

# **Trade and American Jobs**

## **The Impact of Trade on U.S. and State-Level Employment:**

**2014 Update**

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# Executive Summary

U.S. trade continues to expand, and with it, U.S. employment. Today, nearly 40 million U.S. jobs depend on trade. This means that more than one in every five U.S. jobs is linked to exports and imports of goods and services. Nearly three times as many jobs were supported by trade in 2013 as in 1992 – before the accelerated wave of trade liberalization that began with the implementation of the North American Free Trade Agreement in 1994 – when our earlier research found that trade supported 14.5 million jobs, or one in every ten U.S. jobs.

- As U.S. trade -- both exports and imports -- has grown over the past two decades, caused in part by trade liberalizing international agreements, so has the number of U.S. jobs tied to trade. Indeed, trade-dependent jobs have grown more than three times faster than U.S. jobs generally.
- Every U.S. state has realized net employment gains directly attributable to trade.
- Services sector jobs figure prominently among these trade-dependent jobs, while trade has a net positive impact on the number of U.S. manufacturing jobs.
- U.S. trade with countries involved in the Trans-Pacific Partnership (TPP) and the Trans-Atlantic Trade and Investment Partnership (TTIP) negotiations account for important shares of this trade related employment. In 2013, trade with TPP partners supported 15.3 million jobs, and trade with the TTIP countries (the European Union) supported an additional 6.8 million jobs. Importantly, trade with TTP and TTIP countries currently supports a net positive number of jobs in every state.

# Trade and American Jobs

## The Impact of Trade on U.S. and State-Level Employment:

### 2014 Update

Laura M. Baughman and Joseph F. Francois\*

#### I. Introduction

The 2014 Trade and American Jobs report updates a series of path-breaking studies, first issued by Business Roundtable in 2007, that offer a thorough examination of the impacts of trade on U.S. jobs.<sup>1</sup> The report examines the impacts of both exports *and* imports of goods and services on U.S. employment. It confirms that trade has a net positive impact on American jobs. Importantly, the positive impact of trade on U.S. employment has grown significantly during the past two decades, coinciding with the liberalization of U.S. trade both multilaterally through the World Trade Organization and bilaterally and regionally through free trade agreements.

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<sup>1</sup> Laura M. Baughman and Joseph Francois, *Trade and American Jobs: The Impact of Trade on U.S. and State-Level Employment*, prepared for the Business Roundtable, February 2007; Laura M. Baughman and Joseph Francois, *Trade and American Jobs: The Impact of Trade on U.S. and State-Level Employment, An Update*, prepared for the Business Roundtable, July, 2010; and Business Roundtable, *How the U.S. Economy Benefits from International Trade and Investment*.

## II. The Importance of Trade to the United States

Trade has become a vital part of the U.S. economy. Since the middle of the 20<sup>th</sup> century, U.S. exports and imports have grown steadily and trade reflects an increasingly large share of the nation's economic activity. In 2013, total trade (exports plus imports) represented 30 percent of gross domestic product (GDP), up from 10.6 percent when the General Agreement on Tariffs and Trade — the precursor to the World Trade Organization (WTO) — was launched in 1947.

### ***Export Trends***

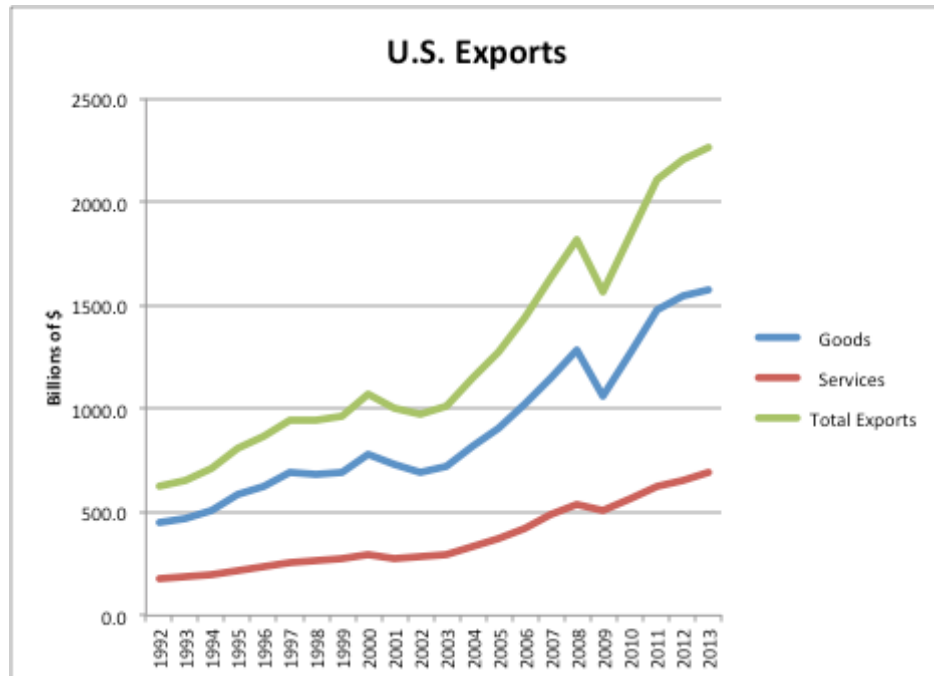
U.S. exports continue to grow. For more than two decades, total U.S. exports have increased at an average *annual* rate of 6.6 percent, notwithstanding the declines experienced during the 2001-2002 and 2008-2009 recessions. In the four years since the last recession, export growth has been especially strong, averaging 9.4 percent per year. Goods exports generally dominate total U.S. exports, accounting for just under 70 percent of total exports. However, services exports have also been growing, increasing at an average annual rate of 6.8 percent over the two decades. As a result, services' share of total U.S. exports has increased from 28 percent in the early 1990s to just over 30 percent today. (Detailed data are provided in Appendix A, Table A1.)

Leading U.S. exports<sup>2</sup> in 2013 included aerospace products and parts; motor vehicles and parts; basic chemicals; pharmaceuticals and medicines, nonferrous metals and products, oilseeds and grains, measuring, electromedical and control instruments; agriculture and construction machinery, and other general purpose machinery.

Leading services exports include business, professional and technical services; royalties and license fees, and financial services.

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<sup>2</sup> Based on four-digit North American Industrial Classification System codes, excluding petroleum.

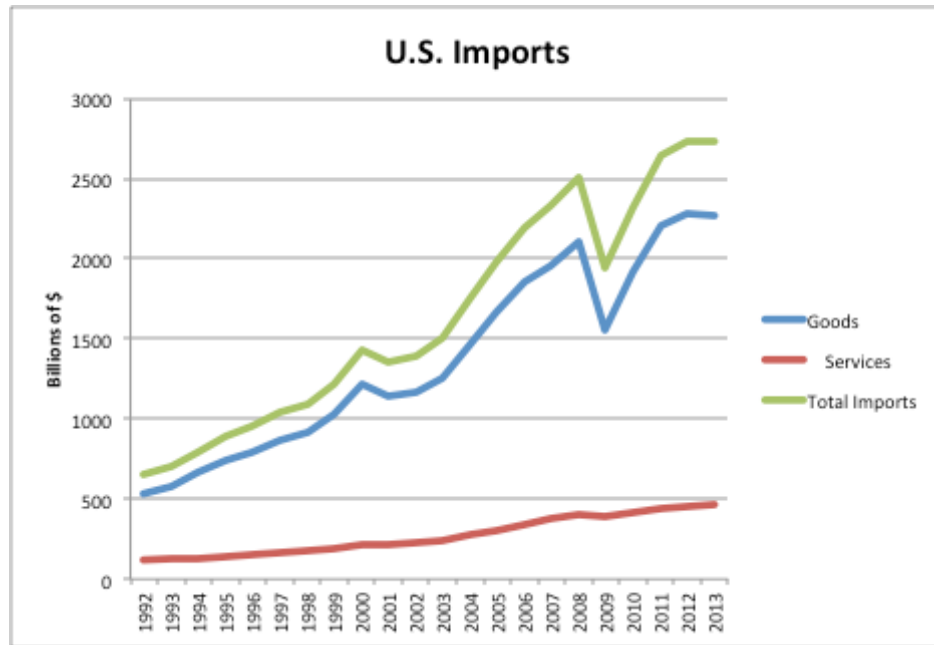


Source: Bureau of Economic Analysis, U.S. Department of Commerce, as detailed in Appendix Table A1.

### ***Import Trends***

U.S. imports have generally increased over the two decades, spurred by periods of strong economic growth and curtailed by the 2001-2002 and 2008-09 recessions. (Detailed data are provided in Appendix A, Table A2.) The correlation between imports and economic growth makes sense given that approximately 60 percent of U.S. merchandise imports are raw materials, capital goods and industrial products used by U.S. manufacturers to make goods in the United States. When U.S. manufacturing output slows or contracts, producers' need for imported raw materials and other inputs declines. Likewise, when household income drops as it does during a recession, families put off buying expensive consumer goods, including consumer goods imports which constitute 40 percent of total goods imports.

In terms of services, key imports include business, professional, and technical services; travel; and insurance services. These are services purchased by U.S. entities, such as U.S. companies using foreign legal services, or U.S. tourists traveling abroad.



Source: Bureau of Economic Analysis, U.S. Department of Commerce, as detailed in Appendix Table A2.

### ***“Openness” of the U.S. Economy to Trade***

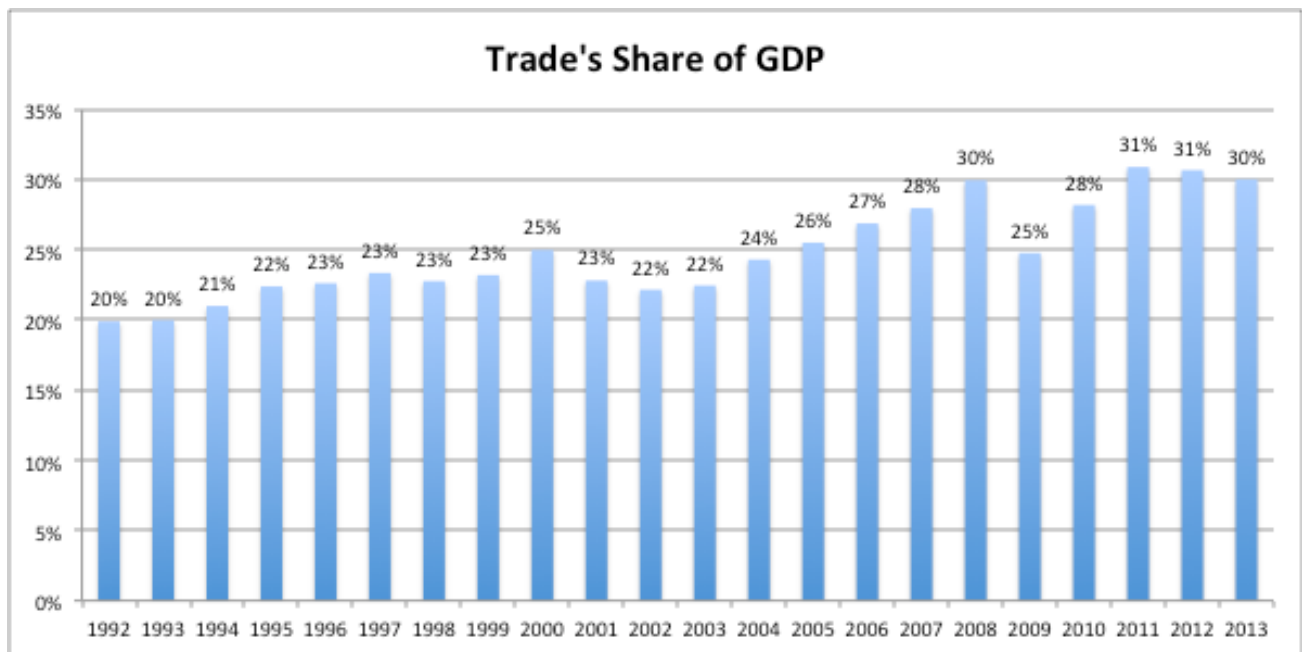
Trade agreements have been an important contributor to the growth in trade, particularly during the past two decades. They have increasingly reduced foreign barriers to trade, opening new markets for U.S. exports, while also opening the U.S. market to increased imports from other countries.

- ▶ Gradual reductions in trade barriers between Mexico and the United States began in 1994 as part of the North American Free Trade Agreement (NAFTA), which also subsumed and expanded upon the U.S.-Canada free trade agreement (FTA).
- ▶ Significant global liberalization began between the United States and members of the WTO as the Uruguay Round was implemented in 1995.
- ▶ China joined the WTO in December 2001, starting the process of opening its market to U.S. exports of goods and services.
- ▶ FTAs were implemented with Jordan (2001), Chile and Singapore (2004), Australia (2005), Morocco (2006), Central America (2006- 2009), Bahrain (2006), Oman (2009), Peru (2009), and South Korea, Colombia and Panama (2012). Each of these agreements helped to increase total U.S. trade, including both exports and imports. The share of total U.S. goods trade with bilateral or regional trade agreement partners has increased from less than 1 percent in 1992 (when the United States had just two FTA partners, Israel and Canada), to 46 percent in 2013 (when the United

States had 20 FTA partners).<sup>3</sup>

As U.S. manufacturers and services providers have taken advantage of the lower costs of inputs and other benefits of FTAs, the importance of global value chains to U.S. companies and their workers has increased. U.S. exports increasingly incorporated imported parts or components: according to data from the OECD and the WTO, foreign parts and components represented 11.3 percent of the value of U.S. goods and services exports in 2009 (the most recent year available), compared to 8.4 percent in 1995. Similarly, foreign producers increasingly rely on U.S. inputs to make goods or services later exported back to the United States. U.S. parts and components accounted for 25.1 percent of the value of U.S. goods and services imports in 2009, up from 21.9 percent in 1995.<sup>4</sup> Companies have lowered costs through these value chains, becoming more competitive in U.S. and foreign markets and relying more than ever on suppliers in other countries for inputs to U.S. production.

Consequently, the importance of trade to the U.S. economy has increased significantly during the last two decades. During this period of accelerating trade liberalization, total trade – exports plus imports – has risen from 20 percent of GDP in 1992 to 30 percent in 2013 (see Appendix A, Table A3 for detailed data).



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

<sup>3</sup> Services trade data for many individual countries are not available, so it is not possible to include services trade with current and prospective FTA partners in this calculation.

<sup>4</sup> Derived from OECD/WTO (2013), *OECD-WTO: Statistics on Trade in Value Added*, (database). DOI: 10.1787/data-00648-en (Accessed on 03 September 2014).

The prospects for further growth in trade are good. The United States is engaged in the negotiation of two new ambitious trade agreements, the first with 11 other countries in the Pacific region, the Trans-Pacific Partnership agreement (TPP), and the other with members of the European Union, the Trans-Atlantic Trade and Investment Partnership agreement (TTIP). Together, these potential new FTA trading partners accounted for about 57 percent of U.S. goods exports in 2013. If these negotiations are successful and Congress passes legislation to implement them, the share of U.S. goods trade covered by bilateral or regional trade agreements would rise from 46 percent in 2013 to 64 percent.<sup>5</sup>

In addition, negotiation of a multilateral (or plurilateral) services agreement aims to address costly barriers to cross-border services trade facing U.S. exporters and importers. While services trade is not subject to tariffs, it faces a range of non-tariff barriers. These include conflicting or differing regulations between trading partners, differing registration or licensing requirements, among others, all of which raise the costs of cross-border services trade.<sup>6</sup> Addressing barriers to services trade would cause trade to increase as U.S. services providers become more cost-competitive in global services markets.

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<sup>5</sup> We focus on goods exports here only because the U.S. government does not publish services export data for all of the U.S. FTA partners or for all of the pending FTA partners.

<sup>6</sup> More detailed examples of such barriers to services trade and the degree to which they constitute barriers to trade can be found in Koen G. Berden et al, *Non-Tariff Measures in EU-US Trade and Investment, An Economic Analysis* (Rotterdam, the Netherlands: ECORYS Nederland, 2010), chapters 13-17.



### III. Trade and American Jobs

As the U.S. and global economies pull themselves out of a deep recession and millions of American workers continue to search for jobs, it is appropriate to ask what role trade plays in job creation and job destruction. While it is generally accepted that trade agreements that open foreign markets boost U.S. exports and related jobs, some worry that because those agreements also further open the U.S. market to imports, they may result in lost U.S. jobs.

These concerns about the impacts of trade liberalization on U.S. jobs result, in part, from the over-simplified way in which trade critics tend to estimate the job impacts of trade. For example, they incorrectly assume that if a particular number of jobs is created from \$1 billion of exports, the same number of jobs is lost from \$1 billion of imports. This results in an overstatement of the negative impact of imports on jobs.<sup>7</sup>

They also underestimate the job gains from exports and imports by not considering all the ways in which exports and imports further impact the U.S. economy. First, and most obviously, it directly supports jobs in factories and offices creating goods and services for export. Second, it indirectly supports jobs in other companies and industries that assist exporters in producing the exported goods or services. Jobs related to making fertilizer that helps to grow the crops that are exported are indirect jobs. Jobs transporting goods to or from ports, wholesaling and retailing the goods, advertising them, financing the transactions, are indirect jobs related to exporting or importing goods. Trade critics recognize these impacts of exports and their studies tend to reflect them.

But third, beyond exports themselves, the income workers earn from these direct and indirect jobs tied to trade is used to buy goods and services elsewhere in the economy (restaurant meals, movie tickets), which supports even more jobs, and trade critics ignore these impacts. Furthermore, because imports lower the costs of many goods and services, consumers have more money to spend on other things (e.g., education, home renovation projects). Because companies benefit from lower input costs and from access to larger markets, they are able to support workers at higher wages, and workers spend those wages on goods and services. Likewise, lower input costs mean U.S. firms are able to spend more on upgrading their plants or office equipment – which supports still more jobs in those sectors. All of this spending is trade related, and the jobs associated with providing the goods and services on which consumers and companies spend trade-related income are trade-related jobs. Trade critics ignore these impacts of trade.

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<sup>7</sup> One recent and typical example is “Trade Policy and Job Loss: U.S. Trade Deals with Colombia and Korea Will be Costly,” EPI Working Paper by Robert E. Scott, Feb. 25, 2010, [http://epi.3cdn.net/87da5b7ec4f5677422\\_o9m6bh6nv.pdf](http://epi.3cdn.net/87da5b7ec4f5677422_o9m6bh6nv.pdf).

A measure of the real impacts of trade on jobs should capture all of these avenues through which trade affects the U.S. economy. This report does just that. It takes a comprehensive approach to measuring the full range of the impacts of trade on the economy, including both the job gains and the job losses associated with trade. It covers both exports *and* imports. It considers both goods *and* services. In addition, it uses a methodology that captures the full range of interactions between different sectors of the U.S. and international economies, which avoids any double counting of job impacts, either positive or negative.<sup>8</sup> As such, our estimates represent the net impacts of trade on U.S. jobs: the positive impacts minus the negative impacts. Appendix B describes the details of our methodology.

Briefly, we found:

- In 2013, an estimated 39.8 million jobs were tied to trade (see Table 1).
- These jobs represent 21.9 percent of total employment, or more than one in five jobs (see Table 1).
- Nearly three times as many jobs were supported by trade in 2013 compared to 1992 – before the accelerated wave of trade liberalization that began with the implementation of NAFTA in 1994 – when our earlier research found that trade supported 14.5 million jobs, or 10.4 percent of total U.S. jobs.<sup>9</sup>
- Trade-dependent jobs are concentrated in services sectors. This is not surprising given the heavy dependence of the U.S. economy on services sectors. But importantly, the biggest impact of trade on the U.S. economy is the ways in which it makes manufacturers and services providers more competitive, giving them and their workers more income to spend on other goods and services. Thus, we see large trade-related jobs in sectors like “Health care, social assistance” and “Government.” They reflect the increased spending that goes on throughout the economy as a result of trade, as explained above, and the fact that these sectors are generally very large employers in the U.S. economy. The share of employment related to trade for each is consistent with the average for the United States as a whole, at about 21 percent.
- Trade has a net positive impact on U.S. manufacturing jobs as well.

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<sup>8</sup> Our methodology does not capture the number of jobs supported by foreign investments in the United States, and therefore our results **likely understate** the number of U.S. jobs tied to the international economy. We do capture the jobs at U.S. subsidiaries of foreign firms that are linked to trade (exports and/or imports). We do not capture jobs at foreign companies not engaged directly or indirectly in foreign trade.

<sup>9</sup> Laura M. Baughman and Joseph Francois, *Trade and American Jobs: The Impact of Trade on U.S. and State-Level Employment*, prepared for the Business Roundtable, February 2007, Table 6, p. 12.

**Table 1**  
**Net Number of U.S. Jobs Related to Trade,\* 2013**  
**(Thousands)**

Total	39,848.6
Agriculture, forestry, fishing	695.9
Manufacturing	1,410.4
Services	32,707.5
Construction	2,230.8
Wholesale trade	1,480.5
Retail trade	4,287.6
Information	885.8
Finance, insurance	2,139.5
Transportation, warehousing	1,448.2
Real estate, rental, leasing	1,729.8
Professional, scientific & technical	2,697.6
Management of companies, admin. support	2,951.7
Education	993.3
Health care, social assistance	4,844.0
Accommodation and food services	3,055.8
Arts & entertainment	1,192.7
Other services	2,770.2
Energy (mining, utilities)	-623.2 <sup>10</sup>
Government	5,658.0
 Share of Total U.S. Employment	 21.9%

\* "Trade" = exports plus imports of goods and services.

Source: Authors' estimates.

Our assessment of the number of U.S. jobs that depend on trade also demonstrates that trade dependent jobs grew at a faster pace than total employment. Between 2004 and

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<sup>10</sup> The U.S. energy sector presents a special case with respect to the impacts of trade on jobs. Despite significant increases in domestic crude oil production, the United States still imports a significant share of the oil it consumes. According to the Energy Information Agency, in 2013, the United States relied on imports for more than one third of its petroleum consumption (see <http://www.usatoday.com/story/news/nation/2013/11/13/us-oil-production-exceeds-imports/3518245/>). Therefore, our modeling scenario (the impact of the absence of trade – exports and imports of crude oil, as described in the Appendix) means that the United States would need to produce all of its crude oil requirements domestically. This would be expensive: the costs of producing this oil domestically would be high, drawing resources (including labor) from other sectors of the economy at great expense. The net impact would be higher employment in the energy sector, and lower employment elsewhere in the economy. This means that importing oil allows workers to find jobs in other sectors of the economy, and "costs" jobs in the energy sector.

2013, trade-dependent jobs increased by 27.2 percent (from 31.3 million<sup>11</sup> to 39.8 million), compared to 7.8 percent for employment generally.<sup>12</sup> In other words, as the economy has become more dependent on trade, employment related to trade has increased at more than three times the rate of non-trade related employment.

Given that the United States is currently negotiating the TPP and TTIP trade agreements, it is also useful to examine the number of U.S. jobs tied to trade with countries involved in those negotiations. Table 2 shows that trade with TPP countries supported more than 15.3 million jobs in 2013, 8.4 percent of total employment and 38.4 percent of all trade-related jobs.

**Table 2**  
**Net Number of U.S. Jobs Related to Trade with TPP Countries,\* 2013**  
**(Thousands)**

Total	15,321.3
Agriculture, forestry, fishing	167.7
Manufacturing	814.3
Services	12,254.4
Construction	615.1
Wholesale trade	568.6
Retail trade	1,646.6
Information	350.8
Finance, insurance	905.4
Transportation, warehousing	357.6
Real estate, rental, leasing	670.1
Professional, scientific & technical	1,044.9
Management of companies, admin. support	1,143.7
Education	388.6
Health care, social assistance	1,895.1
Accommodation and food services	1,173.6
Arts & entertainment	443.2
Other services	1,051.1
Energy (mining, utilities)	-128.8
Government	2,213.6
 Share of Total U.S. Employment	 8.4%

\* "Trade"= exports plus imports of goods and services.

Source: Authors' estimates.

<sup>11</sup> Baughman and Francois, *op cit.*

<sup>12</sup> Derived from U.S. Bureau of Economic Analysis, "Total full-time and part-time employment by industry," (accessed October 6, 2014).

Table 3 shows that trade with the EU supported nearly 6.8 million jobs in 2013, 3.7 percent of total employment and 17.1 percent of all trade-related jobs.

**Table 3**  
**Net Number of U.S. Jobs Related to Trade with the EU,\* 2013**  
**(Thousands)**

Total	6,795.9
Agriculture, forestry, fishing	95.2
Manufacturing	362.0
Services	5,285.8
Construction	133.5
Wholesale trade	251.4
Retail trade	728.1
Information	161.2
Finance, insurance	260.3
Transportation, warehousing	163.6
Real estate, rental, leasing	313.9
Professional, scientific & technical	489.5
Management of companies, admin. support	515.5
Education	179.1
Health care, social assistance	873.4
Accommodation and food services	518.9
Arts & entertainment	200.9
Other services	476.5
Energy (mining, utilities)	32.7
Government	1,020.2
 Share of Total U.S. Employment	 3.7%

\* "Trade"= exports plus imports of goods and services.  
Source: Authors' estimates.

### ***State-Level Trade-Related Employment***

A breakdown of the national employment estimates by state shows that every state realizes a net positive impact from trade (see Table 4). Not surprisingly, the largest states benefited the most. Shares of total state employment related to trade ranged from a low of 17.4 percent (Wyoming) to a high of 23.0 percent (Hawaii and Washington). Tables 5 and 6 present the results by state for trade with TPP partners and the European Union.

**Table 4**  
**Net Number of U.S. Jobs Related to Trade, By State, 2013**  
**(Thousands)**

Alabama	+558.4	Montana	+137.6
Alaska	+90.6	Nebraska	+284.1
Arizona	+747.8	Nevada	+350.5
Arkansas	+342.3	New Hampshire	+179.7
California	+4,684.3	New Jersey	+1,154.1
Colorado	+709.8	New Mexico	+217.2
Connecticut	+507.1	New York	+2,629.6
Delaware	+123.3	North Carolina	1,197.8
District of Columbia	+195.8	North Dakota	+108.3
Florida	+2,398.3	Ohio	+1,469.9
Georgia	+1,238.6	Oklahoma	+398.6
Hawaii	+201.3	Oregon	+484.1
Idaho	+195.5	Pennsylvania	+1,625.9
Illinois	+1,674.4	Rhode Island	+132.4
Indiana	+796.6	South Carolina	+559.3
Iowa	+448.4	South Dakota	+124.2
Kansas	+392.5	Tennessee	+829.5
Kentucky	+529.3	Texas	+3,043.1
Louisiana	+539.0	Utah	+375.0
Maine	+177.5	Vermont	+92.5
Maryland	+791.0	Virginia	+1,115.2
Massachusetts	+955.5	Washington	+915.2
Michigan	+1,160.9	West Virginia	+186.9
Minnesota	+774.7	Wisconsin	+785.2
Mississippi	+335.1	Wyoming	+68.4
Missouri	+815.4	TOTAL	+39,848.6

Source: Authors' estimates.

**Table 5**  
**Net Number of U.S. Jobs Related to Trade with TPP Countries, By State, 2013**  
**(Thousands)**

Alabama	209.9	Montana	52.6
Alaska	34.0	Nebraska	107.7
Arizona	287.1	Nevada	134.4
Arkansas	130.1	New Hampshire	70.6
California	1,827.0	New Jersey	446.7
Colorado	276.3	New Mexico	85.4
Connecticut	194.1	New York	1,018.8
Delaware	47.4	North Carolina	470.3
District of Columbia	75.6	North Dakota	42.0
Florida	912.7	Ohio	555.8
Georgia	475.9	Oklahoma	159.8
Hawaii	75.6	Oregon	186.3
Idaho	74.6	Pennsylvania	627.2
Illinois	640.6	Rhode Island	52.3
Indiana	297.5	South Carolina	214.5
Iowa	168.5	South Dakota	47.7
Kansas	150.7	Tennessee	311.7
Kentucky	194.6	Texas	1,195.0
Louisiana	204.5	Utah	147.0
Maine	68.7	Vermont	35.9
Maryland	302.4	Virginia	423.6
Massachusetts	375.1	Washington	341.2
Michigan	431.5	West Virginia	72.2
Minnesota	302.2	Wisconsin	300.9
Mississippi	128.2	Wyoming	27.5
Missouri	309.1	TOTAL	15,321.3

Source: Authors' estimates.

**Table 6**  
**Net Number of U.S. Jobs Related to Trade with the EU, By State, 2013**  
**(Thousands)**

Alabama	93.2	Montana	23.3
Alaska	16.9	Nebraska	45.8
Arizona	130.5	Nevada	59.2
Arkansas	57.3	New Hampshire	31.5
California	824.5	New Jersey	193.5
Colorado	124.6	New Mexico	40.1
Connecticut	85.8	New York	446.3
Delaware	20.8	North Carolina	203.2
District of Columbia	34.3	North Dakota	19.8
Florida	402.5	Ohio	240.3
Georgia	206.4	Oklahoma	77.5
Hawaii	33.6	Oregon	85.3
Idaho	33.5	Pennsylvania	272.4
Illinois	278.1	Rhode Island	23.0
Indiana	128.9	South Carolina	92.1
Iowa	72.2	South Dakota	20.9
Kansas	69.3	Tennessee	133.8
Kentucky	85.4	Texas	552.9
Louisiana	94.5	Utah	65.1
Maine	30.3	Vermont	16.1
Maryland	133.4	Virginia	187.1
Massachusetts	167.1	Washington	157.1
Michigan	187.9	West Virginia	33.4
Minnesota	133.0	Wisconsin	128.3
Mississippi	57.1	Wyoming	13.5
Missouri	133.6	TOTAL	6,795.9

Source: Authors' estimates.



## IV Conclusion

Our analysis demonstrates that trade continues to be important – indeed, increasingly important – to American workers. As the U.S. economy has become more open and both exports and imports have grown, so too have U.S. jobs dependent on trade.

Thus, policy makers and others seeking to create new jobs for unemployed Americans should not overlook the opportunities afforded by trade policies, negotiations and programs that increase America's participation in the international marketplace.

## Appendix A

### *Trade Data*

**Table A1**  
**U.S. Exports to the World, 1992-2013**  
**(Billions)**

	Goods Exports	Services Exports	Total Exports
1992	\$448.2	\$177.3	\$625.5
1993	465.1	185.9	651.0
1994	512.6	200.4	713.0
1995	584.7	219.2	803.9
1996	625.1	239.5	864.6
1997	689.2	256.1	945.3
1998	682.1	262.8	944.9
1999	695.8	271.3	967.1
2000	781.9	290.4	1,072.3
2001	729.1	274.3	1,003.4
2002	693.1	280.7	973.8
2003	724.8	290.0	1,014.7
2004	814.9	338.0	1,152.8
2005	901.1	373.0	1,274.1
2006	1,026.0	416.7	1,442.7
2007	1,148.2	488.4	1,636.6
2008	1,287.4	532.8	1,820.3
2009	1,056.0	512.7	1,568.8
2010	1,278.5	563.3	1,841.8
2011	1,482.5	627.8	2,110.3
2012	1,545.7	654.9	2,200.6
2013	1,579.6	687.4	2,267.0

Source: U.S. Department of Commerce, Bureau of Economic Analysis, using "Census basis" trade data for goods.

**Table A2**  
**U.S. Imports from the World, 1992-2013**  
**(Billions)**

	Goods Imports	Services Imports	Total Imports
1992	\$532.7	\$119.6	\$652.3
1993	580.7	123.8	704.5
1994	663.3	133.1	796.4
1995	743.5	141.4	884.9
1996	795.3	152.6	947.8
1997	869.7	165.9	1,035.6
1998	911.9	180.7	1,092.6
1999	1,024.6	192.9	1,217.5
2000	1,218.0	216.1	1,434.1
2001	1,141.0	213.5	1,354.5
2002	1,163.4	224.4	1,387.7
2003	1,257.1	242.2	1,499.3
2004	1,469.7	283.1	1,752.8
2005	1,673.5	304.4	1,977.9
2006	1,853.9	341.2	2,195.1
2007	1,957.0	372.6	2,329.5
2008	2,103.6	409.1	2,512.7
2009	1,559.6	386.8	1,946.4
2010	1,913.9	409.3	2,323.2
2011	1,239.9	435.8	2,643.7
2012	2,276.3	450.4	2,726.7
2013	2,268.3	462.1	2,730.5

Source: U.S. Department of Commerce, Bureau of Economic Analysis, using "Census basis" data for goods.

**Table A3**  
**“Openness” of U.S. Economy, 1992-2013**  
**(Billions and Percent)**

	Total U.S. Trade*	Total Trade’s Share of U.S.GDP
1992	\$1,300.9	19.9%
1993	1,374.8	20.0
1994	1,534.3	21.0
1995	1,715.4	22.4
1996	1,831.7	22.6
1997	2,009.6	23.3
1998	2,068.7	22.8
1999	2,240.6	23.2
2000	2,569.4	25.0
2001	2,422.1	22.8
2002	2,431.5	22.1
2003	2,584.2	22.5
2004	2,982.2	24.3
2005	3,339.0	25.5
2006	3,723.6	26.9
2007	4,047.8	28.0
2008	4,406.9	29.9
2009	3,570.9	24.8
2010	4,217.3	25.2
2011	4,792.8	30.9
2012	4,956.7	30.7
2013	5,032.8	30.0

\* “Total Trade” is goods and services exports plus goods and services imports, using “balance of payments” basis data to coincide with GDP data.

Source: U.S. Department of Commerce, Bureau of the Census, National Income and Product Accounts tables.

## Appendix B

### *Methodology*

We applied a multi-sector multi-country computable general equilibrium (CGE) model of the U.S. economy to estimate the impacts of trade on U.S. employment. CGE models use regional and national input-output, employment and trade data to link industries in a value added chain from primary goods to intermediate processing to the final assembly of goods and services for consumption. Inter-sectoral linkages may be direct, like the input of steel in the production of transport equipment, or indirect, via intermediate use in other sectors (e.g., energy used to make steel that is used in turn in the transport equipment sector). Our CGE model captures these linkages by incorporating firms' use of direct and intermediate inputs. The most important aspects of the model can be summarized as follows: (i) it covers all world trade and production; and (ii) it includes intermediate linkages between sectors within each country.

### *The Model*

The specific model used was the Global Trade Analysis Project (GTAP) model (see Hertel 2013). The model and its associated data are developed and maintained by a network of researchers and policymakers coordinated by the Center for Global Trade Analysis at the Department of Agricultural Economics at Purdue University. Guidance and base-level support for the model and associated activities are provided by the GTAP Consortium, which includes members from government agencies (e.g., the U.S. Department of Commerce, U.S. Department of Agriculture, U.S. Environmental Protection Agency, and U.S. International Trade Commission, European Commission), international institutions (e.g., the Asian Development Bank, Organization for Economic Cooperation and Development, the World Bank, United Nations and the World Trade Organization), the private sector and academia. Dr. Francois is a member of the Consortium.

The model assumes that capital stocks are fixed at a national level. Firms are assumed to be competitive, and employ capital and labor to produce goods and services subject to constant returns to scale.<sup>13</sup> Products from different regions are assumed to be imperfect substitutes in accordance with the so-called "Armington" assumption. Armington elasticities are taken directly from the GTAP v. 9 database, as are substitution elasticities for value added.

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<sup>13</sup> Compared to dynamic CGE models and models with alternative market structures, the present assumption of constant returns to scale with a fixed capital stock is closest in approach to older studies based on pure input-output modeling of trade and employment linkages. In the present context, it can be viewed as generating a lower-bound estimate of effects relative to alternative CGE modeling structures.

We are interested in the impact of trade on the U.S. and state economies given the U.S. wage structures in 2013 (i.e., given the prevailing wage structure of the labor force in a given year, how many jobs in the U.S. economy and in each state's economy were linked either directly or indirectly to trade?). As such, the model employs a labor market closure (equilibrium conditions) where wages are fixed at prevailing levels, and employment levels are forced to adjust. This provides a model-generated estimate of the U.S. jobs supported, at current wage levels, by the 2013 level of trade.

### **Data**

The model incorporates data from a number of sources. Data on production and trade are based on national social accounting data linked through trade flows (see Reinert and Roland-Holst 1997). For the 2013 simulation, social accounting data are drawn directly from the most recent version of the GTAP dataset, version 9. Trade data (both exports and imports) exclude re-exports.<sup>14</sup> This dataset is benchmarked to 2011 and includes detailed national input-output, trade, and final demand structures for 140 countries across 56 sectors (see Table A-1). We updated the trade and national account data to 2013.

The basic social accounting and trade data are supplemented with data on tariffs and non-tariff barriers from the World Trade Organization's integrated database and from the UNCTAD/World Bank WITS dataset. All tariff information has been concorded to GTAP model sectors within the version 9 database.

The GTAP model sectors were concorded to state-level employment data from the Commerce Department's Bureau of Economic Analysis (BEA). This allowed us to map nationwide effects to individual states. Based on the availability of employment data as well as the size of some of the sectors, we expanded some sectors (e.g., "Trade" into its "Wholesale" and "Retail" components) and collapsed others (e.g., individual food products into one sector, "Food Products," or individual transportation modes into one sector, "Transportation"). BEA does not disclose state-level employment data for certain sectors for confidentiality reasons. For some of these sectors, we were able to use Moody's Analytics state-level employment estimates to allocate the missing national employment to undisclosed sectors in these states. However, Moody's could not supply all of the missing data; therefore our state jobs estimates may be understated for these states.

The 140 GTAP countries/regions are aggregated into seven groupings: the United States, Canada, Japan, Mexico, other TPP countries, the European Union and rest-of-world.

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<sup>14</sup> See <https://www.gtap.agecon.purdue.edu/databases/contribute/reexports.asp>.

**Table A-1**  
**GTAP Model Sectors**

Paddy rice*	Wood products
Wheat*	Paper products, publishing
Cereal grains*	Petroleum and coal products
Vegetables, fruits, and nuts*	Chemicals, rubber, plastics
Oil seeds*	Mineral products
Sugar cane*	Ferrous metals
Plant-based fibers*	Non-ferrous metals
Other crops*	Metal products
Cattle, sheep, goats, and horses*	Motor vehicles and parts
Other animals*	Other transport equipment
Raw milk*	Electronic equipment
Wool, silk-worm cocoons*	Other machinery and equipment
Forestry	Other manufactures
Fisheries	Electricity
Coal	Gas manufacture, distribution
Oil	Water
Gas	Construction
Other minerals	Wholesale and retail trade**
Bovine meat products	Water transport
Other meat products	Air transport
Vegetable oils and fats	Other transport
Dairy products	Communication services
Processed rice	Financial services
Sugar	Insurance services
Other food products	Other business services
Beverages and tobacco	Recreational and other services
Textiles	Government, education, health
Wearing apparel	services**
Leather products	

\* While GTAP has data for subsectors of agriculture, the U.S. Department of Commerce does not publish total U.S. employment for agricultural subsectors, so we were forced to look at these sectors in the aggregate.

\*\* GTAP does not break these categories down further.

### ***Modeling Simulation***

The simulation conducted with the GTAP model involved imposing changes in U.S. trade, in this instance a hypothetical elimination of all U.S. exports and imports of goods and

services by imposing prohibitive duties against goods trade with the United States across the board, and prohibitive trade costs against services trade with the United States.<sup>15</sup>

Our results tell us how much U.S. and state output and employment would decline were the United States to cease exporting and importing goods and services, tracing changes at the border as they work through the U.S. economy. The net negative (or positive, in some cases) impacts on output and jobs from an absence of trade serves as a proxy for the opposite: the net positive (or negative) impacts on U.S. output and employment *because* of trade. We report the results from this second perspective in this paper.

## References

Hertel, T. (2013). "Global Applied general Equilibrium Analysis Using the Global Trade Analysis Project Framework," in P. B. Dixon and D. W. Jorgenson eds. *Handbook of Computable General Equilibrium Modeling*. Amsterdam: Elsevier, 815-76.

Reinert, K.A.. and D.W. Roland-Holst (1997), "Social Accounting Matrices," in Francois, J.F. and K.A. Reinert, eds. (1997), *Applied methods for trade policy analysis: a handbook*, Cambridge University Press: New York.

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<sup>15</sup> We have modeled an extreme shock to the economy to show the extent to which sectors of the economy are tied to trade. We are not suggesting that a prohibitive tariff is a policy option that has been proposed by anyone. It is useful to understand the job impact of complete elimination of both exports and imports, in order to quantify the opposite scenario: the job impact of actual U.S. trade in the experiment years.