# Trade and American Jobs


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

# 2019 Update


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# Executive Summary

U.S. trade continues to expand, and with it, U.S. employment.  Based on the latest available data (2017) and taking into account both the gains and the losses (i.e., a net estimate), trade supports nearly 39 million U.S. jobs.  This means that one in every five U.S. jobs is linked to exports and imports of goods and services.  Nearly two times as many jobs were supported by trade in 2017 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 net 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 U.S. jobs have grown more than four times as fast as U.S. jobs generally.

- Every U.S. state has realized net employment gains directly attributable to trade.

- Trade has a positive net impact on U.S. jobs in both the services and manufacturing sectors.

- U.S. trade with our NAFTA partners, as well as with Europe, Japan, Korea and China, among others, accounts for important shares of this trade related employment. In 2017, trade with Canada supported, on net, 7.2 million jobs; Mexico, 4.9 million jobs; European Union (27), 5.7 million jobs; China, 7.3 million jobs; Japan, 1.3 million jobs; and Korea and the UK, just over 1 million jobs each.

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## The Impact of Trade on U.S. and State-Level Employment:
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Laura M. Baughman and Joseph F. Francois[*]

## I.      Introduction

The 2019 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.[1] The report examines the impacts, positive and negative, of both exports *and* imports of goods and services on U.S. employment based on the latest available data (2017). 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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[1]      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; Business Roundtable, *How the U.S. Economy Benefits from International Trade and Investment* (2013); *Trade and American Jobs: The Impact of Trade on U.S. and State-Level Employment, 2014 Update*, prepared for the Business Roundtable, October 2014, *Trade and American Jobs: The Impact of Trade on U.S. and State-Level Employment, 2016 Update*, prepared for the Business Roundtable, January 2016, *Trade and American Jobs: The Impact of Trade on U.S. and State-Level Employment, 2018 Update*, prepared for the Business Roundtable, March 2018.

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

Trade is a vital part of the U.S. economy. Since the middle of the 20th century, U.S. exports and imports have grown strongly and today trade reflects a large share of the nation's economic activity. From 2011-2017, total trade (exports plus imports) represented nearly 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 have been generally increasing over the last 25 years. For more than two decades, total U.S. exports have increased at an average *annual* rate of 5.5 percent, notwithstanding recent declines and the declines experienced during the 2001-2002 and 2008-2009 recessions. Since our last report, services exports have continued to increase and now account for 34 percent of total U.S. exports. Goods exports (e.g., industrial, agricultural) still dominate total U.S. exports, accounting for just under 70 percent of the total, so their declines in 2015 and 2016 drove the overall decline in U.S. exports in those years. Growth in both goods and services exports rebounded in 2017. (Detailed data are provided in Appendix A, Table A1.)
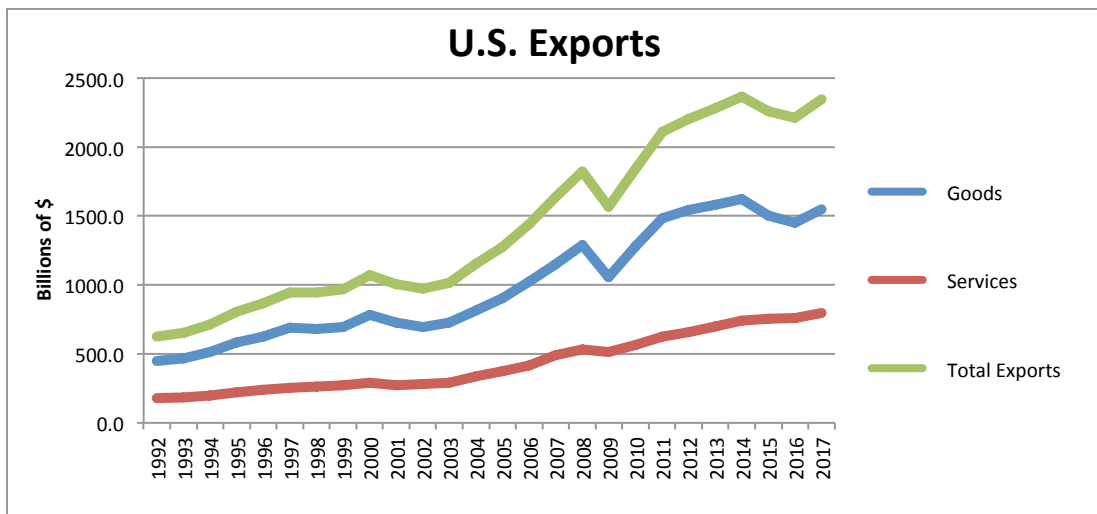


Source:  Bureau of Economic Analysis, U.S. Department of Commerce, as detailed in Appendix Table A1.

Leading U.S. goods exports[2] in 2017 included aerospace products and parts; oil and gas and petroleum and coal products; motor vehicles and parts; basic chemicals; pharmaceuticals and medicines; oilseeds and grains; measuring, electro-medical and control instruments; resins, rubber and artificial fibers; semiconductors; agriculture and construction machinery, and other general-purpose machinery.

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[2]    Based on four-digit North American Industrial Classification System codes.

Contributing to the return to growth in the total value of goods exports from 2016-2017 were surge in exports of coal and petroleum gases (up 125.1 percent), oil and gas (up 97.7 percent), industrial machinery (up 26.4 percent) and petroleum and coal products (up 25.7 percent).

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

**Import Trends**

U.S. imports have also generally increased over the past two decades, spurred by periods of strong economic growth and curtailed by the 2001-2002 and 2008-09 recessions. (Detailed aggregate data are provided in Appendix A, Table A2.) In general, there is a positive correlation between changes in imports and changes in U.S. economic growth. This correlation 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 and farmers to produce goods in the United States.

When U.S. manufacturing or agricultural output slows or contracts, producers' and farmers' 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. The recent uptick in the total value of imports is owed in part to strong economic growth of the U.S. economy in 2017.

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.
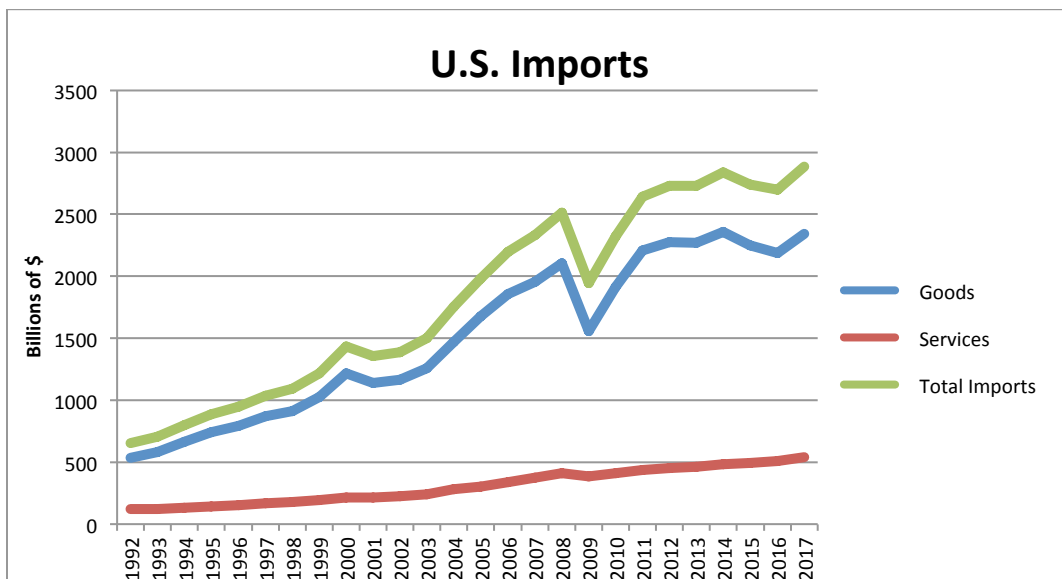


Source:  Bureau of Economic Analysis, U.S. Department of Commerce, as detailed in Appendix A, Table A2.

*"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.

• 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 Mexico and Canada (NAFTA 1993), 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 and services exports 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 39 percent in 2017 (when the United States had 20 FTA partners).

As U.S. manufacturers, farmers 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, farmers and their workers has increased.  U.S. exports incorporate imported parts or components: according to data from the OECD and the WTO, foreign parts and components represented 9.5 percent of the value of U.S. goods and services exports in 2015 (the most recent year available); the foreign input share is higher for manufactured goods exports, 11.7 percent.[3]  Similarly, foreign producers use U.S. inputs to make goods or services later exported back to the United States.  U.S.-made parts and components accounted for 4.6 percent of the value of U.S. goods and services imports in 2015.[4] For manufactured imports, the U.S. content share is higher, 6.4 percent. 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

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[3] OECD, Origin of Value Added in Gross Exports, https://stats.oecd.org/Index.aspx?DataSetCode=TIVA_2018_C2  (Accessed February 20, 2019)

[4] *Ibid.*, https://stats.oecd.org/Index.aspx?DataSetCode=TIVA_2018_C2*.*

trade – exports plus imports – rose from 20 percent of GDP in 1992 to 30 percent in 2014, dropping to 27 percent in 2017 primarily due to the various factors noted above (see Appendix A, Table A3 for detailed data).

## Trade's Share of GDP
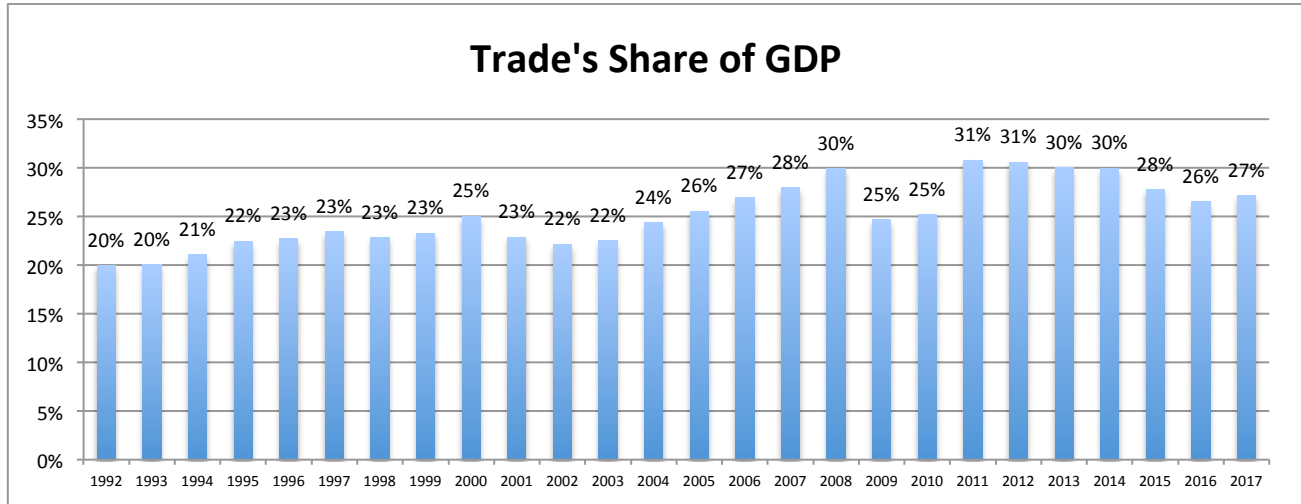


Source:  Derived from Bureau of Economic Analysis, U.S. Department of Commerce.

## III.  Trade and American Jobs

Concerns about the impact of trade on U.S. jobs remain widespread in America. Some policy makers are convinced that U.S. goods trade deficits equate to lost U.S. jobs. It is generally accepted that exports have a positive impact on U.S. jobs. However, many worry that imports have a negative impact on U.S. jobs.

A proper assessment of the impacts of trade on U.S. jobs should use an approach that captures the full range of the many ways in which those impacts are experienced by farmers, manufacturers, services providers, workers and consumers. This study uses such an approach, which is detailed in Appendix B. Briefly stated, it explores the direct and indirect effects of exports, the direct and indirect effects of imports, and the effects of additional trade-induced spending on U.S. output and consumption and, consequently, jobs. It reflects the differences in price, quantity and quality between imported goods and U.S.-produced goods. It also captures the jobs directly and indirectly related to the process of importing goods and services into the United States (e.g., jobs associated with transporting imports from the ports to warehouses, jobs at the warehouses, or retail jobs that sell the imported goods if they are finished consumer products). Finally, our methodology also considers the positive and negative effects of trade on jobs, and results reported are therefore "net" job impacts.

Briefly, the findings of this analysis are as follows:

- In 2017, an estimated 39.0 million net jobs were tied to trade (see Table 1).

- These jobs represent 19.9 percent of total employment, or one in five jobs (see Table 1).

- As the economy has become more dependent on trade, employment related to trade has increased at more than four times the rate of non-trade related employment. Between 1992 and 2017, trade-dependent jobs increased by 169 percent (from a net of 14.5 million[5] to 39.0 million), compared to 40 percent for employment generally.[6]

- Nearly two times as many jobs were supported by trade in 2017 (19.9 percent) compared to 1992 (10.4 percent) – before the accelerated wave of trade liberalization that began with the implementation of NAFTA in 1994.[7]

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[5]     Baughman and Francois (2007), *op cit*.

[6]     Derived from U.S. Bureau of Economic Analysis, "Total full-time and part-time employment by industry," (accessed February 20, 2019).

[7]     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. It should also

- Trade has a net positive impact on U.S. jobs in both the services and manufacturing sectors.

**Table 1**
**Net Number of U.S. Jobs Related to Trade,\* 2017**
**(Thousands)**

| | |
|---|---|
| Total | +38,956.2 |
| Agriculture, forestry, fishing | +1,514.7 |
| Manufacturing | +1,782.9 |
| Services | +36,205.9 |
|     Construction | +1,251.3 |
|     Wholesale and retail trade | +8,717.8 |
|     Finance | +1,347.5 |
|     Insurance | +738.7 |
|     Transportation | +2,354.7 |
|     Communications | +926.2 |
|     Business and professional services | +6,604.3 |
|     Personal and recreational services | +2,683.9 |
|     Other services (e.g. educ., health, gov't, etc.) | +12,507.7 |
| Energy (mining, utilities) | -547.3[8] |
| | |
| Share of Total U.S. Employment | 19.9% |

\* "Trade" = exports plus imports of goods and services.
See Appendix Table  B.1 for sector descriptions
Source:  Authors' estimates.

As noted above, the biggest impacts of trade are the ways in which it increases spending across the U.S. economy.  But most analysts seeking to assess the impacts of trade on U.S. jobs stop with the direct and indirect impacts of exports and imports.  In doing so, they miss the largest source of job-creating activity that comes from trade: the extra spending power companies, workers and consumers have in their bank accounts, spending power

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be noted that, because trade has played a somewhat smaller role in the U.S. economy in 2017 than in 2014, U.S. employment related to that trade has declined from the 41 million estimated for 2014 (*Trade and American Jobs:  The Impact of Trade on U.S. and State-Level Employment, 2016 Update*, prepared for the Business Roundtable, January 2016).

[8]    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 petroleum it consumes.  According to the Energy Information Agency, in 2017, the United States relied on imports for 19 percent of its petroleum consumption (see https://www.eia.gov/tools/faqs/faq.php?id=32&t=6).  Therefore, our modeling scenario (the impact of the absence of trade – exports and imports of petroleum, as described in Appendix A) means that the United States would need to produce *all* of its petroleum, including 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.

that generates still more job-supporting economic activity. Additional spending power comes from, for example, wages of direct and indirect workers in export-related jobs, from wages of direct and indirect workers in import-related jobs, and from consumers who take advantage of lower prices for goods and services resulting from imports, which in turn supports still more economic activity that supports even more jobs.  The extra income is spent on other goods and services that are not traded internationally – like dinners out, pre-school or day care for one's child, or a home renovation project.  Thus, Table 1 reports large trade-related jobs in sectors like "Construction" and "Personal and recreation services." The estimates in Table 1 reflect the increased spending that goes on throughout the economy as a result of higher incomes and lower costs due to trade. The methodology in the report captures all these effects.[9]

### *U.S. Jobs Related to Trade with Selected Trading Partners*

Table 2 details jobs supported by trade with selected leading U.S. trading partners. Trade with Canada and Mexico together supported more than 12 million jobs in 2017, 31 percent of all trade-related jobs. Trade with China supports a *net positive* number of U.S. jobs, over 7 million, accounting 19 percent of total U.S. trade-related jobs and 3.7 percent of all U.S. jobs. Trade with Japan, Korea, the EU (27) and UK also add importantly to net U.S. employment rolls.  Together, trade with these partners alone supported 14.6 percent of all U.S. jobs in 2017.

**Table 2**
**Net Number of U.S. Jobs Related to Trade with Leading U.S. Trading Partners,* 2017**
**(Thousands)**

|  | Canada | Mexico | China | Japan | Korea | EU (27) | UK |
|---|---|---|---|---|---|---|---|
| Total | +7,191.2 | +4,870.2 | +7,328.0 | +1,336.7 | +1,042.2 | +5,712.5 | +1,204.0 |
| Ag., forestry, fishing | +113.3 | +71.7 | +464.6 | +157.2 | +100.8 | +166.7 | +39.4 |
| Manufacturing | +553.9 | +75.7 | -530.7 | -181.1 | -48.1 | -118.2 | +51.5 |
| Services | +6,554.0 | +4,469.4 | +6,385.5 | +1,218.1 | +934.2 | +5,353.0 | +1,090.7 |
| Energy | -224.8 | -55.8 | +142.3 | +34.6 | +7.4 | +120.1 | +2.0 |
| Share of Total U.S. Jobs | 3.7% | 2.5% | 3.7% | 0.7% | 0.5% | 2.9% | 0.6% |
| Share of Trade-  Related Jobs | 18.5% | 12.5% | 18.8% | 3.4% | 2.7% | 14.7% | 3.1% |

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

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[9]     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.

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

As demonstrated by a breakdown of the national employment estimates by state (see Table 3), every U.S. state realizes a net positive impact from trade. Not surprisingly, the largest states benefit the most. Shares of total state employment related to trade ranged from a low of 17 percent (Wyoming and Oklahoma) to a high of 21 percent (Nebraska and South Dakota). See Appendix B for an explanation of our methodology for breaking down trade-related employment by state.

**Table 3**
**Net Number of U.S. Jobs Related to Total Trade, by State, 2017**
**(Thousands)**

| | | | |
|---|---|---|---|
| Alabama | +532.2 | Montana | +137.5 |
| Alaska | +86.7 | Nebraska | +277.1 |
| Arizona | +736.7 | Nevada | +343.9 |
| Arkansas | +334.5 | New Hampshire | +170.4 |
| California | +4,710.6 | New Jersey | +1,091.8 |
| Colorado | +720.8 | New Mexico | +211.9 |
| Connecticut | +467.8 | New York | +2,512.8 |
| Delaware | +118.1 | North Carolina | +1,177.8 |
| District of Columbia | +188.5 | North Dakota | +110.8 |
| Florida | +2,395.7 | Ohio | +1,387.8 |
| Georgia | +1,222.4 | Oklahoma | +403.5 |
| Hawaii | +190.9 | Oregon | +505.7 |
| Idaho | +205.2 | Pennsylvania | +1,526.3 |
| Illinois | +1,566.8 | Rhode Island | +128.1 |
| Indiana | +770.0 | South Carolina | +550.7 |
| Iowa | +432.6 | South Dakota | +127.9 |
| Kansas | +380.4 | Tennessee | +806.1 |
| Kentucky | +512.3 | Texas | +3,141.0 |
| Louisiana | +516.2 | Utah | +389.0 |
| Maine | +171.3 | Vermont | +89.3 |
| Maryland | +742.8 | Virginia | +1,054.0 |
| Massachusetts | +945.1 | Washington | +921.4 |
| Michigan | +1,114.9 | West Virginia | +167.4 |
| Minnesota | +752.1 | Wisconsin | +748.5 |
| Mississippi | +324.5 | Wyoming | +69.0 |
| Missouri | +767.4 | TOTAL | +38,956.3 |

Source: Authors' estimates.

**Table 4**
**Net Number of U.S. Jobs Related to Trade with Canada, by State, 2017**
**(Thousands)**

| | | | |
|---|---|---|---|
| Alabama | +97.4 | Montana | + 23.2 |
| Alaska | +14.3 | Nebraska | + 49.0 |
| Arizona | +137.2 | Nevada | +63.7 |
| Arkansas | +58.6 | New Hampshire | +34.1 |
| California | +898.5 | New Jersey | +207.4 |
| Colorado | +130.4 | New Mexico | +36.2 |
| Connecticut | +85.9 | New York | +475.9 |
| Delaware | +22.1 | North Carolina | +225.8 |
| District of Columbia | +34.8 | North Dakota | +17.3 |
| Florida | +446.3 | Ohio | +257.5 |
| Georgia | +229.2 | Oklahoma | +61.3 |
| Hawaii | +35.2 | Oregon | +95.2 |
| Idaho | +37.2 | Pennsylvania | +282.3 |
| Illinois | +293.7 | Rhode Island | +24.2 |
| Indiana | +144.4 | South Carolina | +103.4 |
| Iowa | +77.9 | South Dakota | +22.4 |
| Kansas | +62.7 | Tennessee | +149.7 |
| Kentucky | +91.5 | Texas | +549.4 |
| Louisiana | +88.8 | Utah | +72.6 |
| Maine | +31.5 | Vermont | +16.7 |
| Maryland | +139.9 | Virginia | +193.8 |
| Massachusetts | +183.6 | Washington | +163.3 |
| Michigan | +209.7 | West Virginia | +27.6 |
| Minnesota | +142.8 | Wisconsin | +138.7 |
| Mississippi | +57.5 | Wyoming | +10.1 |
| Missouri | +139.3 | TOTAL | +7,191.2 |

Source: Authors' estimates.

**Table 5**
**Net Number of U.S. Jobs Related to Trade with Mexico, by State, 2017**
**(Thousands)**

| | | | |
|---|---|---|---|
| Alabama | +64.8 | Montana | +17.0 |
| Alaska | +11.5 | Nebraska | +33.9 |
| Arizona | +91.1 | Nevada | +44.1 |
| Arkansas | +42.0 | New Hampshire | +20.6 |
| California | +572.2 | New Jersey | +141.2 |
| Colorado | +91.1 | New Mexico | +26.8 |
| Connecticut | +59.1 | New York | +323.5 |
| Delaware | +15.2 | North Carolina | +150.6 |
| District of Columbia | +24.9 | North Dakota | +13.5 |
| Florida | +304.1 | Ohio | +170.9 |
| Georgia | +158.2 | Oklahoma | +51.0 |
| Hawaii | +24.8 | Oregon | +58.9 |
| Idaho | +24.0 | Pennsylvania | +195.7 |
| Illinois | +198.0 | Rhode Island | +16.5 |
| Indiana | +89.2 | South Carolina | +69.9 |
| Iowa | +52.1 | South Dakota | +15.3 |
| Kansas | +47.2 | Tennessee | +99.0 |
| Kentucky | +60.0 | Texas | +399.5 |
| Louisiana | +68.5 | Utah | +48.8 |
| Maine | +22.2 | Vermont | +10.9 |
| Maryland | +96.1 | Virginia | +135.3 |
| Massachusetts | +118.9 | Washington | +113.8 |
| Michigan | +128.6 | West Virginia | +21.7 |
| Minnesota | +91.0 | Wisconsin | +92.5 |
| Mississippi | +40.1 | Wyoming | +9.0 |
| Missouri | +95.3 | TOTAL | +4,870.2 |

Source:  Authors' estimates.

**Table 6**
**Net Number of U.S. Jobs Related to Trade with China, by State, 2017**
**(Thousands)**

| | | | |
|---|---|---|---|
| Alabama | +103.4 | Montana | +30.6 |
| Alaska | +20.6 | Nebraska | +55.8 |
| Arizona | +132.6 | Nevada | +66.5 |
| Arkansas | +68.0 | New Hampshire | +24.7 |
| California | +780.8 | New Jersey | +193.8 |
| Colorado | +142.2 | New Mexico | +46.6 |
| Connecticut | +87.4 | New York | +454.8 |
| Delaware | +21.9 | North Carolina | +206.1 |
| District of Columbia | +37.1 | North Dakota | +27.6 |
| Florida | +448.8 | Ohio | +265.4 |
| Georgia | +226.9 | Oklahoma | +103.3 |
| Hawaii | +38.0 | Oregon | +83.0 |
| Idaho | +37.5 | Pennsylvania | +287.9 |
| Illinois | +285.6 | Rhode Island | +22.6 |
| Indiana | +147.4 | South Carolina | +103.2 |
| Iowa | +83.6 | South Dakota | +26.2 |
| Kansas | +84.4 | Tennessee | +157.0 |
| Kentucky | +107.5 | Texas | +657.7 |
| Louisiana | +115.6 | Utah | +70.9 |
| Maine | +31.6 | Vermont | +16.2 |
| Maryland | +139.3 | Virginia | +204.3 |
| Massachusetts | +154.5 | Washington | +182.8 |
| Michigan | +213.4 | West Virginia | +33.8 |
| Minnesota | +124.4 | Wisconsin | +134.5 |
| Mississippi | +66.8 | Wyoming | +39.3 |
| Missouri | +149.4 | TOTAL | +7,328.0 |

Source: Authors' estimates.

**Table 7**
**Net Number of U.S. Jobs Related to Trade with Japan, by State, 2017**
**(Thousands)**

| | | | |
|---|---|---|---|
| Alabama | +15.1 | Montana | +6.5 |
| Alaska | +4.1 | Nebraska | +11.3 |
| Arizona | +24.9 | Nevada | +12.2 |
| Arkansas | +13.0 | New Hampshire | +4.9 |
| California | +165.1 | New Jersey | +38.2 |
| Colorado | +28.5 | New Mexico | +9.6 |
| Connecticut | +12.7 | New York | +88.9 |
| Delaware | +4.3 | North Carolina | +39.8 |
| District of Columbia | +7.3 | North Dakota | +5.6 |
| Florida | +85.8 | Ohio | +37.3 |
| Georgia | +41.6 | Oklahoma | +19.6 |
| Hawaii | +7.4 | Oregon | +18.3 |
| Idaho | +8.5 | Pennsylvania | +51.5 |
| Illinois | +50.3 | Rhode Island | +4.1 |
| Indiana | +15.0 | South Carolina | +15.8 |
| Iowa | +15.9 | South Dakota | +5.4 |
| Kansas | +14.3 | Tennessee | +23.7 |
| Kentucky | +15.2 | Texas | +124.8 |
| Louisiana | +20.9 | Utah | +13.6 |
| Maine | +6.3 | Vermont | +3.3 |
| Maryland | +27.0 | Virginia | +37.3 |
| Massachusetts | +31.3 | Washington | +30.0 |
| Michigan | +23.1 | West Virginia | +7.0 |
| Minnesota | +25.9 | Wisconsin | +22.9 |
| Mississippi | +11.3 | Wyoming | +3.9 |
| Missouri | +26.2 | TOTAL | +1,336.7 |

Source:  Authors' estimates.

**Table 8**
**Net Number of U.S. Jobs Related to Trade with Korea, by State, 2017**
**(Thousands)**

| | | | |
|---|---|---|---|
| Alabama | +13.4 | Montana | +4.5 |
| Alaska | +2.9 | Nebraska | +8.5 |
| Arizona | +19.2 | Nevada | +9.2 |
| Arkansas | +10.1 | New Hampshire | +3.9 |
| California | +124.8 | New Jersey | +28.7 |
| Colorado | +20.1 | New Mexico | +6.7 |
| Connecticut | +11.8 | New York | +66.9 |
| Delaware | +3.2 | North Carolina | +31.0 |
| District of Columbia | +5.2 | North Dakota | +3.9 |
| Florida | +64.1 | Ohio | +33.3 |
| Georgia | +33.0 | Oklahoma | +13.6 |
| Hawaii | +5.5 | Oregon | +13.6 |
| Idaho | +6.0 | Pennsylvania | +40.8 |
| Illinois | +40.2 | Rhode Island | +3.3 |
| Indiana | +16.3 | South Carolina | +13.8 |
| Iowa | +12.6 | South Dakota | +4.0 |
| Kansas | +11.8 | Tennessee | +20.5 |
| Kentucky | +13.4 | Texas | +90.3 |
| Louisiana | +15.3 | Utah | +10.2 |
| Maine | +5.7 | Vermont | +2.5 |
| Maryland | +19.9 | Virginia | +28.7 |
| Massachusetts | +23.7 | Washington | +26.3 |
| Michigan | +23.2 | West Virginia | +5.2 |
| Minnesota | +19.7 | Wisconsin | +19.4 |
| Mississippi | +9.5 | Wyoming | +2.5 |
| Missouri | +21.2 | TOTAL | +1,042.2 |

Source:  Authors' estimates.

**Table 9**
**Net Number of U.S. Jobs Related to Trade with the EU (27), by State, 2017**
**(Thousands)**

| | | | |
|---|---|---|---|
| Alabama | +72.7 | Montana | +21.3 |
| Alaska | +15.2 | Nebraska | +38.5 |
| Arizona | +110.4 | Nevada | +52.8 |
| Arkansas | +47.3 | New Hampshire | +24.4 |
| California | +700.5 | New Jersey | +161.2 |
| Colorado | +114.5 | New Mexico | +35.7 |
| Connecticut | +64.9 | New York | +380.9 |
| Delaware | +17.6 | North Carolina | +168.3 |
| District of Columbia | +30.6 | North Dakota | +18.6 |
| Florida | +356.3 | Ohio | +187.0 |
| Georgia | +176.0 | Oklahoma | +73.6 |
| Hawaii | +28.9 | Oregon | +72.9 |
| Idaho | +29.8 | Pennsylvania | +220.0 |
| Illinois | +222.4 | Rhode Island | +18.6 |
| Indiana | +95.2 | South Carolina | +75.1 |
| Iowa | +57.4 | South Dakota | +17.9 |
| Kansas | +57.1 | Tennessee | +109.2 |
| Kentucky | +68.6 | Texas | +509.0 |
| Louisiana | +81.4 | Utah | +57.7 |
| Maine | +24.2 | Vermont | +13.0 |
| Maryland | +112.9 | Virginia | +156.6 |
| Massachusetts | +141.5 | Washington | +129.6 |
| Michigan | +146.3 | West Virginia | +27.6 |
| Minnesota | +107.4 | Wisconsin | +97.7 |
| Mississippi | +45.9 | Wyoming | +13.3 |
| Missouri | +107.0 | TOTAL | +5,712.5 |

Source: Authors' estimates.

**Table 10**
**Net Number of U.S. Jobs Related to Trade with the UK, by State, 2017**
**(Thousands)**

| | | | |
|---|---|---|---|
| Alabama | +15.9 | Montana | +4.4 |
| Alaska | +3.0 | Nebraska | +8.3 |
| Arizona | +22.2 | Nevada | +10.8 |
| Arkansas | +10.4 | New Hampshire | +5.5 |
| California | +148.8 | New Jersey | +33.7 |
| Colorado | +22.8 | New Mexico | +7.1 |
| Connecticut | +12.8 | New York | +78.7 |
| Delaware | +3.5 | North Carolina | +37.1 |
| District of Columbia | +6.2 | North Dakota | +3.6 |
| Florida | +72.7 | Ohio | +41.9 |
| Georgia | +37.3 | Oklahoma | +13.8 |
| Hawaii | +6.0 | Oregon | +16.1 |
| Idaho | +6.5 | Pennsylvania | +47.4 |
| Illinois | +48.2 | Rhode Island | +3.9 |
| Indiana | +23.0 | South Carolina | +16.5 |
| Iowa | +13.0 | South Dakota | +3.9 |
| Kansas | +11.0 | Tennessee | +24.4 |
| Kentucky | +15.3 | Texas | +100.0 |
| Louisiana | +16.2 | Utah | +12.1 |
| Maine | +5.2 | Vermont | +2.8 |
| Maryland | +23.3 | Virginia | +32.1 |
| Massachusetts | +29.9 | Washington | +25.8 |
| Michigan | +33.4 | West Virginia | +5.6 |
| Minnesota | +23.8 | Wisconsin | +23.1 |
| Mississippi | +9.9 | Wyoming | +2.4 |
| Missouri | +22.9 | TOTAL | +1,204.0 |

Source: Authors' estimates.

## IV  Conclusion

Our analysis demonstrates that trade continues to be important – indeed, increasingly important – to the U.S. economy and 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, 1992-2017**
**(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            | 1,820.2       |
| 2009 | 1,056.0       | 512.7            | 1,568.7       |
| 2010 | 1,278.5       | 562.8            | 1,841.3       |
| 2011 | 1,482.5       | 627.0            | 2,109.5       |
| 2012 | 1,545.7       | 655.7            | 2,201.4       |
| 2013 | 1,578.4       | 700.5            | 2,278.9       |
| 2014 | 1,621.9       | 741.1            | 2,363.0       |
| 2015 | 1,503.1       | 755.3            | 2,258.4       |
| 2016 | 1,451.0       | 758.9            | 2,209.9       |
| 2017 | 1,546.3       | 797.7            | 2,344.0       |

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, 1992-2017**
**(Billions)**

|      | Goods Imports | Services Imports | Total Imports |
|------|---------------|------------------|---------------|
| 1992 | $532.7        | $119.6           | $652.3        |
| 1993 | 580.7         | 123.8            | 704.4         |
| 1994 | 663.3         | 133.1            | 796.3         |
| 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 | 1,161.4       | 224.4            | 1,385.7       |
| 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 | 2,208.0       | 435.8            | 2,643.7       |
| 2012 | 2,276.3       | 452.0            | 2,728.3       |
| 2013 | 2,268.0       | 461.1            | 2,729.1       |
| 2014 | 2,356.4       | 480.8            | 2,837.2       |
| 2015 | 2,248.8       | 491.7            | 2,740.5       |
| 2016 | 2,187.6       | 509.8            | 2,697.4       |
| 2017 | 2,342.0       | 542.4            | 2,884.4       |

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

**Table A3**
**"Openness" of U.S. Economy, 1992-2017**
**(Billions and Percent)**

|      | Total U.S. Trade* | Total Trade's Share of U.S.GDP |
|------|-------------------|-------------------------------|
| 1992 | $1,300.9          | 20.0%                         |
| 1993 | 1,374.8           | 20.0                          |
| 1994 | 1,534.3           | 21.1                          |
| 1995 | 1,715.4           | 22.5                          |
| 1996 | 1,831.7           | 22.7                          |
| 1997 | 2,009.6           | 23.4                          |
| 1998 | 2,068.7           | 22.8                          |
| 1999 | 2,241.4           | 23.3                          |
| 2000 | 2,567.6           | 25.0                          |
| 2001 | 2,417.2           | 22.8                          |
| 2002 | 2,422.8           | 22.2                          |
| 2003 | 2,575.5           | 22.5                          |
| 2004 | 2,974.3           | 24.4                          |
| 2005 | 3,331.6           | 25.6                          |
| 2006 | 3,716.1           | 26.9                          |
| 2007 | 4,040.2           | 28.0                          |
| 2008 | 4,397.2           | 29.9                          |
| 2009 | 3,560.4           | 24.6                          |
| 2010 | 4,206.5           | 25.2                          |
| 2011 | 4,785.5           | 30.8                          |
| 2012 | 4,951.2           | 30.6                          |
| 2013 | 5,037.6           | 30.0                          |
| 2014 | 5,250.3           | 30.0                          |
| 2015 | 5,051.5           | 27.7                          |
| 2016 | 4,955.7           | 26.5                          |
| 2017 | 5,278.8           | 27.1                          |

* "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.[10]  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. 10 database, as are substitution elasticities

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[10]     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.

for value added.[11]

We are interested in the impact of trade on the U.S. and state economies given the U.S. wage structures in 2017 (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 2017 level of trade.

### *Data*

The model incorporates data from a number of sources.  Data on production and trade are based on input-output, final demand, and trade data from the GTAP database (see Aguiar, Narayanan & McDougall 2016).  These data provide important information on cross-border linkages in industrial production, related to trade in parts and components.  For the 2017 simulation, social accounting data are drawn directly from the most recent version of the GTAP dataset, version 10. Trade data (both exports and imports) exclude re-exports.[12] This dataset is benchmarked to 2014 and includes detailed national input-output, trade, and final demand structures for 140 countries across 56 sectors (see Table A-1). We have updated the trade and national accounts data to 2017.

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 10 database.  For the purposes of the modeling exercise, the aggregation of the GTAP database includes 110 regions and 27 sectors.[13]

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.  It is important to emphasize that we distribute the employment impacts of trade at the national level to employment at the state level.  We are therefore reporting state-level employment related to trade nationally.  We are not reporting the state level employment impacts of state-level trade. Based on the availability of employment data as well as the size of some of the sectors, we expanded some sectors

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[11]    Technically we work with what is known as a "non-nested" version of the trade demand equation in the GTAP model.  As such, in this case the model also corresponds analytically to a recent type of model known as an Eaton-Kortum model.  See Bekkers et al (2017) for further technical discussion and derivations.

[12]    See https://www.gtap.agecon.purdue.edu/databases/contribute/reexports.asp.

[13]    The GTAP database includes relatively more detail in sectors, particularly in agricultural, primary production, and processed foods than we can use here when mapping model results by sector to state employment data by sector. State employment data for most of these sectors are not available.

(e.g., "Finance and Insurance" its "Finance" and "Insurance" 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 estimate the missing national employment to undisclosed sectors in these states. However, because we mixed employment data from two sources (BEA and Moody's), the sum of the employment effects for the states may not add perfectly to the total for the United States.

For purposes of the modeling exercise here, the 110 countries/regions in the standard GTAP model were placed in eight distinct groupings of trading partners for the purpose of examining the impact of U.S. trade with those countries: Canada, Mexico, China, Japan, Korea, the European Union (excluding the UK), the United Kingdom, and rest-of-world. We also aggregated the standard GTAP model sectors into those shown in Table B-1.

**Table B-1**
**Model Sectors**

| | |
|---|---|
| Primary agriculture | Construction |
| Primary energy, mining | Air transport |
| Processed Foods | Water transport |
| Beverages and tobacco | Other transport |
| Petrochemicals | Trade and distribution (Wholesale, retail, |
| Chemicals, rubber, plastics | accommodation and food services) |
| Metals | Communications (Information, postal, |
| Motor vehicles | delivery services) |
| Electronic equipment | Financial services |
| Textiles | Insurance |
| Clothing | Business and professional services |
| Footwear, leather | Personal and recreational services (Arts, |
| Wood, paper | entertainment, and recreation services) |
| Other transport equipment | Other services (Education, health care, |
| Other machinery | social assistance, government services) |
| Other goods | |

***Model-based Simulations***

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.[14]

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[14] We have modeled an extreme shock to the economy to show the extent to which sectors of the

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 serve 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

Aguiar, Angel, Badri Narayanan, & Robert McDougall. "An Overview of the GTAP 9 Data Base." Journal of Global Economic Analysis 1, no. 1 (June 3,2016): 181-208.

Bekkers, E., Francois, J. F. and Rojas-Romagosa, H. (2017), Melting Ice Caps and the Economic Impact of Opening the Northern Sea Route. *Economic Journal*. doi:10.1111/ecoj.12460

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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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.