OPENING MARKETS, CREATING JOBS:

Estimated U.S. Employment Effects of Trade with FTA Partners

U.S. CHAMBER OF COMMERCE

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Executive Summary

The impact of trade generally and U.S. free trade agreements (FTAs) specifically on U.S. employment requires careful empirical analysis. This study takes a close look at the employment and other economic effects of trade with countries with which the United States has FTAs, and then more specifically the employment and other economic effects associated with the FTAs themselves. We use a comprehensive methodology that enables us to account for all the upstream, downstream, direct, and indirect effects of trade not only in goods but in services as well. We examine FTAs in effect in 2008: those with Israel, Canada, Mexico, Jordan, Chile, Singapore, Australia, Morocco, Bahrain, and the U.S.-Dominican Republic-Central America FTA (DR-CAFTA) countries excluding Costa Rica. We find the following:

- Trade generally with the 14 FTA partners boosted U.S. GDP by $1.0 trillion. Total U.S. exports of goods and services to the world were $462.7 billion higher than they otherwise would have been because we trade with these countries. Further, trade with the FTA partners supported 17.7 million U.S. jobs across the range of U.S. industries.

- The FTAs themselves generated $304.5 billion in U.S. output in 2008, or 2.1 percent of U.S. GDP. They expanded total U.S. exports of goods and services to the world by $462.7 billion. They also supported 5.4 million U.S. jobs.

- Because Canada and Mexico are very large trading partners of the United States, it is no surprise that most of the gains from the FTAs result from the North American Free Trade Agreement (NAFTA). Its effects are also greater because it has been in force longer than many of the other FTAs. NAFTA trade represents 92 percent of the net employment gains associated with the 14 FTAs in 2008; 92 percent of the output gain, and 80 percent of the total U.S. goods and services export increases.

Opening Markets, Creating Jobs: Estimated U.S. Employment Effects of Trade with FTA Partners

by

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May 14, 2010

I. Introduction

Some critics of U.S. participation in free trade agreements (FTAs) have introduced legislation that would withdraw the United States from the North American Free Trade Agreement (NAFTA) (H.R. 4759) on the grounds that it has caused U.S. job losses. Such critics charge that the FTAs that the United States has implemented with individual or regional trading partners are on balance harmful to the U.S. economy and to U.S. workers in particular. Indeed, a significant number of Members of the House of Representatives support the Trade Reform, Accountability, Development and Employment Act of 2009 (H.R. 3012), which would among other provisions mandate a quantification of the U.S. employment impacts of current U.S. trade agreements. Such an assessment would be taken into account in any decision about whether existing trade agreements should be renegotiated.

The call by some Members of the House for quantification of FTA employment effects reflects valid public policy concern and genuine questions from the voting public about trade agreements. The impact of trade agreements on U.S. employment, output and trade requires careful empirical analysis. This study takes a close look at the employment and other economic effects of U.S. bilateral and regional trade agreements. We examine trade agreements in effect in 2008: those with Israel, Canada, Mexico, Jordan, Chile, Singapore, Australia, Morocco, Bahrain, and the U.S.-Dominican Republic-Central America FTA (DR-CAFTA) countries excluding Costa Rica.[1] The paper begins with a review of the agreements and the trade trends with the partner countries. We then estimate the U.S. employment and other economic impacts of the trade agreements.

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[1] The agreements with Peru, Costa Rica, and Oman did not affect their trade until 2009.

II. FTA Partner Trade Trends

Since 1985, the United States has implemented 12 FTAs[2] with 17 individual countries (see Table 1). U.S. goods exports to FTA partners in 2009 ($358 billion) exceeded, by a considerable margin, total U.S. exports to the European Union ($202 billion). Even excluding U.S. exports to Canada and Mexico, U.S. exports to the remaining FTA partners, at $81 billion, are still significant: If these markets were a single country, it would be the third largest U.S. goods export market, displacing China, which accounted for $65 billion in U.S. exports in 2009.

Table 1
U.S. Free Trade Agreements
(as of May 2010)

	Implementation Date
U.S.-Israel Free Trade Agreement	9/1/1985
U.S.-Canada Free Trade Agreement	1/1/1989
North American Free Trade Agreement (Canada and Mexico)	1/1/1994
U.S.-Jordan Free Trade Agreement	12/17/2001
U.S.-Chile Free Trade Agreement	1/1/2004
U.S. Singapore Free Trade Agreement	1/1/2004
U.S. Australia Free Trade Agreement	1/1/2005
U.S. Morocco Free Trade Agreement	1/1/2006
U.S.-Dominican Republic-Central America Free Trade Agreement:	
El Salvador	3/1/2006
Nicaragua	4/1/2006
Honduras	4/1/2006
Guatemala	7/1/2006
Dominican Republic	3/1/2007
Costa Rica	1/1/2009
U.S.-Bahrain Free Trade Agreement	8/1/2006
U.S.-Oman Free Trade Agreement	1/1/2009
U.S.-Peru Trade Promotion Agreement	2/1/2009

Source: U.S. Customs & Border Protection,
www.customs.gov/xp/cgov/trade/trade_programs/international_agreements/fta_ptl.xml

[2] Most of the agreements are referred to as free trade agreements as they effectively remove the preponderance of barriers to cross-border trade or investment. In virtually every case, however, trade or investment barriers relating to some sectors are excluded from the agreement completely (e.g., sugar from the U.S.-Australia FTA, or several services sectors from NAFTA); in other cases, restrictive rules of origin limit liberalization (most notably in textiles and apparel).

U.S. trade with FTA partners is significant. It amounts to 30.7 percent of total U.S. imports in 2009, and 38.2 percent of total U.S. exports. As a group, U.S. FTA partner countries have proven to be stronger markets for export growth than most non-FTA partner countries. Table 2 shows that U.S. exports to partners with FTAs in effect in 2008 grew at an average *annual* rate of 17.4 percent since each individual FTA went into effect, compared to an average annual growth rate of 6.0 percent for U.S. exports to non-FTA partners.[3] Table 2 shows U.S. exports to FTA partner countries grew considerably faster under the FTA than in the three years prior to implementation of the FTA.

Table 2
Average Annual Growth of U.S. Merchandise Exports to FTA Partner Countries

	Three Years Prior to FTA	Implementation of FTA through 2008
Australia	9.9%	11.7%
Bahrain	-6.6	30.3
Canada	6.7	5.0
Chile	-8.0	36.3
Dominican Republic	7.9	11.9
El Salvador	3.5	10.0
Guatemala	10.5	19.1
Honduras	7.7	14.3
Israel	-5.1	7.1
Jordan	0.4	15.4
Mexico	9.5	6.1
Morocco	-1.8	44.6
Nicaragua	11.8	20.5
Singapore	-2.3	11.6
Total of 14 FTAs	3.2	17.4
Non-FTA countries, 1998-2008	6.0	

Source: Bureau of the Census

[3] We exclude 2009, as well as the three countries whose FTAs went into effect in 2009, to avoid biasing the analysis with most of the negative effects of the global recession, which occurred independent of the FTAs.

Table 2 focuses on merchandise (industrial and agricultural products) trade, but U.S. FTAs increasingly benefit U.S. services trade as well.[4] Because the United States is today predominately a services economy — 78 percent of private sector U.S. output and 83 percent of U.S. private sector employment are in services sectors — and foreign barriers to U.S. services exports are high, the FTAs' impacts on services trade liberalization is in fact where the U.S. economy and U.S. workers stand to gain the most from these agreements. Three recent FTAs that cover services show the significant increases in U.S. services exports that followed implementation of the FTAs (see Table 3).

Table 3
Average Annual Growth of U.S. Services Exports to FTA Partner Countries

	Three Years Prior to FTA	Implementation of FTA through 2008
Australia	12.4%	16.3%
Chile	-0.089	14.1
Singapore	-0.004	12.9

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

III. Impact of FTAs on the U.S. Economy and U.S. Employment

What Do FTAs Do?

To properly evaluate the impact of free trade agreements, one must understand all the pieces of the economy that are affected by them. Trade agreements — even those with relatively small economies — impact the U.S. economy in a range of ways. Most Americans are familiar with the benefits to exports. When FTA partners reduce their barriers to U.S. goods and services exports, U.S. exports of goods and services become more competitive in the FTA partner market. U.S. companies win more sales, particularly relative to other trading partners that still face tariffs or non-tariff barriers in the FTA partner market. As U.S. companies export more, they are able to increase U.S. production — and perhaps employment[5] — in the United States. These are what are known as the "direct effects" of increases in exporting.

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[4] The U.S.-Israel FTA did not cover services trade, and NAFTA covers services, but in a limited way. Post-NAFTA FTAs increasingly expand the coverage of services trade barrier elimination in partner countries.

[5] In times of tight employment, the exporting sectors lure workers away with higher wages from other U.S. sectors that are not seeing an increase in their production. In this case, U.S. employment overall does not increase; instead, it shifts from one sector of the economy to

The economic effects of trade agreements are not limited to the more obvious direct export effects. Additional indirect effects can outweigh the direct ones. For example, to meet new demand for exports, producers of U.S. goods and services buy more raw materials and equipment from other sectors of the U.S. economy — and from abroad — which increases output (and, again, perhaps employment) in these other sectors.[6] As jobs expand (high unemployment case) and/or worker income grows (low unemployment case), U.S. consumer spending grows and that, in turn, supports still more jobs in non-traded goods and services sectors of the economy.

Modeling Options: Effects of FTAs on…

…Goods and/or Services Exports
Up- and downstream effects on U.S. output and employment, typically estimated with a simple multiplier. See for example, U.S. Department of Commerce, "Exports Support American Jobs," International Trade Research Report, March 2010.

…Goods Exports *and Imports*
Up- and downstream effects on U.S. output and employment, with related direct and indirect effects, most appropriately estimated with a computable general equilibrium model. See for example International Trade Commission evaluations of U.S. FTAs.

…Goods *and Services* Exports and Imports
Up- and downstream effects on U.S. output and employment, with related direct and indirect effects, typically estimated with a computable general equilibrium model. See for example this study and U.S. Chamber of Commerce, "Trade Action – or Inaction: The Cost for American Workers and Companies," September 2009.

In addition to increased exports, trade agreements also eliminate U.S. barriers to trade in goods and services with the FTA partner country. This means that imports of these goods and services become less costly, and U.S. imports increase. Increased imports can replace U.S. production, at which point U.S. production and U.S. employment directly linked to that production decline. This is a direct negative impact on competing U.S. firms and workers. However, as is the case with exports, there are important indirect effects at play as well. They are not as obvious as imports replacing U.S. production, yet they are critical to the overall analysis. For example, jobs associated with bringing imports to their ultimate customer may increase with imports — from the dockworkers to the truckers to the warehouse operators to retailers, among others. In addition, the lower cost of

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another. In times of high unemployment, the increased demand for workers can be supplied from a pool of unemployed workers at prevailing wages, so workers without jobs join the workforce and overall U.S. employment grows (jobs are "created").

[6] A recent U.S. Department of Commerce effort to measure the number of U.S. jobs supported by U.S. exports of goods and services goes this far. See U.S. Department of Commerce, International Trade Administration, "Exports Support American Jobs," International Trade Research Report no. 1 (released March 2010), http://www.trade.gov/publications/pdfs/exports-support-american-jobs.pdf

imported goods that are raw materials or machinery or other inputs to U.S. production can make U.S. producers or services providers more competitive in global markets. This effect is uneven, as some sectors benefit more than others from access to lower-cost inputs, contributing to the uneven effect that an FTA can have across U.S. sectors. Finally, if imported goods and services are consumer products that now cost less, the savings consumers experience enable them to spend more on other goods and services (which creates new jobs or boosts income) or to save more (which lowers interest rates). All in all, the job effects of imports are not necessarily a net negative.

The net effect of all these channels of change is not obvious without working through detailed data on production, trade and consumption. The ripple effects – greater production in export-intensive industries, lower production costs from competitively priced imports, and greater consumer income available to spend or save – have the potential to make the U.S. economy more efficient and workers more productive, boosting their incomes. These effects need to be balanced against the direct competition that imports place on U.S. jobs. Where the net effects are positive, they can increase U.S. GDP — the economy can generate and consume more goods and services at lower cost, even after accounting for any losses in U.S. production stemming from import competition.

Estimating the impact of an FTA therefore is a complicated exercise because of all of the moving parts involved. Indeed this is why the public policy debate can be contentious and at times sound confused. It reflects genuine interest focused on sometimes smaller pieces of a bigger picture. Some parties are primarily interested in particular parts of the total mechanism linking trade and trade agreements to jobs and competitiveness. Others are uncertain how the net

About the Study

The estimates presented in this study were derived from a computable general equilibrium (CGE) analysis of the economic impacts on the United States of, in effect, canceling in 2008 U.S. FTAs in effect in that year. General equilibrium models are the most sophisticated and comprehensive vehicles for assessing the global up- and downstream economic impacts of trade policy changes. The specific CGE model we use here is the Global Trade Analysis Project (GTAP), a model developed in the early 1990s and now maintained by a consortium of 31 U.S. and international organizations that include the U.S. International Trade Commission, the U.S. Department of Agriculture, the U.S. Environmental Protection Agency, the U.S. Department of Energy, the OECD, the World Bank, and the World Trade Organization. The model has been used by economists to assess the impacts of the Uruguay and Doha rounds of multilateral trade negotiations.

Dr. Joseph Francois, an individual member of the GTAP consortium, has joined with Laura M. Baughman to use the model to help U.S. policy makers understand the economic effects on the United States of trade. Reports have included, for example, “Non-Tariff Measures on EU-US Trade and Investment – An Economic Analysis” (2009), prepared with Ecorys for the European Commission, and “Trade Action – or Inaction: The Cost for American Workers and Companies” (2009), prepared for the U.S. Chamber of Commerce.

effects play out, or have strong beliefs that one channel or the other dominates. Answering this question is not as simple as multiplying increased exports by a factor of some kind (X jobs per billion dollars of total or net exports,[7] for example). To catch the interaction of the moving parts that make up the economy, one needs to resort to a multi-sector approach. In technical terms, a tool that meets this set of requirements is called a "computable general equilibrium" or CGE model. CGE models permit us to sort out many of the simultaneous and sometimes conflicting effects of a trade agreement to arrive at a *net* impact assessment. For this reason, we work with a CGE model here to estimate the impacts of U.S. FTAs in 2008.

A technical description of the underlying methodology is provided in Appendix A. Basically, we have estimated the impacts on U.S. goods and services exports and imports if U.S. and partner country tariff and non-tariff barriers are restored to what they would be in 2008 absent the FTAs. In other words, starting with the actual economy in 2008, we "unwind" the FTAs and see what the resulting impacts are on output, trade and employment. Appendix B details what those tariff rates would be for U.S. exports to FTA partners. U.S. tariffs that would be applied to *imports* from FTA partners that would not benefit from a preference program absent the FTA are also shown in Appendix B. These duties would raise the cost of imports from Australia, Bahrain, Canada, Israel, and Singapore. Imports from the other FTA partners would be eligible for preferences, either under the Generalized System of Preferences (Jordan, Chile and Mexico) or under the Caribbean Basin Trade Partnership Act (Dominican Republic, El Salvador, Nicaragua, Honduras, and Guatemala), and thus would likely continue to enter the United States duty-free or at reduced duties, even in the absence of the FTAs.

In addition to tariffs, another potential benefit of these agreements for exporters is the reduction in costs linked to foreign regulatory barriers that largely affect services trade, and the simple but often expensive problem of time lost with customs clearance. These costs are more insidious, in a way, because they are not apparent, as the cost of a tax (like a tariff) collected at the border would be, and so traders are unaware of their value. The costs are simply imposed through wasted resources and time.[8] We included estimates of such cost savings from the FTAs in this exercise. We estimate barriers to trade in

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[7] Use of "net exports" is problematic because it assumes that imports and domestic production are identical – all products that are imported can be produced in the United States at the same level of quality, in the same quantity and at the same price as the imported good. This is never the case in the aggregate (total trade), and rarely the case at the sector level.

[8] Indeed a recent analysis of trans-Atlantic trade found that such barriers may be far more significant than tariffs in raising costs for exporters and limiting gains linked to improved market access. *See* K. G. Berden *et al*, "Non-Tariff Measures in EU-US Trade and Investment -- An Economic Analysis," ECORYS Nederland BV: Rotterdam, December 2009, http://www.tradepartnership.com/pdf_files/EU-US_NTM_Study_FinalReport-Dec2009.pdf.

services by comparing trade flows within NAFTA and within the other U.S. FTAs to trade flows between other countries.[9] We find that in recent years the services provisions of the NAFTA have translated into a 13.3 percent reduction in cost savings for U.S. services exporters. This means that, where it would have cost $100 to sell a service to NAFTA partners before the agreement went in effect, it now costs $86.70 to sell the same service at the same price. For other FTA partners, we estimate an average cost saving of 8.5 percent. The detailed estimates are provided in Appendix B.

The motor vehicle provisions of the U.S.-Canada FTA and, later, the NAFTA also provide an important cost savings. The provisions have reduced transit and coordination costs linked to modern just-in-time delivery and inventory management in the motor vehicle sector. Since parts can cross a border multiple times during various processing stages, savings in border costs can add up substantially. The result has been the transformation of the industry to a continental model of production. Using methods similar to those applied for services, where we compare motor vehicle trade between countries outside NAFTA to motor vehicle trade within NAFTA, and controlling for cost savings related to tariff elimination under NAFTA for motor vehicles, we estimate that these regulatory and administrative cost savings translate into a further effective cost reduction (beyond tariffs) of 35 percent for exports in the motor vehicle sector.[10] We factor these cost savings into our modeling effort.

What Is the Impact of Trade Generally with FTA Partners in 2008?

The U.S. trading relationship with the 14 FTA partner countries in 2008 does not operate completely within the confines of the FTAs. Some FTAs are fully implemented (NAFTA, Israel), but do not cover services trade as fully as other FTAs (and yet, there is still services trade with these partners in these sectors outside the scope of the FTA). Other FTAs are in transition to full implementation, and, again, there is trade in goods and services for which the barriers have not yet been liberalized.

So first we examine the economic impacts on the United States of the total trade relationship between the United States and the FTA partner countries. These impacts are linked to the full bilateral flow of goods and services exports and imports between the United States and the FTA partner countries for 2008. We that because of this trade, U.S. GDP was 7.2 percent higher than it would have been otherwise — $1.0 trillion. In other words, goods and services trade

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[9] Technically, this involves the application of an "econometric gravity model." *See* J. Francois and B. Hoekman (2010), "Trade and Policy in Services," forthcoming in the *Journal of Economic Literature*, for further discussion. Also see Appendix A to this study for further details.

[10] Again, technically this cost factor is estimated using an "econometric gravity model" as discussed in Appendix A.

with the 14 FTA countries generated net U.S. output gains worth $1 trillion in 2008. Furthermore, total U.S. exports of goods and services to the world are $462.7 billion higher than they otherwise would be because we trade with these countries.[11] Finally, out of the total number of jobs in the U.S. economy in 2008 and the wages they paid to workers, trade with the FTA partners supported 17.7 million of those U.S. jobs. These jobs are spread across the range of U.S. industries. These higher levels of output, trade, and employment were made possible by the benefits of trading with the 14 FTA partner countries.[12]

Table 4
Total U.S. Output, Exports and Employment Related to Trade with U.S. FTA Partners, 2008

	Output (billions)	Goods & Services Exports (Millions)	Employment (Thousands)
Primary sectors (ag., forestry, fishing, mining)	$2.3	$17,276.8	76.3
Construction	28.3	21.8	688.1
Manufacturing	83.9	312,162.0	1,160.3
Services	905.6	133,298.2	15,789.5
Wholesale and retail services	*124.6*	*n.a.*	*2,706.7*
Accommodation and food	*39.1*	*n.a.*	*1,413.4*
Management	*19.4*	*n.a.*	*1,016.0*
Professional and technical	*74.8*	*n.a.*	*965.5*
Finance and insurance	*85.5*	*15,365.4*	*805.0*
Rental, leasing and real estate	*143.3*	*n.a.*	*654.5*
Transportation & warehousing	*30.3*	*16,070.0*	*646.1*
Information	*42.5*	*n.a.*	*437.1*
Utilities	*23.1*	*n.a.*	*76.8*
Other consumer and public services	*323.0*	*101,819.3*	*7,068.4*
Total	1,020.1	462,715.3	17,714.3

n.a.: not available
Source: Authors' estimates

[11] Even if the United States did not trade with FTA countries, like Canada, there is still the opportunity to redirect some trade to third countries, like Germany or Japan. We therefore measure the net change in the value of U.S. goods and services exports *to the world* that follows from trade with the 14 FTA partners. In other words, were there no trade with these countries at all, total U.S. goods and services exports would decline.

[12] It is important to remember that gains from trade are linked to both imports and exports.

What Is the Impact of the FTAs?

We next examine the contribution of the FTAs specifically to total U.S. output, total U.S. goods and services exports to the world, and employment (Table 5). This involves a narrower exercise than what we have reported in Table 4. Instead, we now focus just on the reduction in tariffs and trade costs that are linked to the FTAs. We find that the FTAs in 2008 generated $304.5 billion in U.S. output, or 2.1 percent of U.S. GDP. They expanded total U.S. exports of goods and services to the world by $462.7 billion. Finally, they supported 5.4 million U.S. jobs.[13] This is output, exports and employment that would not exist in the absence of the 2008 FTAs (fully implemented in some cases, partially implemented in others).

Table 5
U.S. Output, Exports and Employment Related to U.S. FTAs, 2008

	Output (billions)	Goods & Services Exports (Millions)	Employment (Thousands)
Primary sectors (ag., forestry, fishing, mining)	$1.6	$1,675.6	43.1
Construction	8.6	39.9	214.2
Manufacturing	31.4	86,472.8	379.3
Services	262.9	19,996.8	4,778.2
Wholesale and retail services	*36.6*	*n.a.*	*836.3*
Accommodation and food	*10.6*	*n.a.*	*411.6*
Management	*5.7*	*n.a.*	*310.3*
Professional and technical	*21.9*	*n.a.*	*294.9*
Finance and insurance	*25.1*	*4,003.9*	*246.3*
Rental, leasing and real estate	*42.0*	*n.a.*	*199.9*
Transportation & warehousing	*8.9*	*1,471.6*	*182.9*
Information	*12.4*	*n.a.*	*134.1*
Utilities	*6.7*	*n.a.*	*23.8*
Other consumer and public services	*93.0*	*17,464.6*	*2,138.2*
Total	304.5	462,715.3	5,414.8

n.a.: not available
Source: Authors' estimates

[13] In other words, as the recession took hold in 2008, the U.S. economy was able to keep an additional 5.4 million workers employed at existing wage levels than otherwise, specifically because of FTA-linked gains from trade.

What Is the Impact of Individual FTAs?

Finally we turn to the relative importance of NAFTA-related trade and trade with countries under other FTAs. Together, Canada and Mexico account for the bulk of FTA-related trade. Not surprisingly, therefore, they also account for much of the estimated benefits that follow from FTA trade and are reported in Table 5. Table 6 shows that NAFTA has brought clear, positive gains through NAFTA-related trade with both Canada and Mexico. FTA-induced trade with Canada, an important U.S. trading partner and an integral part of the North American manufacturing based, is estimated to have brought roughly 60 percent of overall FTA labor market and output gains from trade shown in Table 5. Mexican trade brings with it an additional one-third of the overall gains. The fact that much of the NAFTA trade involves trade at intermediate stages of processing also means that the gains from NAFTA trade are larger, relative to the impact on trade itself, than is the case with other FTA partners. In addition, NAFTA has been in place longer, and the estimated reductions in trade costs for services are larger than in the younger FTAs. Overall, the size of the trade relationship is related to the size of our estimated impact on labor markets and output.

Table 6
Breakout of Economic Effects of FTAs
(Percent)

	All FTAs	Canada Trade Due to NAFTA	Mexico Trade Due to NAFTA	Other Partners Trade Due to Other FTAs
Employment	100.0%	60.4%	31.5%	8.1%
Gross Domestic Product	100.0	60.8	31.2	8.0
Exports	100.0	50.7	29.4	19.9

Source: Authors' calculations

IV. Conclusion

It is appropriate for policy makers to seek to measure the economic effects of U.S. trade agreements on the economy generally and on U.S. employment specifically. But because it is a very complicated dynamic, the assessment must be comprehensive. It must fully consider all of the facets of the economy, not just one (exports) or two (net exports). It must cover all sectors of the economy, including services. It must measure up- and downstream costs *and* benefits. If done properly, policy makers will find that they can rest easy: the FTAs with U.S. trading partners are delivering net gains to the U.S. economy and to U.S. workers.

Appendix A
Methodology

We utilized a computable multi-sector model of the U.S. economy to estimate the impacts on the United States of total trade with FTA partners. We used the most recent version of a computable general equilibrium (CGE) model known as the "Global Trade Analysis Project" (GTAP), updated to reflect the state of the U.S. and world economies in 2008. We provide a technical overview of our methodology in this Appendix.

The 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 our experiments, these social accounting data are drawn directly from the most recent version of the Global Trade Analysis Project (GTAP) dataset, version 7 (*see* Dimaranan and McDougall, 2002). The GTAP version 7 dataset is benchmarked to 2004 and includes detailed national input-output, trade, and final demand structures. Using macro and related trade and employment data, we updated the dataset to 2008.

The basic social accounting and trade data are supplemented with trade policy data, including additional data on tariffs and non-tariff barriers. Apart from database updates, the methodology follows closely that of our earlier estimates, so that our estimates here are consistent with our earlier findings (*see* Baughman and Francois 2006).

The data on tariffs are taken from the World Trade Organization'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 7 database.

In addition to data on applied and MFN tariffs from the WTO tariff database, we also estimated trade cost reduction in the motor vehicle sector linked to NAFTA using a gravity model. Furthermore, using bilateral trade data on service trade, we have also used a gravity model to estimate reductions in trade costs in the service sector. This involves application of the gravity methods used in the recent study of transatlantic trade barriers (*see* Berden *et al* 2009, Francois and Hoekman 2010).

The Model

We used the same basic model structure for both the assessment of impact of all trade with FTA partners on the United States, and the impact of the

FTAs themselves on the United States. The only critical difference is the counterfactual: the cessation of all trade between the FTA partners and the U.S., or raising tariffs to current MFN rates and reimposing non-tariff barriers in motor vehicles and in services.

The CGE model is a static multi-regional, multi-sector computable general equilibrium model. On the production side, capital stocks are fixed at a national level. Firms are competitive, and employ capital and labor to produce goods and services subject to constant returns to scale.[14] Products from different regions are assumed to be imperfect substitutes in accordance with the so-called "Armington" assumption. Trade, demand and production elasticities are taken from the GTAP 7 database.

On the demand side, 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.

Because we are interested in estimates close, in concept, to the older generation of input-output calculations and net labor embodied in trade, we work with a version of the GTAP model with standard assumptions about resources and technology. In other words, the counterfactual represents an effort to link trade to labor market patterns, given the structure of the U.S. economy in 2008. This approach will miss important dynamic effects, so that our estimates here may understate overall labor market impacts. For example, the productivity benefits of trade with FTA partners may be reinforced by investment that itself is a response, at the margin, to these productivity effects. This means that the underlying capital stock in the U.S. is also supported, in part, by productivity gains linked to foreign trade. Including these effects would likely magnify the effects identified here, reinforcing the static estimates we report. We have not focused on these additional mechanisms because we view them as removed from our core question, which is linking current jobs to current trade given current economic structures (including the U.S. capital stock in 2008).

[14] 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.

Experiments

We seek to estimate the impact of FTA trade on the U.S. given the actual U.S. wage structures prevailing in 2008. For a given level of wages, the ability of the firms producing a good or service in the United States to supply jobs to workers at those wages depends on the productivity of U.S. workers. Labor productivity, in turn, hinges on the general level of productivity of the U.S. economy as a whole, which is a function of underlying technology in 2008 as well as the effect of trade on overall productivity of the U.S. economy. Our goal here is to estimate this overall effect, and translate it directly into the number of jobs made possible by these productivity effects. In other words, given U.S. productivity in 2008 and the resulting prevailing wage structure of the labor force in that year, how many total jobs in the U.S. economy were linked either directly or indirectly to trade linked to existing FTAs? As such, 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 FTA-related trade.

The FTA experiment consists of imposing changes in U.S. trade policy, in this instance effectively eliminating the cost savings (both tariffs and NTBs) linked to FTAs in place in 2008. This involves putting tariffs back in place, and increasing NTBs in services, and also for NAFTA auto trade, back to pre FTA levels. The results tell us how much U.S. output, total exports and employment would decline were the United States to withdraw from these agreements. These results thus also measure the reverse scenario: how much 2008 levels of trade in goods and services contributed to U.S. output, total exports and employment.

It is important to stress that, in the absence of trade under existing FTAs, trade would adjust. Trade, at a lower level, would continue with FTA partners. In addition, some trade would be re-directed toward third markets. In other words, if we did not allow trade with other countries to adjust, we would overstate the impact of FTA trade on the U.S. economy. For this reason we work with a multi-region model that allows for diversion of U.S.-FTA trade to third countries. As such, our estimates take into account the impact of trade diversion involving third countries.

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Appendix B
Table B-1
Extra Tariff Cost Faced by U.S. Exports to FTA Partners, Absent the FTAs

	2008 Exports (Millions $)	Trade-Weighted* Tariff Rate (Percent)	Trade Taxes Saved (Millions $)
Australia			
Beverages, tobacco products	159.9	3.88%	$6.2
Textiles	152.1	10.31	15.7
Wearing apparel	32.7	15.83	5.2
Leather products	27.0	6.90	1.9
Wood products	126.8	4.57	5.8
Paper products, publications	462.9	3.37	15.6
Petroleum, coal products	347.6	0	0
Chemicals, rubber, plastics	4,430.1	2.65	117.4
Mineral products	122.6	4.41	5.4
Ferrous metals	111.9	4.75	5.3
Other metals	510.6	0.72	3.7
Metal products	457.3	5.45	24.9
Motor vehicles & parts	1,824.7	6.07	110.8
Other transport equip.	2,696.4	0.91	24.5
Electronic equipment	1,335.3	0.51	6.8
Machinery & other equipment	8,655.3	3.58	309.9
Other manufactures	362.9	2.86	10.4
Bahrain			
Beverages, tobacco products	18.7	112.49	21.0
Textiles	1.6	5.00	0.1
Wearing apparel	0.6	5.00	**
Leather products	0.3	5.00	**
Wood products	3.5	5.05	0.2
Paper products, publications	1.9	6.01	0.1
Petroleum, coal products	9.1	5.00	0.5
Chemicals, rubber, plastics	20.2	3.66	0.7
Mineral products	1.7	5.00	0.1
Ferrous metals	7.9	5.00	0.4
Other metals	3.0	6.70	0.2
Metal products	3.9	5.03	0.2
Motor vehicles & parts	51.4	5.00	2.6
Other transport equip.	1.5	4.89	0.1
Electronic equipment	12.3	5.00	0.6
Machinery & other equipment	63.0	5.00	3.1
Other manufactures	3.2	5.00	0.2

Table B-1, continued

	2008 Exports (Millions $)	Trade-Weighted* Tariff Rate (Percent)	Trade Taxes Saved (Millions $)
Canada			
Beverages, tobacco products	$1,405.0	5.24%	$73.6
Textiles	2,436.0	11.38	277.2
Wearing apparel	326.3	16.39	53.5
Leather products	148.8	10.60	15.8
Wood products	4,054.3	4.34	176.0
Paper products, publications	8,026.0	0.01	0.8
Petroleum, coal products	7,111.4	2.23	158.6
Chemicals, rubber, plastics	31,000.0	2.97	920.7
Mineral products	2,941.5	2.57	75.6
Ferrous metals	8,212.7	0.34	27.9
Other metals	7,138.0	0.58	41.4
Metal products	6,987.3	3.53	246.7
Motor vehicles & parts	45,400.0	5.00	2,270.0
Other transport equip.	8,695.1	1.45	126.1
Electronic equipment	7,194.9	0.28	20.1
Machinery & other equipment	40,300.0	1.60	644.8
Other manufactures	2,087.3	3.18	66.4
Chile			
Beverages, tobacco products	37.0	6.00	2.2
Textiles	65.1	6.00	3.9
Wearing apparel	14.8	6.00	0.9
Leather products	5.8	6.00	0.3
Wood products	41.2	6.00	2.5
Paper products, publications	253.3	5.92	15.0
Petroleum, coal products	4,362.1	6.00	261.7
Chemicals, rubber, plastics	1,879.8	6.00	112.8
Mineral products	51.0	6.00	3.1
Ferrous metals	103.0	6.00	6.2
Other metals	22.0	6.00	1.3
Metal products	175.6	6.00	10.5
Motor vehicles & parts	645.3	5.99	38.7
Other transport equip.	71.4	5.39	3.8
Electronic equipment	474.0	6.00	28.4
Machinery & other equipment	2,605.5	6.00	156.3
Other manufactures	107.5	6.00	6.5

Table B-1, continued

	2008 Exports (Millions $)	Trade-Weighted* Tariff Rate (Percent)	Trade Taxes Saved (Millions $)
Dominican Republic			
Beverages, tobacco products	$29.4	14.48%	$4.3
Textiles	666.1	7.33	48.8
Wearing apparel	34.6	19.95	6.9
Leather products	95.4	19.64	18.7
Wood products	81.0	7.71	6.2
Paper products, publications	228.9	6.85	15.7
Petroleum, coal products	757.5	6.78	51.4
Chemicals, rubber, plastics	984.8	6.39	62.9
Mineral products	44.7	12.27	5.5
Ferrous metals	108.6	6.68	7.3
Other metals	77.8	4.72	3.7
Metal products	107.9	11.66	12.6
Motor vehicles & parts	467.1	13.23	61.8
Other transport equip.	14.1	12.16	1.7
Electronic equipment	207.9	6.00	12.5
Machinery & other equipment	1,166.0	6.68	77.9
Other manufactures	293.8	18.94	55.6
El Salvador			
Beverages, tobacco products	$10.9	23.39%	$2.5
Textiles	696.2	14.58	101.5
Wearing apparel	37.1	24.70	9.2
Leather products	13.2	14.04	1.8
Wood products	13.9	11.43	1.6
Paper products, publications	167.6	4.31	7.2
Petroleum, coal products	502.1	4.31	21.6
Chemicals, rubber, plastics	439.6	5.05	22.2
Mineral products	10.1	9.16	0.9
Ferrous metals	17.7	2.70	0.5
Other metals	17.1	0.85	0.1
Metal products	43.5	5.81	2.5
Motor vehicles & parts	105.2	9.13	9.6
Other transport equip.	7.1	6.61	0.5
Electronic equipment	287.1	1.78	5.1
Machinery & other equipment	344.2	3.46	11.9
Other manufactures	45.7	14.16	6.5

Table B-1, continued

	2008 Exports (Millions $)	Trade-Weighted* Tariff Rate (Percent)	Trade Taxes Saved (Millions $)
Guatemala			
Beverages, tobacco products	$13.1	20.90%	$2.7
Textiles	277.1	12.12	33.6
Wearing apparel	48.1	17.85	8.6
Leather products	11.3	17.19	1.9
Wood products	24.8	13.36	3.3
Paper products, publications	236.6	5.05	11.9
Petroleum, coal products	1,260.9	3.99	50.3
Chemicals, rubber, plastics	756.2	4.49	34.0
Mineral products	15.7	8.15	1.3
Ferrous metals	105.2	2.77	2.9
Other metals	63.6	2.44	1.6
Metal products	78.6	5.77	4.5
Motor vehicles & parts	323.4	10.57	34.2
Other transport equip.	19.1	7.96	1.5
Electronic equipment	486.6	2.74	13.3
Machinery & other equipment	608.7	3.38	20.6
Other manufactures	82.3	13.39	11.0
Honduras			
Beverages, tobacco products	$9.2	13.77%	$1.2
Textiles	19.8	6.90	1.4
Wearing apparel	20.4	14.76	3.0
Leather products	9.4	14.66	1.4
Wood products	22.0	12.61	2.8
Paper products, publications	115.3	4.49	5.2
Petroleum, coal products	831.8	0	0
Chemicals, rubber, plastics	401.4	3.29	13.2
Mineral products	12.1	6.69	0.8
Ferrous metals	30.4	5.78	1.8
Other metals	13.6	2.40	0.3
Metal products	38.4	3.44	1.3
Motor vehicles & parts	171.5	9.63	16.5
Other transport equip.	8.4	5.63	0.5
Electronic equipment	208.4	0.97	2.0
Machinery & other equipment	317.7	2.90	9.2
Other manufactures	36.7	9.89	3.6

Table B-1, continued

	2008 Exports (Millions $)	Trade-Weighted* Tariff Rate (Percent)	Trade Taxes Saved (Millions $)
Israel			
Beverages, tobacco products	$55.7	3.67%	$2.0
Textiles	56.5	5.95	3.4
Wearing apparel	24.3	11.76	2.9
Leather products	15.9	8.41	1.3
Wood products	51.2	12.81	6.6
Paper products, publications	170.7	2.53	4.3
Petroleum, coal products	427.3	2.05	8.8
Chemicals, rubber, plastics	1,050.9	3.42	35.9
Mineral products	61.7	6.51	4.0
Ferrous metals	124.6	0.85	1.1
Other metals	187.8	0.67	1.3
Metal products	186.3	7.68	14.3
Motor vehicles & parts	224.0	4.38	9.8
Other transport equip.	487.2	0.27	1.3
Electronic equipment	907.6	0.11	1.0
Machinery & other equipment	2,244.6	4.27	95.8
Other manufactures	960.3	1.20	11.5
Jordan			
Beverages, tobacco products	$0.9	49.07%	$0.5
Textiles	6.2	1.63	0.1
Wearing apparel	2.5	19.13	0.5
Leather products	0.5	27.28	0.1
Wood products	14.0	13.14	1.8
Paper products, publications	25.7	8.83	2.3
Petroleum, coal products	2.9	9.33	0.3
Chemicals, rubber, plastics	97.3	2.47	2.4
Mineral products	1.8	20.50	0.4
Ferrous metals	4.8	4.48	0.2
Other metals	25.8	8.22	2.1
Metal products	6.4	13.40	0.9
Motor vehicles & parts	75.9	10.92	8.3
Other transport equip.	48.8	10.33	5.0
Electronic equipment	44.1	2.85	1.3
Machinery & other equipment	175.8	9.32	16.4
Other manufactures	10.0	18.58	1.9

Table B-1, continued

	2008 Exports (Millions $)	Trade-Weighted* Tariff Rate (Percent)	Trade Taxes Saved (Millions $)
Mexico			
Beverages, tobacco products	$725.3	36.35%	$263.7
Textiles	3,717.3	13.67	508.2
Wearing apparel	358.7	34.33	123.2
Leather products	287.4	24.42	70.2
Wood products	1,436.6	12.37	177.7
Paper products, publications	4,998.1	6.92	345.9
Petroleum, coal products	14,000.0	4.13	578.2
Chemicals, rubber, plastics	27,000.0	8.48	2,340.5
Mineral products	1,125.5	12.90	158.1
Ferrous metals	5,038.5	5.97	300.8
Other metals	4,590.0	5.78	265.3
Metal products	5,902.0	10.95	646.3
Motor vehicles & parts	17,500.0	24.28	4,249.0
Other transport equip.	1,089.7	8.12	88.5
Electronic equipment	9,472.8	1.98	187.6
Machinery & other equipment	31,300.0	7.95	2,488.4
Other manufactures	1,082.2	7.64	82.7
Morocco			
Beverages, tobacco products	$50.3	31.48%	$15.8
Textiles	5.6	37.36	2.1
Wearing apparel	0.4	49.97	0.2
Leather products	0.2	43.65	0.1
Wood products	1.4	32.56	0.4
Paper products, publications	38.9	39.98	15.6
Petroleum, coal products	239.1	22.23	53.2
Chemicals, rubber, plastics	165.7	24.94	41.3
Mineral products	4.7	37.53	1.8
Ferrous metals	55.6	19.25	10.7
Other metals	0.9	19.78	0.2
Metal products	18.3	32.43	5.9
Motor vehicles & parts	76.5	28.47	21.8
Other transport equip.	234.3	12.41	29.1
Electronic equipment	50.5	4.23	2.1
Machinery & other equipment	250.9	15.48	38.8
Other manufactures	3.7	32.94	1.2

Table B-1, continued

	2008 Exports (Millions $)	Trade-Weighted* Tariff Rate (Percent)	Trade Taxes Saved (Millions $)
Nicaragua			
Beverages, tobacco products	$0.7	12.38%	$0.1
Textiles	13.8	11.54	1.6
Wearing apparel	7.3	14.90	1.1
Leather products	3.0	10.65	0.3
Wood products	9.8	13.58	1.3
Paper products, publications	22.6	3.16	0.7
Petroleum, coal products	113.2	3.91	4.4
Chemicals, rubber, plastics	180.0	2.14	3.9
Mineral products	5.1	4.86	0.3
Ferrous metals	8.4	3.42	0.3
Other metals	2.3	1.77	**
Metal products	17.5	6.14	1.1
Motor vehicles & parts	28.8	4.87	1.4
Other transport equip.	2.9	4.25	0.1
Electronic equipment	30.0	1.25	0.4
Machinery & other equipment	138.0	2.20	3.0
Other manufactures	17.0	13.24	2.3
Singapore			
Beverages, tobacco products	$33.9	0%	$0
Textiles	69.6	0	0
Wearing apparel	32.1	0	0
Leather products	19.6	0	0
Wood products	50.9	0	0
Paper products, publications	261.0	0	0
Petroleum, coal products	1,949.8	0	0
Chemicals, rubber, plastics	4,383.3	0	0
Mineral products	111.4	0	0
Ferrous metals	254.0	0	0
Other metals	500.7	0	0
Metal products	494.1	0	0
Motor vehicles & parts	376.0	0	0
Other transport equip.	7,951.9	0	0
Electronic equipment	9,068.3	0	0
Machinery & other equipment	10,600.0	0	0
Other manufactures	400.3	0	0

*Weighted by trade with the world
** Less than $50 million
Source: WITS (World Integrated Trade Solution).

Table B-2
Trade-Weighted* Tariff Rates That Would Be Applied to U.S. Imports from FTA Partners Not Eligible for Preferences, Absent the FTAs in 2008

Beverages, tobacco products	1.45%
Textiles	9.36
Wearing apparel	11.61
Leather products	9.99
Wood products	0.36
Paper products, publications	0
Petroleum, coal products	0
Chemicals, rubber, plastics	1.83
Mineral products	3.95
Ferrous metals	0.42
Other metals	1.51
Metal products	2.38
Motor vehicles & parts	3.97
Other transport equip.	0.46
Electronic equipment	0.21
Machinery & other equipment	1.31
Other manufactures	1.63

Source: WITS (World Integrated Trade Solution).

Table B-3
Cost Saving Estimates for Commercial Services Trade with FTA Partners, 2008
(Percent)

NAFTA	13.3%
Communications	15.7
Construction	13.4
Insurance	26.4
Royalties and licensing	24.2
Other business and professional services	12.0
Recreational and personal services	29.5
Other FTAs	8.5

Source: Authors' estimates.

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