are calculated based on trade data reported by the United States International Trade Commission (USITC), available at https://dataweb.usitc.gov/ (accessed on February 10, 2017). Because USITC did not report the import values of NAICS 3328 (Coating, Engraving, Heat Treating, and Allied Activities), sector NAICS 3328 is excluded from the analysis here.

44. In 2001, on average, $1 billion (measured in 2009 prices) manufacturing output supported 10,892 direct and indirect jobs (direct = 4483.5, indirect in the manufacturing sector=2788.1, indirect in the nonmanufacturing sector = 3620.4). The figures decreased to 6,767 jobs in 2014 (direct = 2,560.4, indirect in the manufacturing sector = 1385.2, indirect in the nonmanufacturing sector = 2821.3). The average of the 2001 and 2014 figures suggests that 8,829.5 jobs (direct = 3,522, indirect in the manufacturing sector = 2086.7, indirect in the nonmanufacturing sector = 3220.9) were supported by $1 billion manufacturing output (measured in 2009 prices). The implicit GDP deflators were 111.440 in 2016 and 100 in 2009. Therefore, the implied coefficient is: $1 billion (2016 prices) manufacturing output supported 7,923 jobs (direct = 3,160.4, indirect in the manufacturing sector = 1872.5, indirect in the nonmanufacturing sector = 2890.3) over the period 2001 to 2014. Assuming that every dollar rise in US manufacturing imports substituted for one dollar of US manufacturing output, the above coefficient indicates that, during the period 2001 to 2014, $1 billion of manufactured imports (measured in 2016 prices) affected 7,923 US jobs.

45. Acemoglu et al. (2014) studied the China shock on US employment between 1999 and 2011. They evaluated different channels through which imported goods from China could reduce US employment. Their estimates were done both at the industry-level and the local commuting zone (CZ) level. Analysis on the CZ level suggested that the *net* impact of local reallocation of labor and changes in aggregate demand due to heightened exposure to Chinese imports between 1999 and 2011 led to reduced employment for 2.37 million US workers (including employment changes within nonexposed sectors). According to the Census Bureau, US goods imports from China were $81.8 billion in 1999 and $399.4 billion in 2011 (both measured on a nominal basis). According to the Bureau of Economic Analysis, implicit GDP deflators for 1999, 2011, and 2016 were 80.065, 103.311, and 111.440 (2009 = 100), respectively. Therefore, increased US goods imports from China between 1999 and 2011 equaled $317.0 billion (measured in 2016 dollars). Hence, the implied coefficient indicates that a $1 billion (measured in 2016 dollars) increase in goods imports from China between 1999 and 2011 decreased roughly 7,476 US jobs. This figure is smaller than the 7,923 affected jobs derived from the BLS data, but rather close considering the methodological differences.

46. Note that Hufbauer and Wong (2004) showed that manufactures trade deficit is *positively* related with quarterly changes in manufactured output as both manufacturing imports and manufacturing output tend to rise and fall with the overall economy.

47. US manufactured imports (NAICS 31-33) in 2001 were $960.6 billion at market prices. Implicit GDP deflator was 83.754 in 2001 and 111.440 in 2016 (2009 = 100). Trade

Applying the coefficient derived from the BLS matrix, the *maximum* number of jobs affected by increased manufactured imports between 2001 and 2016 was around 5 million jobs, suggesting a *gross* impact of roughly 312,500 lost US jobs per year over the past 16 years.[48] Of these 312,500 jobs affected by manufactured imports per year, some 36 percent, or 112,500 jobs, were indirectly affected nonmanufacturing jobs, mainly in the services sector. By subtraction, about 200,000 affected jobs annually were manufacturing jobs.

It is worth noting that the number of affected US jobs derived from BLS matrices was much smaller in recent years because of the sluggish growth in trade since 2011. US manufactured imports decreased slightly from $1,908 billion in 2013 to $1,906 billion in 2016 (both measured in 2016 prices).[49] This suggests that, in recent years, international trade in the manufacturing sector had a minimal impact on US jobs.

Jobs supported by increased manufactured exports

The International Trade Administration (ITA) reports the number of jobs supported by annual merchandise exports.[50] According to the ITA, $1 billion (measured in 2016 dollars) of exported goods of all types (manufacturing, agriculture, and mining) supported 7,443 jobs in 2001 and 5,210 jobs in 2015.[51] This Policy Brief assumes the same figures can be applied to manufactured exports alone. The average of the two years is 6,326.5 jobs. The United States exported $873 billion and $1,268 billion (both measured in 2016 prices) of manufactured goods in 2001 and 2016, respectively.[52] Applying the average ITA coefficient arrives at a *gross* number of approximately 2.5 million additional jobs, or around 156,250 US jobs per year, supported by increased manufactured exports.[53] Of course, because of lethargic trade growth since the Great Recession, calculations of additional jobs supported were much smaller or nearly zero in recent years. Based on the BLS matrix analysis reported above, probably about 36 percent of the 156,250 additional US jobs supported annually were mainly in the services sector, leaving about 100,000 as manufacturing jobs.[54]

Net jobs affected by manufactured imports and supported by manufactured exports

Previous calculations suggest that during the period 2001 to 2016, around 5 million jobs, or a *gross* of roughly 312,500 US jobs per year, were affected by increased manufactured imports. At the same time, around 2.5 million jobs, or a *gross* of 156,250 US jobs per year, were supported by rising manufactured exports. Therefore, the *net* effect of jobs affected by increased imports and supported by increased exports in the manufacturing sector over the entire period 2001 to 2016 was roughly 2.5 million jobs, or a loss of around 156,250 US jobs per year. Of these, about 100,000 were manufacturing jobs, and the remaining 56,250 were mainly services jobs.[55]

Total employment in the manufacturing sector decreased from 16.4 million in 2001 to 12.3 million in 2016, suggesting a loss of roughly 256,000 jobs per year.[56] The *net* effect of increased trade in the manufacturing sector

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data comes from the United States International Trade Commission, available at https://dataweb.usitc.gov/ (accessed on February 10, 2017). GDP deflators come from the Bureau of Economic Analysis.

48. Calculated as (1,906 – 1,278) * 7,923 = 5 million. Lost jobs in this calculation do not necessarily mean unemployed workers, since the workers may find jobs outside the manufacturing sector.

49. US manufactured imports in 2013 were $1,830 billion at market prices. The implicit GDP deflator was 106.913 in 2013 and 111.440 in 2016 (2009 = 100). Trade data come from the United States International Trade Commission, available at https://dataweb.usitc.gov/, deflated by implicit GDP deflators reported by the Bureau of Economic Analysis.

50. See "Jobs Supported by Exports 2015: An Update," Office of Trade and Economic Analysis, International Trade Administration, Department of Commerce, April 8, 2016, available at http://www.trade.gov/mas/ian/build/groups/public/@tg_ian/documents/webcontent/tg_ian_005500.pdf (accessed on January 11, 2017).

51. $1 billion (measured on a nominal basis) of exported goods supported 5,279 and 9,903 jobs in 2015 and 2001, respectively. Implicit GDP deflators were 83.754, 109.998, and 111.440 in 2001, 2015, and 2016, respectively (2009 = 100). Implicit GDP deflators come from the Bureau of Economic Analysis. About 6 percent of exported goods are from the agriculture and mining sectors.

52. US exported $656.453 billion manufactured goods in 2001 (measured at market prices). Implicit GDP deflator was 83.754 in 2001 and 111.440 in 2016 (2009 = 100). Trade data comes from the United States International Trade Commission, available at https://dataweb.usitc.gov/ (accessed on February 10, 2017). GDP deflators come from the Bureau of Economic Analysis.

53. Calculated as (1,268 – 873) * 6,326.5 = 2.5 million. Expressed in annual terms: 2,500,000 / 16 = 156,250 jobs per year.

54. Calculated as 156,250 * (100% – 36%) = 100,000. The ITA does not distinguish between direct and indirect jobs supported by exports.

55. Net impact on manufacturing jobs = 312,500 * (40% + 24%) – 156,250 * (40% + 24%) = 100,000. Net impact on nonmanufacturing (mainly services) jobs = 312,500 * 36% – 156,250 * 36% = 56,250.

56. Data come from the Federal Reserve Bank of St. Louis, available at https://fred.stlouisfed.org/series/MANEMP#0 (accessed on February 22, 2017). Numbers are annual average.

Table 8 Estimated workers covered by certified TAA petitions, fiscal years 2003–15

Year	Estimate source: Congressional Research Service	Estimate source: DOL Annual Reports
2003	197,748	n.a.
2004	149,705	n.a.
2005	118,022	n.a.
2006	119,602	n.a.
2007	146,838	n.a.
2008	126,633	126,633
2009	201,774[a]	201,774[a]
2010	287,061	287,061
2011	103,283[b]	103,283[b]
2012	n.a.	81,510
2013	n.a.	104,158
2014	n.a.	67,738
2015	n.a.	57,631

n.a. = not available; DOL = Department of Labor; TAA = Trade Adjustment Assistance

a. The spike in the number resulted from the implementation of the 2009 program on May 18, 2009.
b. All petitions denied under the 2002 program were reconsidered under the expanded provisions of the 2011 program.

Sources: Trade Adjustment Assistance for Workers, Congressional Research Service, available at https://greenbook.waysandmeans.house.gov/sites/greenbook.waysandmeans.house.gov/files/2012/documents/R42012_gb.pdf; TAA Annual Reports, Department of Labor, available at https://www.doleta.gov/tradeact/docs/AnnualReport15.pdf, https://www.doleta.gov/tradeact/docs/AnnualReport14.pdf, https://www.doleta.gov/tradeact/docs/AnnualReport13.pdf, https://www.doleta.gov/tradeact/docs/AnnualReport12.pdf, https://www.doleta.gov/tradeact/docs/AnnualReport11.pdf.

on manufacturing jobs was a loss of about 100,000 jobs annually, accounting for 39 percent of total manufacturing job losses.

Workers adversely affected by manufactured imports

The previous calculation of 312,500 jobs affected by manufactured imports may seriously exaggerate the number of workers adversely affected by rising manufactured imports per year, judging from recent statistics on workers covered by TAA certifications.

TAA-certified workers could be adversely affected by manufactured imports or imports in other sectors. Therefore, workers adversely affected by manufactured imports are a subset of TAA-certified workers, but probably the dominant category.

According to the annual report by the United States Department of Labor (DOL), during fiscal year (FY) 2015, about 57,631 US workers were covered by certified TAA petitions.[57] Hence, the number of workers adversely affected by manufactured imports in 2015, which should be smaller than 57,631, is much lower than the previous estimation of 312,500 jobs affected by manufactured imports each year. Total funding for the TAA program during FY 2015 was $507 million, including $241 million allocated to TAA benefits, $236 million allocated to TAA training, and the remaining $30 million allocated to alternative/reemployment TAA.[58] Therefore, funding allocated to each worker averaged around $8,800.

Statistics on TAA certifications over past years also provides evidence that the 312,500 affected jobs estimate exaggerates the number of workers adversely affected by rising manufactured imports. Table 8 presents data on estimated workers covered by certified TAA petitions reported by the Congressional Research Service (CRS) and the DOL.[59] According to the DOL and the CRS, an average of roughly 136,000 persons per year were certified for TAA benefits between FY 2003 and 2015.

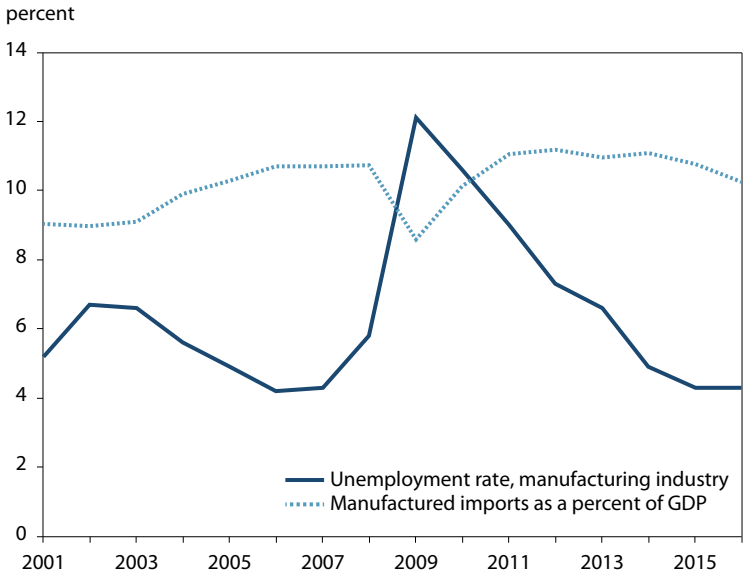
Obviously, the number of TAA-certified workers fluctuates with macroeconomic conditions. The average number of workers adversely affected by manufactured imports might be smaller than the 136,000 figure because, as mentioned before, workers can be adversely affected either by manufactured imports or other imports. However, not all workers who were adversely affected by imports necessarily applied for TAA benefits, and the eligibility requirements may exclude cases where imports had an adverse effect on

57. See "Trade Adjustment Assistance for Workers Program. Fiscal Year 2015" by Employment and Training Administration, United States Department of Labor, available at https://www.doleta.gov/tradeact/docs/AnnualReport15.pdf (accessed on February 10, 2017).

58. See *Federal Unemployment Benefits and Allowances* in "FY 2017, Department of Labor, Budget in Brief," available at https://www.dol.gov/sites/default/files/documents/general/budget/FY2017BIB_0.pdf (accessed on February 22, 2017). Total enacted TAA funding for FY 2016 was $802.5 million. The FY 2017 budget request was $849 million.

59. Public Citizen maintains a TAA database. However, that database reports "layoff date," which is "the date stated in a certification of eligibility to apply for TAA on which the total or partial separations of workers covered by the certification began or threatened to begin." This is different from the date that the DOL certified the petitions. Therefore, the figures from Public Citizen are different from those reported in table 8.

Figure 3 Unemployment rate and imports as a percent of GDP, manufacturing sector, 2001–16



Sources: Federal Reserve Bank of St. Louis, US International Trade Commission Interactive Tariff and Trade DataWeb, Bureau of Economic Analysis, and authors' calculations.

workers.[60] Hence, the average TAA number for the period 2003 to 2015 (about 136,000 persons) probably understates the number of workers adversely affected by manufactured imports.

Even taking a reasonable degree of bias into consideration, the number of workers adversely affected by manufactured imports should be far below the annual average figure of 312,500 import-affected jobs estimated for 2001 to 2016.

Furthermore, the concept of workers adversely affected by imports covers a broader range than workers displaced by imports. Therefore, the calculation of 312,500 jobs affected by manufactured imports annually not only exaggerates the number of workers adversely affected by manufactured imports, but also undoubtedly overstates the number of workers displaced by manufactured imports.

Reinforcing this observation, figure 3 portrays a comparison of manufactured imports, expressed as a percent of GDP, and unemployment among manufacturing workers. The correlation between annual changes in these two series is –0.76. This strong negative correlation suggests that when manufactured imports rise, the unemployment rate in the manufacturing sector actually falls. A strong economy lifts all boats, implying that calculations of import-affected jobs generally do not track actual factory layoffs.

Displaced workers for all causes

The BLS defines displaced workers as "persons 20 years and over who lost or left jobs because their plant or company closed or moved, there was insufficient work for them to do, or their position or shift was abolished." As mentioned previously, it should be noted that workers are often displaced for reasons other than trade—in particular, industrial automation and firm closures owing to domestic competition.

Every two years, the BLS conducts surveys on displaced workers. Table 9 presents total numbers of displaced workers reported by the BLS from 2001 to 2015.[61]

Similar to the number of workers covered by certified TAA petitions, the displaced worker figures are closely related to macroeconomic conditions. Displacements peaked

60. Another reason that TAA-certified workers fluctuate is that the Trade Act of 1974 has been amended many times since its enactment. Hence, TAA operated under different provisions during fiscal years 2003–15. See "Trade Adjustment Assistance for Workers Programs: Statutes," Employment and Training Administration, United States Department of Labor, available at https://www.doleta.gov/tradeact/statutesregs.cfm, for most recent amendments since 2002. See *Appendix A* in "Trade Adjustment Assistance for Workers Program. Fiscal Year 2015" by Employment and Training Administration, United States Department of Labor, available at https://www.doleta.gov/tradeact/docs/AnnualReport15.pdf, for a comparison of TAA programs covered by different provisions.

61. The number for total displaced workers includes both those who lost jobs that they had held for at least three years (long-tenured workers), and those who were displaced from jobs that they had held for less than three years (short-tenured workers) during the survey period.

Table 9 Displaced workers (in thousands)

Survey period	Total displaced workers	Annual average
2001–03	11,421	3,807
2003–05	8,149	2,716
2005–07	8,250	2,750
2007–09	15,429	5,143
2009–11	12,854	4,285
2011–13	9,529	3,176
2013–15	7,440	2,480

Source: Bureau of Labor Statistics Worker Displacement News Releases.

during the Great Recession and have declined since then. In recent years, the number of displaced workers for all causes has dropped below precrisis levels.

As discussed in the previous section, the estimation of 312,500 jobs per year affected by manufactured imports undoubtedly exaggerates the number of workers displaced by manufactured imports. Therefore, at most, increased manufactured imports accounted for no more than 10 percent of displaced workers for all reasons during the period 2001–15.

(B) Private costs of workers adversely affected by imports

Previous analysis on jobs and workers clearly shows that international trade creates losers. This section evaluates private costs of adversely affected workers from the perspective of forgone wages. Estimates for these costs use key parameters and assumptions (see box 1) based on the most recent BLS survey on displaced workers.[62] The analysis in this section assumes that adversely affected workers share the same characteristics as displaced workers and that each worker retires at the age of 65.

The reported average number of adversely affected workers was 136,000 per year during the fiscal years 2003–15, though this is probably a lower bound figure. It is assumed, on the pessimistic side, that the 16.5 percent of the adversely affected workers who were not in the labor force when the survey was conducted will never return to the labor force, and that this group of workers are 50 years old on average (box 2 explains how estimated average ages are calculated for each group of adversely affected workers). Therefore, this group loses around $15.5 billion in lifetime wages.[63]

The 16.9 percent unemployed adversely affected workers are assumed to be 40 years old on average (see box 2). Additionally, it is assumed that it takes them two years on average to find new jobs, and their new jobs pay at the same wage level. Thus, the two-year unemployment period costs them $2.1 billion.[64]

Lastly, the 66.5 percent reemployed adversely affected workers are assumed to be 40 years old on average as well (see box 2). It is assumed that those reemployed adversely affected workers who experienced a wage loss (gain) of over 20 percent had a loss (gain) of 30 percent on average, and that those who had a wage loss (gain) of between zero and 20 percent had a loss (gain) of 10 percent.[65] Moreover, this group of reemployed adversely affected workers hold their new jobs until retirement, and they do not experience further wage changes. According to the BLS survey (box 1), 28 percent of the 66.5 percent reemployed adversely affected workers had a wage loss of more than 20 percent, and 19 percent had a wage loss under 20 percent. Therefore, these groups lose $8.7 billion and $2.0 billion in lifetime wages, respectively.[66] Apart from these workers who experienced wage losses, other reemployed adversely affected workers earned more in their new positions. Of the 66.5 percent reemployed adversely affected workers, 21 percent had a wage gain of over 20 percent, and 32 percent earned zero to 20 percent more. Hence, they gained $6.5 billion and $3.3 billion in lifetime wages, respectively.[67]

Summing the values, the *gross* private costs of adversely affected workers from 2003 to 2015 were estimated to average around $28.3 billion per year, and the *net* private costs (taking into account the workers who earned higher wages in their new positions) were around $18.4 billion annually.[68]

The foregoing calculations suggest that, on average during the last 13 years, each year a new cohort of adversely affected workers experienced lifetime earnings losses of about

62. See *Worker Displacement: 2013–15*, Bureau of Labor Statistics, August 25, 2016, available at https://www.bls.gov/news.release/pdf/disp.pdf (accessed on February 9, 2017).

63. Calculated as 883.17 * 52 * (65 – 50) * 136,000 * 16.5% = $15.458 billion.

64. Calculated as 883.17 * 52 * 2 * 136,000 * 16.9% = $2.111 billion.

65. For example, if worker A had a wage cut of 50 percent, and worker B had a wage cut of 25 percent, both are assumed to have had a wage loss of 30 percent; if worker C had a wage increase of 15 percent, and worker D had an increase of 5 percent, both are assumed to earn 10 percent more in their new jobs.

66. Calculated as 883.17 * 0.3 * 52 * (65 – 40) * 136,000 * 66.5% * 28% = $8.722 billion and 883.17 * 0.1 * 52 * (65 – 40) * 136,000 * 66.5% * 19% = $1.973 billion.

67. Calculated as 883.17 * 0.3 * 52 * (65 – 40) * 136,000 * 66.5% * 21% = $6.541 billion and 883.17 * 0.1 * 52 * (65 – 40) * 136,000 * 66.5% * 32% = $3.323 billion.

68. The *gross* private costs per year were calculated as 8.722 + 1.973 + 2.111 + 15.458 = $28.264 billion. The *net* private costs per year were calculated as 8.722 + 1.973 + 2.111 + 15.458 – 3.323 – 6.541 = $18.399 billion.

Box 1 Bureau of Labor Statistics survey on displaced workers, 2013–15

According to the BLS, of all displaced workers, 66.5 percent had been reemployed (full-time, part-time, or self-employed) by the time the survey was conducted, 16.9 percent were still unemployed, and the remaining 16.5 percent had left the labor force.[a]

The BLS reports changes in earnings of reemployed (on a full-time basis) long-tenured displaced workers.[b] All 66.5 percent reemployed displaced workers (long- and short-tenured) are assumed to have been employed on a full-time basis, and that the same pattern of changes in earnings for long-tenured displaced workers holds for short-tenured displaced workers who were reemployed. Of these 66.5 percent displaced workers who lost full-time wage and salary jobs during the survey period and were reemployed on a full-time basis, 28 percent incurred an earnings loss of 20 percent or more in their new jobs after the displacement episode, 19 percent experienced a wage loss of less than 20 percent, 32 percent earned zero to 20 percent more than the last job, and 21 percent earned 20 percent or more than the last job.[c] This array of outcomes forms the basis of calculations in this Policy Brief.

Finally, this analysis assumes that each displaced worker was making $883.17 per week, the average weekly earnings of all employees in 2016.[d]

a. See table 8 in *Worker Displacement: 2013–15*, Bureau of Labor Statistics, August 25, 2016, available at https://www.bls.gov/news.release/pdf/disp.pdf (accessed on February 9, 2017).

b. See table 7 in *Worker Displacement: 2013–15*, Bureau of Labor Statistics, August 25, 2016, available at https://www.bls.gov/news.release/pdf/disp.pdf (accessed on February 9, 2017). Those who lost jobs that they had held for at least three years during the survey period are long-tenured workers, and those who were displaced from jobs that they had held for less than three years are short-tenured workers.

c. See table 7 in *Worker Displacement: 2013–15*, Bureau of Labor Statistics, August 25, 2016, available at https://www.bls.gov/news.release/pdf/disp.pdf (accessed on February 9, 2017).

d. Data comes from the Federal Reserve Bank of St. Louis, available at https://fred.stlouisfed.org/series/CES0500000011#0 (accessed on February 9, 2017).

$28.3 billion. Since the number of reported adversely affected workers may be understated, it is better to say that the average annual private costs were between $28 billion and $40 billion, allowing for a possible understatement of 30 percent. By comparison, just considering expanded trade since 2003, the national economy gained $191 billion in 2016. Calculated this way, the ratio of annual national gains to annual private costs is around 5 to 1.[69] The ratio would be much higher if trade expansion over the entire post-WWII period were considered: The benefit-cost ratio is roughly 51 to 1 for that time range.[70] Gains from trade expansion recur and cumulate year after year, while private costs are limited in time for each cohort of affected workers. But gains are widely distributed while costs are highly concentrated.[71] That explains why political hostility to trade expansion deviates so far from the economic contrast between national gains and private costs.

(C) Better programs for displaced workers

Previous arithmetic shows that although gains from expanded trade are significant and durable, the assistance offered to those who are adversely affected deserves far more attention. Unless the government does a better job in compensating the unfortunate losers, opposition to globalization will continue. An overhaul of the social safety net is beyond the purview of this Policy Brief; instead, it discusses possible improvements in programs currently available.

Lawrence (2014) and Lawrence and Moran (2016) recommended a TAA program with a more generous wage-loss insurance program in the context of a possible China-US trade and investment agreement and the Trans-Pacific Partnership.[72] While TAA is a program that specifically benefits workers adversely affected by imports, Lawrence and Moran argued for a more general adjustment assistance program that does not distinguish between displaced workers based on the reasons of their displacement. They viewed wage insurance as a better way to mitigate adjustment costs than extended unemployment benefits or other possible plans.

While in agreement with Lawrence and Moran's recommendation, this Policy Brief advocates an expansion of the Earned Income Tax Credit (EITC) program rather than TAA. Under the current EITC, qualified low-income and moderate-income working people can receive a certain amount of income tax credit subject to an annual cap of

69. Calculated as 191 / 40 = 4.775.

70. Calculated as 2,056 / 40 = 51.4.

71. Gains from trade disproportionately raise the real incomes of poorer consumers, as explained in footnote 1, but the political economy point is that costs to displaced workers are much more concentrated than gains to consumers writ large.

72. Wage insurance schemes can lead to moral hazard: Knowing that their employees will be partly compensated through the scheme, some employers may offer lower wages (World Bank 2017). Moral hazard is a side effect of all forms of insurance, whether for health, fire, casualty, or anything else. The moral hazard effect seems small but not trivial for wage insurance.

Box 2 Calculating estimated average ages for displaced workers

The Bureau of Labor Statistics survey on displaced workers covers different characteristics of workers who lost jobs. Table B2.1 summarizes statistics on displaced workers by age and employment status reported in table 8 of the most recent BLS survey. The arithmetic that follows illustrates the calculations used to estimate the average age of the 16.5 percent displaced workers who were not in the labor force in January 2016, when the survey was conducted.

First, calculate the number of workers in each age group:

a. 20 to 24 years = 708 * 0.173 = 122.484;
b. 25 to 54 years = 4,972 * 0.115 = 571.78;
c. 55 to 64 years = 1,386 * 0.225 = 311.85;
d. 65 years and over = 374 * 0.594 = 222.156;
e. Total, 20 years and over = 7,440 * 0.165 = 1,227.6.

Second, make assumptions for the average age of workers in each age group:

a. Workers in the group of 20 to 24 years are all assumed to be 22 years;
b. Workers in the group of 25 to 54 years are all assumed to be 40 years;
c. Workers in the group of 55 to 64 years are all assumed to be 60 years;
d. Workers in the group of 65 years and over are all assumed to be 75 years.

Third, calculate the average age of the 16.5 percent displaced workers who were not in the labor force:

The average age = (122.484 * 22 + 571.78 * 40 + 311.85 * 60 + 222.156 * 75) / 1,227.6 = 49.640, or approximately 50 years old.

The exercise is repeated for the 16.9 percent unemployed displaced workers and the 66.5 percent reemployed displaced workers. Results show that the average age of both groups is around 40 years old (42.3 years old for unemployed displaced workers and 42.6 for reemployed displaced workers).

As mentioned before, the analysis in this section assumes that adversely affected workers share the same characteristics as displaced workers. Therefore, the above estimated ages for displaced workers also apply to adversely affected workers.

Table B2.1 Total displaced workers by age and employment status in January 2016

		Percent distribution by employment status			
Age group	Total (thousands)	Total	Employed	Unemployed	Not in the labor force
20 to 24 years	708	100.0	62.5	20.2	17.3
25 to 54 years	4,972	100.0	71.3	17.1	11.5
55 to 64 years	1,386	100.0	61.0	16.6	22.5
65 years and over	374	100.0	30.8	9.7	59.4
Total, 20 years and over	7,440	100.0	66.5	16.9	16.5

Source: Worker Displacement: 2013–15, Table 8, Bureau of Labor Statistics, August 25, 2016, available at https://www.bls.gov/news.release/pdf/disp.pdf (accessed on April 26, 2017).

$6,269 (Tax Year 2016 maximum amount), depending on the petitioner's number of qualifying children.[73] Of course the petitioner must have a job to be eligible for EITC; the program is designed to encourage gainful employment. Appendix C provides an overview of the current EITC program.

The EITC system has three virtues compared to TAA: It covers all workers, it encourages unemployed persons to find a job, and it is more popular with Congress (especially Republican members) than TAA.

73. See "2016 EITC Income Limits, Maximum Credit Amounts and Tax Law Updates," available at https://www.irs.gov/credits-deductions/individuals/earned-income-tax-credit/eitc-income-limits-maximum-credit-amounts, for more details (accessed on May 4, 2017).

In recent years, bipartisan proposals to expand EITC benefits have been floated, including plans by then-President Barack Obama,[74] House Speaker Paul Ryan (R-WI),[75] and other congressmen such as Senator Marco Rubio (R-FL)[76] and Representative Richard Neal (D-MA).[77] Common suggestions are to increase the maximum credit for workers without qualifying children (only $506 for Tax Year 2016) and extend the age limits for childless workers (currently between 25 and 65).

To meet the needs of all displaced workers (whatever the cause), this Policy Brief advocates legislation to expand the coverage of EITC from low-income and moderate-income working people to cover all displaced workers who incur an earnings loss of 20 percent or more in their new jobs after the displacement episode. Moreover, EITC benefits should be more generous for those people. Finally, to assist displaced workers while unemployed and searching for new jobs, benefits during the standard 26 weeks of unemployment insurance (UI) should be increased by 50 percent to approximately $517 per person per week.[78] The next two subsections estimate adjustment costs of an expanded EITC and a more generous UI program, and discuss funding.[79]

74. See "Proposed Tax Changes in President Obama's Fiscal Year 2016 Budget," Tax Foundation, February 11, 2015, available at https://taxfoundation.org/proposed-tax-changes-president-obama-s-fiscal-year-2016-budget/ (accessed on February 15, 2017).

75. See "The Earned Income Tax Credit" in *Expanding Opportunity in America: A Discussion Draft from the House Budget Committee*, July 24, 2014, available at http://budget.house.gov/uploadedfiles/expanding_opportunity_in_america.pdf (accessed on February 17, 2017).

76. See "Rubio Delivers Address on 50th Anniversary of the 'War on Poverty'," available at http://www.rubio.senate.gov/public/index.cfm/press-releases?ID=958d06fe-16a3-4e8e-b178-664fc10745bf (accessed on February 17, 2017).

77. See "H.R.902 – Earned Income Tax Credit Improvement and Simplification Act 2015," available at https://www.congress.gov/bill/114th-congress/house-bill/902/text (accessed on February 17, 2017).

78. According to the Employment and Training Administration under the United States Department of Labor, the average weekly unemployment insurance benefit amount at the national level was $344.43 in 2016. $344.43 * (1 + 50%) = $517. Data is available at https://workforcesecurity.doleta.gov/unemploy/claimssum.asp (accessed on February 23, 2017).

79. Better labor mobility is an important way to mitigate trade adjustment costs. The World Bank (2017) discusses frictions that discourage workers from switching jobs. Although this Policy Brief does not address mobility issues directly, the proposed EITC expansion, supplemented with a more generous UI program, indirectly offsets limited labor mobility. Apart from labor market policies, complementary policies in housing, education, and credit can also facilitate the adjustment process (World Bank 2017).

(D) Adjustment costs

This section estimates adjustment costs of a more generous UI program and an expanded EITC system for displaced workers. According to the BLS, from January 2013 through December 2015, a total of 7,440,000 workers, or 2,480,000 workers each year, were displaced. This number includes both long-tenured and short-tenured displaced workers.[80] The following calculations on adjustment costs draw on statistics reported in the BLS survey, summarized in box 1.

Assuming on a pessimistic side, the 16.9 percent unemployed displaced workers will never find a job and exit the labor force, and the 16.5 percent of the displaced workers who left the labor force when the survey was conducted will never return to the labor force. Therefore, these 33.4 percent of the displaced workers will be eligible for UI benefits for 26 weeks. As discussed in the previous section, this Policy Brief proposes increasing the standard 26 weeks of UI benefits to approximately $517 per person per week. Therefore, the annual costs of *additional* UI benefits for these 33.4 percent of the displaced workers are $3.72 billion.[81]

Now consider the 66.5 percent reemployed displaced workers. Again, assume on a pessimistic side that it takes these workers 26 weeks to search for and find a new job. Additionally, assume that each reemployed displaced worker keeps the new job until retirement. Therefore, this group will also receive *additional* UI benefits for 26 weeks. This adds $7.40 billion to annual costs.[82]

After the 26-week unemployment episode, 28 percent of the 66.5 percent reemployed workers incur a wage loss of 20 percent or more compared to their previous jobs. This Policy Brief proposes expanded EITC benefits to these displaced workers for up to three years. The EITC amount each worker would receive equals the size of his or her wage loss in excess of 20 percent. For example, suppose a displaced worker finds a job that pays 30 percent less than his last job. Under the expanded EITC system, he would receive EITC benefits equal to 10 percent of his previous wage for up to three years. Again, assume on a pessimistic side that all of the hard hit but reemployed workers experienced a wage cut of 50 percent. Assuming that the displaced workers were making on average $883.17 per week, each of the hard-hit reemployed workers who takes on a job that pays only $441.58 a week (883.17 * 50 percent) will receive an EITC of $264.95 per week (883.17 * (50 percent – 20 percent) = $264.94). Therefore,

80. Those who lost jobs that they had held for at least three years during the survey period are long-tenured workers, and those who were displaced from jobs that they had held for less than three years are short-tenured workers.

81. Calculated as 2,480,000 * (16.9% + 16.5%) * (517 – 344.43) * 26 = $3.72 billion.

82. Calculated as 2,480,000 * 66.5% * 26 * (517 – 344.43) = $7.40 billion.

the expanded EITC would cost $6.36 billion for each year of benefits for eligible workers once reemployed.[83]

Summing these values, the costs of a more generous UI program and an expanded EITC that covers reemployed displaced workers who experience a wage loss of more than 20 percent are estimated to average $30.2 billion annually, for each year's cohort of displaced workers, assuming three years of benefits.[84] Of the $30.2 billion annual cost, $19.08 billion are attributed to the expanded EITC, and the remaining $11.12 billion are attributed to the enlarged UI program. It should be noted that the $30.2 billion annual cost is the estimation of adjustment programs that cover *all* displaced workers. As previously discussed in subsection (A), a substantial share of workers are displaced through industrial automation. Hence, only a small percentage of this $30.2 billion annual cost, maybe around 20 percent (roughly $6 billion), would be allocated to workers displaced by imports.

The adjustment cost attributable to trade-displaced workers under the proposed expanded UI program and EITC—$6 billion—is much lower than the previous estimate of the private costs of workers adversely affected by imports in subsection (B)—$28 billion to $40 billion. The main reasons for the difference are: First, adjustment costs are limited to three years of EITC benefits, whereas private costs are assumed to endure for the worker's entire career; and second, adjustment costs are limited to compensation for wage losses in excess of 20 percent in the new job, whereas private costs reflect all wage losses.

(E) Funding of the adjustment programs

The proposed reforms to enlarge UI benefits and to extend EITC would entail the kind of budget outlays that conservative members of Congress generally oppose. Given the current political climate, this is not an auspicious moment for such reforms. When the political climate changes, one possible way to fund adjustment programs is to add a small additional tax to the existing Federal Insurance Contributions Act (FICA) tax to cover the expanded EITC, and to apply a higher rate on the Federal Unemployment Tax Act (FUTA) tax to cover the enlarged UI benefits.[85]

The FICA tax is imposed to finance Social Security and Medicare. In 2015, FICA taxes paid to Social Security and Medicare were $1,564.7 billion, of which the Social Security portion was $920.2 billion.[86] The calculation above suggests that an expanded EITC would cost $19.08 billion each year. This would require an increase of 2.1 percent in the Social Security tax revenue.[87]

For 2017, the Social Security tax rate is 6.2 percent each for the employee and employer.[88] Hence, to fund the cost of the expanded EITC, the Social Security tax rate would need to increase by 0.13 percentage point each for the employee and the employer.[89] Rounded down, the increase would be 0.1 percentage point each.

The FUTA tax rate for employers not subject to a FUTA credit reduction is usually 0.6 percent.[90] In 2017, the average state rate for new employers is roughly 2.4 percent.[91] Therefore, the combined FUTA tax rate is around 3 percent for employers.

Previous calculations indicate that the enlarged UI benefits will cost an additional $11.12 billion each year. Total UI benefits paid in 2016 were $31.7 billion.[92] Therefore, the FUTA tax rate would need to be increased by 1.05 percentage points to cover a more generous UI program.[93] Rounded down, the increase would be 1.0 percentage point.

Even in a very good political climate, increasing the FICA tax rate by 0.1 percentage point and the FUTA tax rate by 1.0 percentage point would be highly controversial. However, without a stronger safety net for displaced workers, it will be hard to foster greater US integration with

83. Calculated as 2,480,000 * 66.5% * 28% * 883.17 * 30% * 52 = $6.36 billion.

84. Calculated as 3.72 + 7.40 + 6.36 * 3 = $30.2 billion. It is assumed that all of the 3-year EITC benefits are distributed to eligible displaced workers in the year they are displaced.

85. The FICA tax is imposed on both employers and employees, and the FUTA tax is imposed on employers. See "Topic 754 - Social Security and Medicare Withholding Rates," available at https://www.irs.gov/taxtopics/tc751.html, and "Unemployment Insurance Tax Topic," available at https://workforcesecurity.doleta.gov/unemploy/uitaxtopic.asp, for more information.

86. See "Status of the Social Security and Medicare Programs: A summary of the 2016 annual reports," available at https://www.ssa.gov/oact/TRSUM/tr16summary.pdf (accessed on March 28, 2017).

87. Revenue from the Social Security tax should increase by 19.08 / 920.2 * 100% = 2.1 percent.

88. See "Publication 15 - Introductory Material," available at https://www.irs.gov/publications/p15/ar01.html (accessed on March 16, 2017).

89. Calculated as 6.2 * 2.1% = 0.1302 percentage points.

90. See "Unemployment Insurance Tax Topic," available at https://workforcesecurity.doleta.gov/unemploy/uitaxtopic.asp, for more information.

91. Calculated based on current tax rates for individual states. Data come from "Significant Provisions of State Unemployment Insurance Laws Effective January 2017," available at https://workforcesecurity.doleta.gov/unemploy/uitaxtopic.asp (accessed on March 16, 2017). Rates for new employers are not available for Louisiana, Montana, New Mexico, Utah, Washington, and Wyoming.

92. Data is available at https://workforcesecurity.doleta.gov/unemploy/claimssum.asp (accessed on February 23, 2017).

93. Calculated as 3 * (11.12 / 31.7 * 100%) = 1.05 percentage points.

the global economy. Indeed, the backlash against globalization may metastasize to a backlash against automation and artificial intelligence, which are much larger causes of worker displacement than imports.

VII. CONCLUDING REMARKS

International trade expanded dramatically after WWII and propelled world economic growth. This Policy Brief summarizes a previous chapter by Bradford et al. (2005) that estimated the payoff to America from global integration and updates the results to 2016. The calculations suggest that past integration through policy liberalization and technology advances generated annual and recurring income gains of roughly $2.1 trillion in 2016 for the United States. This translates to an increase of $7,014 in GDP per capita and $18,131 in GDP per household of 2.64 persons. Estimated future gains that the United States might realize from fresh policy liberalization are $540 billion, implying that US GDP per capita could increase by $1,670, and US GDP per household could rise by $4,400 by 2025. These are potential gains from worldwide lower tariffs and reduced logistics costs on traded goods, and lower barriers to services trade. Substantial additional gains might be delivered by technological advances that reduce the cost of distance between countries.

Although gains from liberalization are estimated to be significant, expanded trade also entails adjustment costs. Policymakers should pay special attention to displaced workers. Estimates indicate that a *net* of roughly 156,250 jobs were adversely affected annually by increased trade in the manufacturing sector over the past 13 years. Gross private costs of workers adversely affected by trade are estimated to be between $28 billion and $40 billion per year. A comprehensive adjustment program should address all displaced workers rather than just job losses related to trade. A more generous UI program coupled with expanded EITC benefits would cost an estimated $30 billion annually. However, *permanent* gains from liberalization and technology advances far outweigh *temporary* adjustment costs. Adjustment costs should not be used as a reason to say "no" to liberalization or new technology. Free trade, like technological advances, will continue to raise incomes and the standard of living, but sharply improved adjustment programs are needed to compensate those who lose both from deeper integration and from newer technology.

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APPENDIX A

This appendix summarizes three alternative methods of calculating gains from globalization, as spelled out in Bradford et al. (2005).[94]

SIFTING AND SORTING: ENHANCED FIRM PRODUCTIVITY

This approach emphasizes the connection between liberalization and productivity gains at a micro level—individual firms. Traditional trade models (the Ricardian model, for example) focus on differences across countries and/or industries and show how comparative advantage drives international trade. More recent trade theories focus on differences between high-productivity and low-productivity firms in the same industry. As barriers to foreign markets come down, the more productive firms expand while less productive firms contract or even shut down. In the end, this "sifting and sorting" mechanism raises the overall productivity level of each industry, whether engaged in competing with imports or selling abroad.

A simulation by Bernard et al. (2003) suggested that a 5 percentage-point reduction in global trade barriers (tariffs and other costs expressed on an *ad valorem* basis) boost US manufacturing productivity by 4.7 percent. Bradford et al. (2005) simplified this coefficient to a one-to-one relationship to calculate US productivity gains from sifting and sorting. Based on these productivity gains, Bradford et al. (2005) estimated that, in 2003, the United States was $633 billion (5.8 percent of GDP) richer because of enhanced globalization of the economy between 1947 and 2002.

As the sifting and sorting method only measures gains on the production side, Bradford et al. (2005) combined the results with gains on the consumption side from greater variety. The combined result is an increase of 8.6 percent of GDP in 2003 dollars.[95] This transforms to gains of roughly $940 billion in GDP, $3,200 in GDP per capita, and $8,400 in GDP per household. These figures primarily measure gains as a result of changes in public policies, as opposed to the higher estimates from the OECD output elasticity method, which includes gains from policy liberalization and technological advances. Therefore, these are conservative estimates.

SMOOT-HAWLEY CGE: WRITING HISTORY BACKWARD

Bradford and Lawrence (2004b) constructed a counterfactual world where postwar liberalization had never happened by using a CGE model. They found that if the United States reverted to the highly restrictive Smoot-Hawley Tariff of 1930, US GDP would have been 2.4 percent lower in 2003. If US trading partners all retaliated by imposing similar restrictive tariffs on US exports, US GDP would have been 4.5 percent lower.

The counterfactual Smoot-Hawley CGE model did not reflect gains resulting from lower transportation and telecommunication costs, nor technology spillovers from deeper global integration. For these reasons, the counterfactual Smoot-Hawley CGE calculations are conservative.

Bradford et al. (2005) combined the counterfactual simulation with product variety estimates and concluded that US GDP was around $800 billion (7.3 percent of GDP) higher in 2003 because of liberalization. Gains in US GDP per capita and US GDP per household were roughly $2,800 and $7,100, respectively.

INTERMEDIATE IMPORTS: HIGHER LABOR PRODUCTIVITY

Another approach drew on David Richardson's (2005) extension on the basic growth accounting model that includes productivity gains from imported intermediate inputs. The extended growth accounting model is:

$$Q = A (L, K, M) \qquad (1)$$

94. One of the channels through which trade increases income is import competition. On the consumption side, consumers enjoy lower prices and greater varieties. Broda and Weinstein (2004) estimated the increase in consumer purchasing power to be equivalent to a 2.8 percent increase in GDP. Bradford et al. (2005) combined this estimated gain from product variety with gains estimated by using sifting and sorting and Smoot-Hawley CGE methods to get total payoff from trade expansion.

95. Calculated as 5.8 percent (from sifting and sorting) + 2.8 percent (from greater product variety) = 8.6 percent.

where Q = total production, defined as value added, or GDP,
A = technological knowledge,
L = labor,
K = physical and human capital, and
M = imported inputs.
Dividing equation (1) by L expresses the production function on a per worker basis:

$$q = A(k, m) \quad (2)$$

Let %Δ denote the percentage change in a variable. Equation (2) can be further expressed as:

$$\%\Delta q = \%\Delta A + S_k\%\Delta + S_m\%\Delta m \quad (3)$$

where S_k = the share of capital (physical and human) in total production costs (measured in percent of GDP), S_m = the share of imported inputs in total production costs.

Based on statistics of S_m and $\%\Delta m$ (derived from changes in M and L) between 1989 and 2000, Bradford et al. (2005) calculated growth in output per worker due to intermediate import deepening over the specified period, and the corresponding gains in GDP, GDP per capita, as well as output per household. They performed similar analyses over each subperiod from 1961 to 1989.[96] The final estimates arrived at a $1,058 billion payoff from globalization, or an additional $3,635 in GDP per capita and $9,377 in GDP per household.

96. Analyses were done for periods 1961–68, 1968–75, 1975–82, and 1982–89 separately.

APPENDIX B IMPACT OF ALL IMPORTS AND EXPORTS ON JOBS

This Policy Brief classifies the 206 sectors covered by the BLS employment requirements matrix into two broad sectors: the goods sector and the services sector.[97] Similarly, average direct and indirect jobs per $1 million output of goods and services that correspond to an equal value and composition of imports of goods and services are calculated as the weighted average of jobs supported per $1 million output of each sector (the goods sector and the services sector).[98] The weight each sector carries depends on that sector's share in total imports: According to trade data reported by the Census Bureau, goods account for about 83.9 percent of total US imports, and services account for the remaining 16.1 percent.[99]

The calculation indicates that a $1 billion increase (measured in 2016 prices) in US output corresponding to the composition of US imports of goods and services would increase the number of direct and indirect jobs by 9,603 in 2001 and 7,000 in 2014.[100] The average of the two numbers is 8,301.5 jobs. Similarly, assume that each dollar increase in US imports decreases US output by one dollar. Applying the average coefficient of 8,301.5 jobs to increases in US imports of goods and services between 2001 and 2016 ($894 billion in 2016 prices) arrives at a *gross* of roughly 7.4 million jobs, or around 463,000 US jobs per year, that were affected by imports.[101]

US exports of goods and services increased from $1,339 billion in 2001 to $2,212 billion in 2016 (both measured in 2016 dollars).[102] According to the report by the International Trade Administration, $1 billion (measured in 2016 prices) of exports of goods and services supported 5,890 jobs in 2015 and 7,890 jobs in 2001.[103] Taking the average of the two coefficients (6,890 jobs) and applying to increases in US exports between 2001 and 2016 arrives at a *gross* gain of about 6 million jobs, or roughly 375,000 US jobs per year.[104]

The foregoing calculations suggest that during the period 2001 to 2016, *net* jobs affected by imports and supported by exports were roughly 1.4 million, or around 88,000 jobs per year.

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97. NAICS sectors 11 (Agriculture, Forestry, Fishing and Hunting), 21 (Mining, Quarrying, and Oil and Gas Extraction), and 31–33 (Manufacturing) are considered here to be the goods sector, and all remaining NAICS sectors as the services sector.

98. Different from the previous analysis on the manufacturing sector, which is performed on a micro-level, the analysis here is performed on a more aggregate level because data on services imports by NAICS sectors are not available.

99. These weights are the average of 2001 and 2014 levels.

100. $1 billion (measured in 2009 prices) output supported 10,702 jobs in 2001 and 7,801 jobs in 2014. Implicit GDP deflator was 100 in 2009 and 111.440 in 2016 (2009 = 100). GDP deflators come from the Bureau of Economic Analysis.

101. US total imports equaled $1,367 billion and $2,713 billion in 2001 and 2016 (both measured at market prices), respectively. Implicit GDP deflators were 83.754 in 2001 and 111.440 in 2016. Therefore, increases in imports were $2,713 – $1,367 * (111.440 / 83.754) = $894 billion in 2016 prices. Trade data come from the Bureau of Economic Analysis Table 1.1 US International Transactions, and implicit GDP deflators come from the Bureau of Economic Analysis Table 1.1.9 Implicit Price Deflators for Gross Domestic Product.

102. US total exports equaled $1,006 billion in 2001 and $2,212 billion in 2016 (at market prices). Implicit GDP deflator was 83.754 in 2001 and 111.440 in 2016. Trade data come from the Bureau of Economic Analysis Table 1.1 US International Transactions, and implicit GDP deflators come from the Bureau of Economic Analysis Table 1.1.9 Implicit Price Deflators for Gross Domestic Product.

103. Jobs supported per $1 million (at market prices) in US exports were 5,967 in 2015 and 10,498 in 2001. Implicit GDP deflators were 83.754, 109.998, and 111.440 in 2001, 2015, and 2016, respectively (2009 = 100). Implicit GDP deflators come from the Bureau of Economic Analysis. See "Jobs Supported by Exports 2015: An Update," Office of Trade and Economic Analysis, International Trade Administration, Department of Commerce, April 8, 2016, available at http://www.trade.gov/mas/ian/build/groups/public/@tg_ian/documents/webcontent/tg_ian_005500.pdf (accessed on January 11, 2017).

104. Calculated as 6,890 * (2,212 – 1,339) = 6 million.

APPENDIX C EARNED INCOME TAX CREDIT: AN OVERVIEW

The Earned Income Tax Credit (EITC) is a benefit for low-income and moderate-income working people. To qualify for EITC, a person must have earned income and adjusted gross income within certain limits and meet specific rules detailed by the Internal Revenue Service, depending on whether the person has qualifying children or not.[105] For tax year 2015, the average EITC amount each person received was about $2,455. A total of 27 million qualified workers and families received more than $67 billion EITC benefits.[106]

Table C.1 presents income limit requirements of EITC. Workers who earn less than corresponding limits and meet other eligibility requirements are able to receive certain amounts of income tax credits subject to maximum credit amounts.

For a qualified petitioner, his EITC "phases in" at a certain rate with each dollar earned, until his EITC reaches the maximum amount. The income level that hits the maximum credit amount is considered the level where the "phase-in" ends. As his income continues to increase over the level at which the "phase-in" ends, the amount of EITC he receives still equals the maximum credit amount, until his earnings hit the "phase-out" level. Then each dollar he earns decreases his EITC at a certain rate, or in other words, his EITC benefits "phase out" gradually. The EITC completely phases out if his income hits the income limits presented in table C.1. Tables C.2 and C.3 summarize key parameters of EITC benefits under different scenarios during tax year 2016, and figure C.1 provides a visual illustration of how the program works for single filers.

Table C.1 Earned income and adjusted gross income limits

	Qualifying children claimed			
Filing status	**0**	**1**	**2**	**3 or more**
Single, head of household, or widowed	$14,880	$39,296	$44,648	$47,955
Married filing jointly	$20,430	$44,846	$50,198	$53,505

Source: Internal Revenue Service.

Table C.2 Earned income tax credit parameters (single filing status)

Number of qualifying children	Phase-in rate (percent)	Earned income amount	Maximum amount of credit	Threshold phase-out amount	Phase-out rate (percent)	Completed phase-out amount
0	7.65	$6,610	$506	$8,270	7.65	$14,880
1	34.00	$9,920	$3,373	$18,190	15.98	$39,296
2	40.00	$13,930	$5,572	$18,190	21.06	$44,648
3 or more	45.00	$13,930	$6,269	$18,190	21.06	$47,955

Source: Policy Basics: The Earned Income Tax Credit, Center on Budget and Policy Priorities, http://www.cbpp.org/research/federal-tax/policy-basics-the-earned-income-tax-credit.

Table C.3 Earned income tax credit parameters (married filing status)

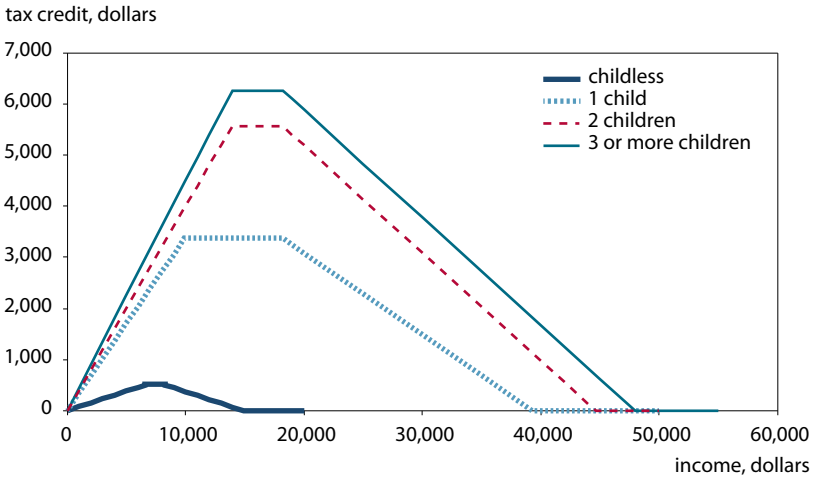
Number of qualifying children	Phase-in rate (percent)	Earned income amount	Maximum amount of credit	Threshold phase-out amount	Phase-out rate (percent)	Completed phase-out amount
0	7.65	$6,610	$506	$13,820	7.65	$20,430
1	34.00	$9,920	$3,373	$23,740	15.98	$44,846
2	40.00	$13,930	$5,572	$23,740	21.06	$50,198
3 or more	45.00	$13,930	$6,269	$23,740	21.06	$53,505

Source: Policy Basics: The Earned Income Tax Credit, Center on Budget and Policy Priorities, http://www.cbpp.org/research/federal-tax/policy-basics-the-earned-income-tax-credit.

105. See "Earned Income Tax Credit (EITC)," available at https://www.irs.gov/credits-deductions/individuals/earned-income-tax-credit (accessed April 14, 2017), for detailed information on qualifications for EITC.

106. See "Statistics for Tax Returns with EITC," available at https://www.eitc.irs.gov/EITC-Central/eitcstats (accessed on February 22, 2017).

Figure C.1 Earned income tax credit amount, single filing status, tax year 2016



Source: Policy Basics: The Earned Income Tax Credit, Center on Budget and Policy Priorities.