



Business Roundtable

Trade and American Jobs

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

February 2007



Business Roundtable

Business Roundtable (www.businessroundtable.org) is an association of chief executive officers of leading U.S. companies with \$4.5 trillion in annual revenues and more than 10 million employees. Member companies comprise nearly a third of the total value of the U.S. stock market and represent over 40 percent of all corporate income taxes paid to the federal government. Collectively, they returned more than \$112 billion in dividends to shareholders and the economy in 2005.

Roundtable companies give more than \$7 billion a year in combined charitable contributions, representing nearly 60 percent of total corporate giving. They are technology innovation leaders, with \$90 billion in annual research and development spending – nearly half of the total private R&D spending in the U.S.

For more information, please contact:

Brigitte Schmidt Gwyn
Director - International Trade & Fiscal Policy
1717 Rhode Island Avenue
Suite 800
Washington, DC 20036
P - 202.496.3263
F - 202.466.3509
bgwyn@businessroundtable.org

Trade and American Jobs

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



Business Roundtable

Table of Contents

EXECUTIVE SUMMARY _____	1
I. INTRODUCTION _____	3
II. THE IMPORTANCE OF TRADE TO THE UNITED STATES: THE BASIC FACTS _____	4
III. THE IMPORTANCE OF TRADE TO THE UNITED STATES: THE FACTS MOST AMERICANS DON'T KNOW _____	8
IV. CONCLUSION _____	15
APPENDIX _____	16
REFERENCES _____	20



Executive Summary

U.S. trade has been expanding and, with it, U.S. employment. An economic study conducted for the Business Roundtable found that more than 31 million U.S. jobs depended on trade in 2004. That means nearly one in every five U.S. jobs are linked to exports and imports of goods and services.

The analysis is the first estimate of the net number of U.S. jobs, both nationally and by state, that depend on U.S. exports and imports of both goods and services. The key findings of the new study are:

- ▶ Total net U.S. jobs dependent on total U.S. trade exceeded 31 million in 2004. Nearly one in every five U.S. jobs are positively linked to exports and imports of goods and services.
- ▶ Contrary to popular belief, the net impact of trade on the number of U.S. manufacturing jobs is positive.
- ▶ Every U.S. state has realized net employment gains directly attributable to trade.
- ▶ As U.S. trade -- both exports and imports -- has grown over the past decade, caused in part by trade liberalizing international agreements, so has the number of U.S. jobs tied to trade.

In 1992, a year prior to the implementation of a long string of multilateral and bilateral trade liberalizing agreements, net total trade-related employment in the United States totalled approximately 14 million jobs, one in ten U.S. workers.

By 2004 the comparable trade-related employment estimate had more than doubled, representing nearly one in five U.S. workers.

Past estimates of trade-related employment either vastly underestimate the number of U.S. jobs tied to trade, or they suffer from serious estimation flaws that bias their results. This study represents the first comprehensive look at total U.S. trade and employs a methodology that accounts for trade gains as well as losses, and that covers services as well as goods trade.

Trade and American Jobs

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

*Laura M. Baughman and Joseph Francois**

I. Introduction

A long-standing perception exists that trade has a net negative impact on U.S. employment and U.S. wages. While most Americans accept that exports are “good” – job creating and generally high paying – they also believe that imports are “bad” – they cost jobs, particularly lower-skilled and lower-wage jobs. Many also believe that, on balance, the costs associated with importing exceed the benefits associated with exporting. The analysis in this study demonstrates that those perceptions are incorrect.

This study contains a thorough examination of the impacts of trade on U.S. jobs. It examines the impact of both exports *and* imports, and of both goods and services on U.S. output and employment and demonstrates that the net impacts are in fact positive. By implication, trade liberalization, which increases both exports and imports, has resulted in net job creation rather than job loss.

This paper begins with a summary of the U.S. trade picture for both goods and services over the last decade.¹ It then reports the results of new research that uses sophisticated computer-based economic modeling techniques to estimate the *total* effects (both gains *and* losses) from trade, defined as broadly as possible (exports and imports of both goods and services). We focus on the impacts of trade on U.S. output and related employment, and break our results down for each U.S. state. An Appendix provides details of our methodology.

* Laura M. Baughman is President of Trade Partnership Worldwide, LLC (TPW, www.tradepartnership.com). She holds degrees in economics from Columbia and Georgetown Universities. Dr. Joseph Francois is Managing Director of Trade Partnership Worldwide, LLC, and professor of economics at Erasmus University. He also holds numerous research fellowships and professorships at think tanks and universities around the world. Dr. Francois formerly was the head of the Office of Economics at the U.S. International Trade Commission, and a research economist at the World Trade Organization. Dr. Francois holds a PhD in economics from the University of Maryland, and economics degrees from the University of Virginia.

¹ This paper focuses on the impacts of trade; it does not address the parallel impacts of foreign investment (both U.S. foreign investment abroad, and foreign investment in the United States). Others have explored these impacts in detail and their research is complementary to ours in this paper. See for example Gordon H. Hanson, Raymond J. Mataloni, Jr., and Matthew J. Slaughter, “Expansion Abroad and the Domestic Operations of U.S. Multinational Firms,” Working Paper, September 2003, http://mba.tuck.dartmouth.edu/pages/faculty/matthew.slaughter/working_papers.html.

II. The Importance of Trade to the United States: The Basic Facts

Trade has become an increasingly important part of the U.S. economy. Our exports and imports have grown consistently since the middle of the 20th Century and trade makes up an increasingly large portion of U.S. GDP. In 2005, total trade (exports plus imports) represented more than 27 percent of U.S. Gross Domestic Product. In 1947, at the launch of the General Agreement on Tariffs and Trade (the precursor to the World Trade Organization), it represented only 7.5 percent of U.S. GDP.

Export Trends

U.S. exports have been growing. Over the last 10 years, total U.S. exports have increased at an average annual rate of 5.0 percent, despite some decreases during the period due to the U.S. recession, “9/11” (which affected travel and tourist-related services), and the strong U.S. dollar. Recovery from the recession and “9/11” economic shock turned around export declines, and the changes in the dollar’s value beginning in 2002, in particular, helped to boost total U.S. export growth into the double-digits. Exports increased 13.2 percent in 2004 and 10.4 percent in 2005.

Table 1

U.S. Exports to the World, 1995-2005

(Billions)

	Merchandise Exports	Services Exports	Total Exports
1995	\$584.7	\$219.2	\$ 803.9
1996	625.1	239.5	864.6
1997	689.2	256.1	945.2
1998	682.1	262.8	944.9
1999	695.8	281.9	977.7
2000	781.9	298.6	1,080.5
2001	729.1	286.2	1,015.3
2002	693.1	292.3	985.4
2003	724.8	302.7	1,027.5
2004	818.8	344.4	1,163.2
2005	906.0	380.6	1,286.6

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

Approximately half 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.

Import Trends

U.S. imports have also been increasing over the last 10 years. Approximately half 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. Thus, import demand is significantly impacted by growth in U.S. industrial production. The other half of U.S. merchandise imports is of finished consumer goods, which, as Chart 1 shows, rise or fall according to consumer spending and tend to rise when the U.S. economy is doing well. Key services imports include travel and transportation services.

Table 2

U.S. Imports from the World, 1995-2005

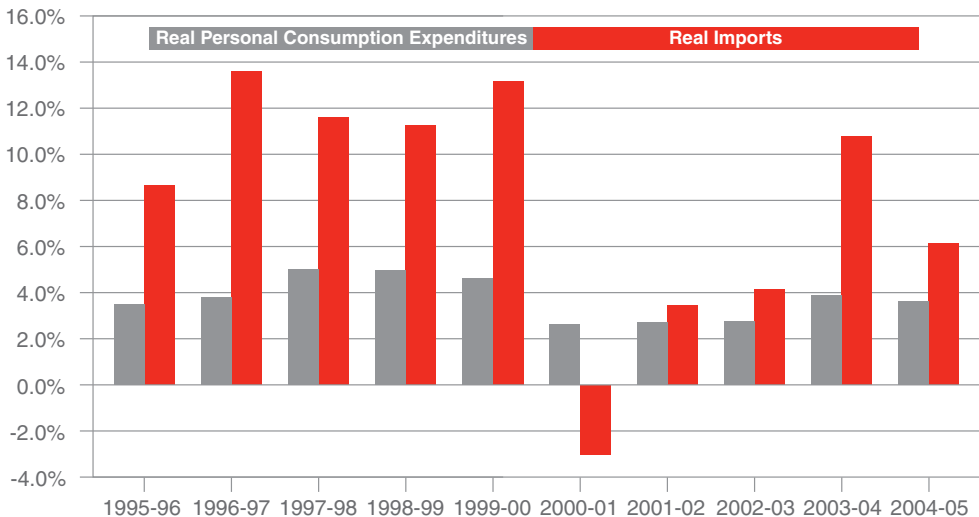
(Billions)

	Merchandise Imports	Services Imports	Total Imports
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	199.2	1,223.8
2000	1,218.0	223.7	1,441.8
2001	1,141.0	221.8	1,362.8
2002	1,161.4	231.1	1,392.4
2003	1,257.1	250.3	1,507.4
2004	1,469.7	290.3	1,760.0
2005	1,673.5	314.6	1,988.1

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

Chart 1

Growth in Consumer Spending Drives Growth in Real Imports



Source: Bureau of the Census

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

Another important contribution to the growth in trade over the last 10 years is trade liberalization, which opened new markets for U.S. exports of both goods and services at the same time it opened the U.S. market to increased imports from other countries.

- ▶ Gradual reductions in trade barriers began in 1994 between Mexico and the United States as part of the North American Free Trade Agreement (NAFTA).
- ▶ Significant global liberalization began between the United States and members of the World Trade Organization 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, and at the same time the United States began to gradually open its markets to Chinese exports of textiles and apparel, in particular.
- ▶ Free trade agreements were implemented between the United States and Jordan (December 2001), Chile and Singapore (January 2004) and Australia (January 2005).

Each of these initiatives helped to increase U.S. exports as well as U.S. imports, and thus total U.S. trade.

Table 3 shows “openness” of the U.S. economy – measured as the value of total trade (exports plus imports) relative to the value of U.S. GDP. The importance of trade to the U.S. economy has increased significantly in the last 10 years, rising from 22.8 percent of GDP at the beginning of this period of accelerating trade liberalization, total trade grew to represent more than 26 percent of GDP in 2005.

Table 3
“Openness” of U.S. Economy, 1995-2005
(Billions and Percent)

	Total U.S. Trade*	Total Trade's Share of U.S. GDP
1995	\$1,688.9	22.8%
1996	1,812.4	23.2
1997	1,980.9	23.9
1998	2,037.5	23.3
1999	2,201.5	23.8
2000	2,522.3	25.7
2001	2,378.1	23.5
2002	2,377.8	22.7
2003	2,534.8	23.1
2004	2,923.2	25.0
2005	3,274.7	26.3

* “Total Trade” is goods and services exports plus goods and services imports.

Source: Bureau of the Census

III. The Importance of Trade to the United States: The Facts Most Americans Don't Know

While many Americans accept that trade is good for the U.S. economy, they frequently believe that this growing “openness” has a negative impact on U.S. jobs.² In fact, the opposite is true. Our research, the details of which we describe in this section, shows that by 2005, U.S. exports and imports of goods and services support nearly one in five U.S. jobs. Moreover, as the U.S. economy has become more open to trade over the last decade, that ratio is double what it once was.

By 2005, U.S. exports and imports of goods and services support nearly one in five U.S. jobs.

To understand why trade supports so many jobs and why one should expect that *more* trade should support *more* jobs, it is useful to detail the process of designing, making and moving goods both out of and into the United States. These processes generate billions of dollars in U.S. output, and millions of employees are needed to generate that output. The contribution to jobs of exporting is well recognized.³ U.S. manufacturers or service providers design a product or service, and produce it. Someone is hired to advertise it, perhaps still others to sell it to foreign customers. Truckers, rail workers, and/or airlines get involved in transporting it to ports and, ultimately, to foreign customers.

The jobs contribution of imports is less well recognized but no less significant. Often, a U.S.-based company designs the product and works with foreign companies to manufacture it. But U.S. companies (and workers) are the ones that take it from the ships docked at the ports to the sales floor of retail outlets around the country – or manufacturing plants in the cases of raw materials and machinery. U.S. companies and

² See, for example, World Public Opinion.org, “Americans and the World: Public Opinion on International Affairs,” released February 15, 2002, http://americans-world.org/digest/global_issues/intertrade/summary.cfm.

³ Ibid.

workers who advertise, finance, warehouse, wholesale, transport and often retail the imported products also play an important role in giving a cost advantage to U.S. goods in world markets. All of this activity creates value added in the United States, and related jobs.

It must also be recognized that imports sometimes replace U.S. production, and U.S. jobs. The question is, how many related jobs? And, do the jobs positively associated with importing exceed the jobs lost when U.S. manufacturing is moved offshore and imports replace goods that were once made in the United States?

Common Assessments of Employment Impacts of Trade

The quantification to date of jobs associated with “trade” is typically very narrow in scope and unsophisticated. Trade supporters focus on jobs related to U.S. manufactured goods exports and ignore jobs related to imports. The most recent government-generated estimates come from the Census Bureau and focus solely on U.S. and state-level jobs directly and indirectly related to manufactured goods exports.⁴ The data are for 2002 only, and are drawn from the 2002 Economic Census amplified by broader trade and input-output data. These estimates do not count the number of jobs related to agricultural or services exports, or the number of jobs associated with imports. As such, they vastly understate the number of U.S. jobs related to trade.

Trade critics, on the other hand, focus on U.S. and state-level jobs lost to net manufactured goods imports (exports less imports). Some of the most frequently cited are papers issued by the Economic Policy Institute which are typically premised on a crucial but faulty assumption that imports are identical substitutes for all goods produced in the United States (which they are not), and thus can be made and sold by U.S. producers at the same prices (which they cannot). This assumption results in a significant overestimate of the number of jobs “lost” to net imports. Trade critics also rely on input-output analysis for their estimates, which results in an overestimation of job impacts, as explained in more detail in our Appendix.

⁴ U.S. Department of Commerce, Census Bureau, Exports from Manufacturing Establishments: 2002, AR(02)-1, issued May 2006; <http://ita.doc.gov/td/industry/otea/jobs/index.html>.

National Trade-Related Employment

The public policy debate has therefore long needed an approach to quantifying the number of total U.S. jobs related to total trade that is comprehensive. This study takes such an approach. It takes into account not only the positive job links but also negative job links. It covers both exports and imports. It considered both goods and services. In addition it uses a methodology that permits the full range of interactions between different sectors of the U.S. and international economies, and that eliminates any double counting of job impacts, either positive or negative. The Appendix describes the details of our analysis.

We find that in 2004 trade (exports plus imports) supported more than 31 million U.S. jobs (see Table 4), largely in trade-related business services sectors like banking, finance, insurance, law, transportation, wholesaling, retailing, even government (Customs workers, for example). Notably, the net impact of trade on U.S. manufacturing jobs is also positive: more than one million U.S. manufacturing jobs are linked to trade. Overall, trade nearly supported one in five U.S. jobs in 2004.

Notably, the net impact of trade on U.S. manufacturing jobs is also positive: more than one million U.S. manufacturing jobs are linked to trade.

Table 4
Estimated U.S. Jobs
Related to Trade,* 2004
(Thousands)

Total	31,306.6
Agriculture, forestry, fishing, mining	533.7
Construction	880.4
Manufacturing	1,153.6
Services	28,739.0
Wholesale, retail, transportation	291.7
Business services	14,149.3
Other services	14,298.0
Share of Total U.S. Employment	18.4%

* "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 5). Not surprisingly, the largest states benefited the most. Shares of total state employment related to trade ranged from a low of 16.8 percent (Wyoming) to a high of 20 percent (Hawaii).

Impact of Trade on U.S. Wages

Our analysis further reveals that total U.S. trade has a positive impact on real U.S. wages. In 2004, real U.S. wages were 5.6 percent higher than they otherwise would have been were there no trade at all. This is due to the fact that the manufacturing jobs that exist in the United States tend to be higher skilled manufacturing jobs in sectors, like chemicals and machinery manufacturing, where the United States is a competitive producer internationally. In addition, a large number of high-skill, high-wage services jobs in sectors like banking, finance, law, insurance, and advertising are related to trade and benefit from it. Indeed, over the last decade service sectors exports have become an increasingly important source of support for higher-wage employment.⁵

Table 5

Net Number of American Jobs Linked to Trade, By State, 2004

(Thousands)

Alabama	+428.5	Montana	+108.9
Alaska	+79.8	Nebraska	+223.0
Arizona	+552.9	Nevada	+254.0
Arkansas	+261.6	New Hampshire	+143.3
California	+3,705.6	New Jersey	+910.1
Colorado	+553.1	New Mexico	+201.8
Connecticut	+402.5	New York	+2,114.4
Delaware	+94.4	North Carolina	+878.4
District of Columbia	+196.0	North Dakota	+88.3
Florida	+1,795.3	Ohio	+1,233.1
Georgia	+893.8	Oklahoma	+370.1
Hawaii	+165.7	Oregon	+381.5
Idaho	+151.0	Pennsylvania	+1,289.4
Illinois	+1,345.6	Rhode Island	+112.9
Indiana	+635.2	South Carolina	+403.3
Iowa	+348.6	South Dakota	+99.3
Kansas	+327.0	Tennessee	+617.4
Kentucky	+418.1	Texas	+2,246.1
Louisiana	+449.1	Utah	+259.7
Maine	+143.4	Vermont	+77.9
Maryland	+639.2	Virginia	+875.8
Massachusetts	+774.1	Washington	+670.2
Michigan	+1,015.3	West Virginia	+162.2
Minnesota	+626.0	Wisconsin	+611.1
Mississippi	+263.7	Wyoming	+58.5
Missouri	+649.8	TOTAL	+31,306.6

Source: Authors' estimates.

In 2004, real U.S. wages were 5.6 percent higher than they otherwise would have been where there were no trade at all.

⁵ Our wage estimates follow from a different experiment than the jobs experiment, though they complement each other. The jobs estimates involve employment at current wage levels. Alternatively, the wage estimates involve the drop in wages needed to continue to support the same number of jobs as we have now.

Job Impacts of Trade Expansion

To determine whether increases in trade caused in part by trade liberalization have been good or bad for U.S. employment, we also examined the impact of trade (broadly defined) on employment for 1992. This was a year that reflects the trade and employment situation in the United States before the implementation of the increasingly ambitious trade liberalization initiatives that began with NAFTA in 1994.

Table 6 shows that growth of trade – including imports – has been job-creating over the last decade.⁶ Total employment related to total trade has more than doubled over the period, from 14.5 million jobs to 31.3 million jobs.⁷ As a share of total employment, trade-related jobs jumped from one in ten to nearly one in five. Manufacturing jobs increased the most in percentage terms, up 212 percent over the decade; services jobs tied to trade increased 128 percent.

In addition, the importance of trade to higher-wage, higher-skill jobs in the United States has increased. As noted above, real U.S. wages were 5.6 percent higher in 2004 than they otherwise would have been were

there no trade at all. The comparable estimate for 1992 is 2.3 percent. In short, growth in trade has not only created more trade-related jobs, those jobs are better paying than the jobs linked to trade in 1992.

⁶ Overall, U.S. job growth results from increases in productivity, economic growth generally, improvements in production efficiency — all variables that are themselves affected by trade. In addition, actions by the Federal Reserve to temper inflation have impacts on overall employment. In an economy that is essentially at full employment, as the U.S. economy is today, trade will not “create” jobs but will instead shift them around from uncompetitive industries to more competitive industries. What we are in fact measuring is this change in job location from 1992 to 2004. To the extent that jobs have shifted from non-trade related sectors to trade-related sectors, trade has “created” jobs.

⁷ Our approach implicitly takes into account improvements in productivity that took place between 1992 and 2005. The model “run” for 1992 reflects the state of productivity in the economy in 1992, and the model “run” for 2004 in turn reflects the state of productivity in the economy in 2004.

Table 6
Estimated U.S. Jobs Related to Trade,*
1992 vs. 2004

(Thousands)	1992	2004
Total	14,452.6	31,306.6
Agriculture, forestry, fishing, mining**	707.4	533.7
Construction	756.2	880.4
Manufacturing	369.4	1,153.6
Services	12,619.6	28,739.0
Share of Total U.S. Employment	10.4%	18.4%

* “Trade” = exports plus imports of goods and services.

** The decline in the number of jobs in these sectors from 1992-2004 reflects the fact that the U.S. mining sector was much more capital-intensive in 2004 than it was in 1992. Thus, the job impact of “no trade,” our modelling scenario, would be much smaller in 2004 than it was for 1992.

Source: Authors’ estimates.

A Note on Foreign Investment-Related Employment

Our research focuses on the impacts of trade on net U.S. employment. It should be noted, however, that investment – both foreign investment in the United States as well as U.S. investment abroad – also supports jobs in the United States.

U.S. government data provide us with estimates of the first set of jobs numbers, namely the number of U.S. jobs provided by foreign companies operating affiliates in the United States. Table 7 shows that U.S. affiliates of foreign companies employed 5.1 million Americans directly in 2004.

The second set of investment-related U.S. jobs – jobs in the United States associated with U.S. investment abroad – is more complicated to estimate. Most critics of globalization assert that U.S. investments abroad cost jobs in the United States because U.S. multinationals that expand operations abroad, reduce employment at home. However, economists with the National Bureau of Economic Analysis and the U.S. Bureau of Economic Analysis took a close empirical look at this hypothesis and found just the

Growth in trade has not only created more trade-related jobs, those jobs are better paying than the jobs linked to trade in 1992.

Table 7
U.S. Employment at U.S. Affiliates of Foreign Companies, 2004

(Thousands)

Alabama	+70.6	Montana	+6.4
Alaska	+11.3	Nebraska	+20.0
Arizona	+62.9	Nevada	+27.0
Arkansas	+32.0	New Hampshire	+41.0
California	+547.0	New Jersey	+219.7
Colorado	+71.4	New Mexico	+12.6
Connecticut	+102.7	New York	+377.0
Delaware	+26.1	North Carolina	+198.0
District of Columbia	+15.7	North Dakota	not avail.
Florida	+238.4	Ohio	+203.6
Georgia	+175.9	Oklahoma	+31.7
Hawaii	+31.6	Oregon	+47.6
Idaho	+12.9	Pennsylvania	+225.6
Illinois	+235.6	Rhode Island	+26.1
Indiana	+132.5	South Carolina	+126.8
Iowa	+36.2	South Dakota	+5.5
Kansas	+32.2	Tennessee	+126.9
Kentucky	+84.7	Texas	+341.2
Louisiana	+49.9	Utah	+30.9
Maine	+29.0	Vermont	+10.8
Maryland	+101.1	Virginia	+133.7
Massachusetts	+182.9	Washington	+83.4
Michigan	+201.0	West Virginia	+19.0
Minnesota	+83.2	Wisconsin	+86.9
Mississippi	+25.5	Wyoming	+8.5
Missouri	+84.2	TOTAL	+5,116.4

Source: Thomas W. Anderson and William J. Zeille, "U.S. Affiliates of Foreign Companies: Operations in 2004," Survey of Current Business, August 2006, Vol. 86, No. 8.

opposite to be the case.⁸ They examined a large set of U.S. government data covering all U.S. multinational firms and concluded that increased sales of foreign affiliates of U.S. firms *raise*, rather than lower, U.S. parent employment. Specifically, they found that a 10 percent increase in affiliate sales increases parent employment by 0.3 percent.

This analysis indicates that foreign investment by U.S. companies increases employment in the United States. As a crude approximation, applying the Hanson *et al* elasticity to all foreign affiliate sales implies that the activities of foreign affiliates, as translated into affiliate sales, support roughly 3 percent of U.S. employment.

⁸ Gordon H. Hanson, Raymond J. Mataloni, Jr., and Matthew J. Slaughter, "Expansion Abroad and the Domestic Operations of U.S. Multinational Firms," September 2003.

IV. Conclusion

Past estimates of trade-related employment either vastly underestimate the number of U.S. jobs tied to trade, or they suffer from serious estimation flaws that bias their results. This study represents the first comprehensive look at total U.S. trade and employs a methodology that accounts for trade gains as well as losses, and that covers goods as well as services trade. When done right, it is clear that total U.S. trade is employment-supporting, and that growth in trade, both exports and imports, is job-expanding.

Appendix

Methodology

Different options are available to estimate trade linkages to employment and output. One involves manipulation of input-output tables to map the linkages between exports and/or imports to labor demand and total output across sectors. Such an approach presents several problems, however. The first is that the shares in the base data basically fix the structure of production and demand. In addition, there may be double counting, as the net effect of exports and imports is not the simple sum of export effects and import effects. In addition, such an approach may also overestimate effects unless the impact of substitution toward trade with the rest of the world is also included.

To accommodate these issues, we applied a computable multi-sector model of the U.S. economy. Computable general equilibrium (CGE) models are characterized by an input-output structure (based on regional and national input-output and employment tables) that explicitly link industries in a value added chain from primary goods, over continuously higher stages of intermediate processing, to the final assembling of goods and services for consumption. Inter-sectoral linkages are direct, like the input of steel in the production of transport equipment, and indirect, via intermediate use in other sectors. The model captures these linkages by modelling firms' use of factors 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.

Data

Our data come 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 1992 experiment, the data came from the GTAP 3 database, though we work with GTAP 6 parameter values (trade and value added substitution elasticities) for both 1992 and 2006. For the 2004 experiment, these social accounting data are drawn directly from the most recent version of the Global Trade Analysis Project (GTAP) dataset, version 6.0. (Dimaranan and McDougall, 2002). The GTAP version 6 dataset is benchmarked to 2001 and includes detailed national input-output, trade, and final demand structures. Using macro and related trade and employment data, we updated the dataset to 2004.

The basic social accounting and trade data are supplemented with trade policy data, including additional data on tariffs and non-tariff barriers. The data are supplemented with data from the U.S. Department of Labor on state-level employment and from the U.S. Bureau of Economic Analysis on state level output. These data allow us to map nationwide effects to state-level changes in employment and output.

The data on tariffs are taken from the WTO's integrated database, with supplemental information from the World Bank's recent assessment of detailed pre- and post-Uruguay Round tariff schedules and from the UNCTAD/World Bank WITS dataset. All of this tariff information has been concorded to GTAP model sectors within the version 6.2 database. The sectors in the model are shown in Table A-1. The GTAP regions are aggregated into the U.S. and rest-of-world.

Table A-1
Model Sectors

Agriculture	Lumber and wood products
Forestry	Paper, pulp, publishing
Fisheries	Petroleum and coal products
Coal	Chemicals, rubber, plastics
Oil	Non-ferrous metals
Gas	Iron and steel
Other minerals	Fabricated metals
Processed foods	Transport equipment
Beverages and tobacco	Other manufactures
Textiles	Construction
Wearing apparel	Trade and transport
Leather	Other private services
	Public services

The Model

We used the same basic model structure for both exercises. The only critical difference is the data, which is benchmarked alternatively to 1992 and to 2004. We also use the same aggregation scheme, in terms of the sectors detailed in Table A-1, for both sets of experiments.⁹

For each version of the model, single representative, composite households comprise each region, with expenditures allocated over personal consumption and savings. The composite household owns endowments of the factors of production and receives income by selling them to firms. It also receives income from tariff revenue and

rents accruing from import/export quota licenses (when applicable). Part of the income is distributed as subsidy payments to some sectors, primarily in agriculture.

Table A-2

Substitution Elasticities Used in the Model

	Substitution in value added	Substitution between imports	Substitution between imports and domestic goods
Agriculture	0.24	2.50	5.04
Forestry	0.20	2.50	5.00
Fisheries	0.20	1.25	2.50
Coal	0.20	3.05	6.10
Oil	0.20	5.20	10.40
Gas	0.20	17.20	34.40
Other minerals	0.20	0.90	1.80
Processed foods	1.12	2.82	5.62
Beverages and tobacco	1.12	1.15	2.30
Textiles	1.26	3.75	7.50
Apparel	1.26	3.70	7.40
Leather	1.26	4.05	8.10
Lumber	1.26	3.40	6.80
Paper, pulp, printing	1.26	2.95	5.90
Petroleum, coal products	1.26	2.10	4.20
Chemicals, rubber, plastics	1.26	3.30	6.60
Non-metallic minerals	1.26	2.90	5.80
Iron and steel	1.26	2.95	5.90
Non-ferrous metals	1.26	4.20	8.40
Fabricated metals	1.26	3.75	7.50
Transport equipment	1.26	3.15	6.42
Other machinery and equipment	1.26	4.19	8.41
Other manufactures	1.26	3.75	7.50
Construction	1.40	1.90	3.80
Trade and transport	1.68	1.90	3.80
Other private services	1.26	2.01	3.89
Public services	1.26	1.90	3.80

⁹ We implemented the 2004 model in both GEMPACK, and using the GTAPinGAMS MPSGE-based model. These both yield the same pattern of results. For reasons related to changes in the database structure between GTAPv3 and GTAPv6, we only used the GEMPACK version of the model for 1992.

On the production side, in all sectors, firms employ domestic production factors (capital, labour and land) and intermediate inputs from domestic and foreign sources to produce outputs in the most cost-efficient way that technology allows. Capital stocks are fixed at a national level. Firms are competitive, and employ capital and labour 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. 6 database, as are substitution elasticities for value added.

We were interested in the impact of trade on the U.S. and state economies given the U.S. wage structures in 1992 and 2004. In other words, given the prevailing wage structure of the labor force in the 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, using the GTAP version 3 for 1992 and version 6 for 2004, we employ a labor market closure (equilibrium conditions) where we fix wages at prevailing levels, and force employment levels to adjust. This provides a direct estimate of the jobs supported, at current wage levels, by the current level of trade.

Experiments

The experiments conducted with the model involve imposing changes in U.S. trade, in this instance effectively eliminating U.S. exports and imports by imposing 1,000 percent duties against trade with the United States across the board.¹¹ This allows us to trace changes at the border as they work through the U.S. economy.

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 modelling 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 modelling structures.

¹¹ 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 tariff of 1,000 percent 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.

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. These results thus also measure the reverse scenario: how much 1992 and 2004 levels of trade in goods and services contributed to U.S. and state output and employment. We report the results from this second perspective in this paper.

References

Dimaranan, B. V. and R. A. McDougall, (2002). *Global Trade, Assistance, and Production: The GTAP 5 Data Base*, Center for Global Trade Analysis, Purdue University.

Hertel, T.W. E. Ianchovichina and B.J. McDonald (1997), "Multi-Region General Equilibrium Modeling," in J.F. Francois and K.A. Reinert, eds., *Applied Methods for Trade Policy Analysis: A Handbook*, Cambridge University Press.

Huff, K. R. McDougall and T. Walmsley (2000), "Contributing Input-Output Tables to the GTAP Data Base," GTAP Technical Paper No. 01, GTAP consortium.

McDonald, S. and K. Thierfelder (2003), "Deriving a Global Social Accounting Matrix from GTAP version 5 Data," GTAP consortium.

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.



Business Roundtable

1717 Rhode Island Avenue
Suite 800
Washington, DC 20036

Telephone 202.872.1260

Facsimile 202.466.3509

Website trade.businessroundtable.org