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National Association of Foreign-Trade Zones

The Economic Impact of

Trade Agreement Parity

for Manufacturing Firms Operating in

US Foreign-Trade Zones

By Dean A. DeRosa & Gary C. Hufbauer

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Study Prepared for the

National Association of Foreign-Trade Zones

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Abstract

This study investigates the Trade Agreement Parity Proposal advanced by the National Association of Foreign-Trade Zones. Using gravity model estimates, we find that extending the benefits of US free trade agreements to FTZ-based manufacturing firms in the United States results in economic gains that dwarf forgone customs revenues of $186 million per year under the Proposal. Subzone firms enjoy a 20 percent increase in their US shipments and add 95 thousand new workers. Reallocating US capital and labor to more productive uses in the zones provides a total gain to the US economy annually of $530 million. These are medium-term estimates because new FTZ firms cannot always invest and expand output rapidly. However, our calculations might also significantly underestimate the short-term benefit to the US economy if the United States slips into a period of slow growth or recession and rising unemployment during 2008.

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1. The Trade Agreement Parity Proposal

The US foreign-trade zones program was established during the 1930s to facilitate US trade, and today the program continues to pursue its mandate to support the international competitiveness of US-based companies.

US foreign-trade zones (FTZs), the central element of the FTZ program, are designed to counter "inverted" structures in the US tariff schedule.[1] The general US tariff rate is not uniformly low across all categories of imported merchandise, and thus it can create unintended distortions, to the disadvantage of US manufacturing firms. When tariffs are higher for their intermediate inputs than their final products, domestic manufacturing firms are disadvantaged relative to foreign firms that can buy the same intermediate inputs free of any tariff and sell their final products in the US market or abroad.

FTZs level the playing field with respect to inverted tariffs. They enable US firms operating within the zones to take delivery of imported items without payment of duties, transform the inputs into finished goods, and finally export the final products without paying US duties or sell them in the US domestic market.[2] When sold in the US market, the foreign content of the finished goods usually pays the MFN tariff applicable to the finished product.[3] Thus, the FTZ system helps maintain US manufacturing output and employment that might otherwise be shifted abroad. During FY 2005, by transforming foreign intermediate goods amounting to $154 billion, FTZs shipped final goods in the total amount of $365 billion to the US marketplace and accounted directly for just over 340 thousand US jobs. This was accomplished principally through the operation of 252 manufacturing subzones located throughout the United States and Puerto Rico, which accounted for $323 billion in US market sales and 286 thousand jobs (Table 1).

Table 1 Movement of Foreign Merchandise, Customs Duties, & Employment in US Foreign-Trade Zones, FY2005 (Millions of dollars; employed persons)

Foreign-Trade Zones & Product Categories	Goods Received		Goods Shipped			Employment
	Foreign	Foreign Status	Exports	Shipments to US	Customs Duty	
All Zones	**154,126**	**38%**	**21,665**	**365,320**	**937**	**343,622**
General Purpose Zones	**22,321**	**33%**	**5,939**	**42,737**	**449**	**57,310**
Subzones	**131,806**	**50%**	**15,725**	**322,584**	**487**	**286,312**
Manufactured foodstuffs	7	10%	0	115	1	—
Mineral products	109,994	48%	4,933	240,971	68	—
Chemicals	4,949	64%	1,066	9,755	21	—
Textiles & apparel	252	73%	2	365	28	—
Base metals & metal products	301	70%	52	336	0	—
Machinery	2,869	55%	1,068	10,589	8	—
Transport equipment	11,723	35%	8,373	55,526	307	—
Professional equipment	1,324	48%	117	2,556	40	—
Miscellaneous manufactures	387	23%	114	2,370	15	—

Source: NAFTZ (2007a), NAFTZ (2007c), US Department of Commerce (2007), and authors' estimates.
Notes: Foreign status is the percentage of foreign goods in total domestic and foreign merchandise received by FTZs.

[1] The tariff rates that generally apply are often referred to as the most-favored-nation (MFN) or normal-trade-relations (NTR) tariff rates. Free trade agreements generally provide zero duty rates for eligible products.
[2] Imported intermediate goods entering FTZs are recorded as part of US general imports, and usually enter the zones free of US customs duties. Final goods shipped from FTZs to the US market place are recorded under US imports for domestic consumption, and their foreign content is subject to US customs duties. Goods shipped abroad from FTZs are recorded as US exports, and of course are subject to no US duties.
[3] If the MFN tariff on the finished product is higher than the duty rates on the imported inputs, then the latter will be assessed by US Customs Service and paid by the importer. The value of the US domestic content of finished goods – including US-made inputs and the services of US labor, capital, and other primary factors of production working in the zone – enter the US domestic market duty-free.

Today, however, the FTZ program and its benefits to the US economy are surprisingly threatened by US initiatives to free global trade. The United States actively promotes deeper integration of economies across the globe through support for multilateral trade negotiations under the auspices of the World Trade Organization (WTO) and the rapidly expanding network of US bilateral free trade agreements (FTAs) – now covering Canada, Mexico, Chile, Australia, Singapore, Central America, the Dominican Republic, and select countries in the Middle East. Free trade agreements in particular are creating a new and unintended form of tariff "inversion". The new inversion threatens US manufacturing by extending US duty-free entry to goods manufactured abroad by firms in US FTA partner countries but not to manufacturing firms located in US foreign-trade zones – even when the FTZ products meet the rules of origin under NAFTA and other established US FTAs.

Nearly 30 percent of US manufactured imports are imported today from FTA partner countries under eleven established US bilateral and regional free trade agreements (Table 2). During the next few years, six additional US FTAs awaiting congressional approval or under negotiation (as of January 2008) may be ratified, increasing FTA manufactured imports to nearly 35 percent of total US manufactured imports.

Table 2 **US Free Trade Agreements and US Merchandise Imports from FTA Partners** (Billions of US Dollars)

Current & Prospective Agreements	Entry into Force	Partners	US Imports, 2006	
			Total	Manufactures
Established			**583.7**	**422.5**
US-Israel Free Trade Agreement	1985	Israel	19.4	18.5
North American Free Trade Agreement (NAFTA)	1994	Canada, Mexico	508.3	360.0
US-Jordan Free Trade Agreement	2001	Jordan	1.5	1.5
US-Chile Free Trade Agreement	2004	Chile	10.3	6.8
US-Singapore Free Trade Agreement	2004	Singapore	18.1	16.1
US-Australia Free Trade Agreement	2005	Australia	8.6	5.9
US-Morocco Free Trade Agreement	2006	Morocco	0.6	0.3
US-Bahrain Free Trade Agreement	2006	Bahrain	0.7	0.5
US-Oman	2006	Oman	1.0	0.1
US-Central America-Dominican Republic Free Trade Agreement (CAFTA-DR)	2006	El Salvador, Guatemala, Honduras, Nicaragua, Dominican Republic	15.4	12.8
Under Negotiation or Not Yet Implemented			**103.0**	**87.1**
US-Colombia	—	Colombia	9.8	2.2
US-Korea	—	Korea	47.6	43.6
US-Malaysia	—	Malaysia	37.5	35.8
US-Panama	—	Panama	0.4	0.1
US-Peru	—	Peru	6.2	4.4
US-United Arab Emirates (UAE)	—	United Arab Emirates	1.4	1.0
Memorandum items				
US Imports from all partners			1,919.3	1,455.3
Established FTAs (% Total)			(30.4)	(29.0)
Established FTAs & FTAs under Negotiation or Not Yet Signed (% Total)			(35.8)	(35.0)

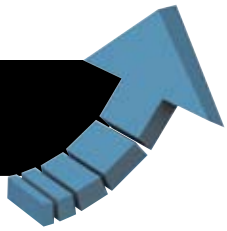
Source: Office of the US Trade Representative (2008), and US International Trade Commission (2008).

The Trade Agreement Parity (TAP) Proposal advanced by the National Association of Foreign-Trade Zones (NAFTZ 2007b) is intend to level the playing field once again for US manufacturers. Essentially, the TAP Proposal would extend US FTA treatment to FTZ-based producers that sell their finished goods in the US domestic market if they meet the relevant FTA rules of origin for the products. For instance, a manufacturer operating in a US subzone might import the bulk of his inputs for fabricating a particular product from Mexico. Under the TAP Proposal, the US manufacturer would qualify for duty-free entry of its final product to the US market, akin to the US customs treatment of competing products from Mexico under NAFTA, so long as the rules of origin for the product under NAFTA are met.[4]

In the remainder of this study, we investigate the economic impacts of the TAP Proposal on subzone firms, their workers, and the US economy, using the so-called gravity trade model. In section 2, we describe the gravity trade model and present detailed econometric estimates of its parameters, highlighting the model's estimates governing the trade impacts of US FTAs and other FTAs worldwide. In section 3, we apply our gravity model estimates, along with supporting recent data on US industry employment and investment, productivity, and wages, to US imports of manufactures for domestic consumption originating in FTZ subzones that conform to US FTA rules of origin, to determine the economic impacts of the TAP Proposal. Finally, we summarize our findings and conclusions in section 4.

[4] Each US FTA has its own set of rules of origin, which are generally based on either a "tariff shift" from the raw material to the finished good or the addition of value in the partner country in excess of a minimum amount provided in the agreement.

2. Gravity Model Analysis



In recent years, the gravity model has become the "work horse" of quantitative studies of economic policy issues in international trade (and investment).[5] Essentially, it uses econometric techniques to evaluate thousands of individual observations on trade flows between countries over time, against the gravitational "mass" of explanatory variables that describe the characteristics of bilateral trading partners. Two familiar explanatory variables are the real GDP levels of trading partners and the distance between them. But numerous other explanatory variables are frequently specified as well, including geographic, political, and institutional factors that either augment or diminish the gravitational forces giving rise to trade between partners. Most important, recent gravity models incorporate indicators for bilateral and regional free trade agreements, enabling the models to assess the added contribution to bilateral trade flows of FTAs involving the United States and other countries.

Our gravity model is based on bilateral trade flows worldwide from 1976 to 2005 at the 1-digit Standard International Trade Classification (SITC) level, compiled by DeRosa (2007) from the UN Comtrade database (using the World Integrated Trade Solution of the World Bank).[6] In the main, the explanatory variables of the model (see Table 3) are taken from an extensive data set compiled by Rose (2004). The FTA indicator variables, on the other hand, are based on historical notifications of the dates on which over 500 free trade agreements entered into force and their contemporary participants. These indicators are dichotomous (0, 1) variables – sometimes called "dummy" variables. They take on the value of 1 if trading partners are FTA members and their mutual FTA is in force, and a value of zero otherwise.[7] Related indicator variables (not reported in Table 3) are included in our gravity model to assess the effect of the FTAs on members' bilateral trade with non-member countries. In all, the model distinguishes nine prominent individual FTAs and groups of FTAs worldwide, including NAFTA.[8]

Notwithstanding the large number of explanatory variables in our gravity model, common practice in estimating gravity models is to take into consideration still missing or unobservable explanatory variables. Additionally, we specify "year-effect" variables (not reported in Table 3) that are intended to capture the influence of episodic events that have a more or less uniform impact on bilateral trade globally. Most important, we specify indicator variables for each ordered country pair in the data set, by commodity group. This common practice seeks to minimize possible bias in the estimated coefficients of the gravity model arising from missing explanatory variables. However, consideration of some thorny technical issues in econometrics recommends the estimation of our gravity model by both fixed-effects and random-effects methods, to ensure that the estimates of the parameters of interest – here the coefficient estimate for the NAFTA indicator variable – are reasonably similar in value regardless of the estimation method.[9]

Our gravity model results for bilateral trade by 1-digit SITC sections are presented in Table 3 (fixed-effects estimates) and Table 4 (random-effects estimates). Although the estimation results are extensive and wide-ranging, a number of regularities are discernible that broadly match the findings of other gravity models. Above all, the results indicate

[5] See Eichengreen and Irwin (1998). The earliest gravity models were developed by Tinbergen (1962) and Poyhonen (1963). For discussion of these early works and the recent advances in gravity trade models, see Greenaway and Milner (2002), Anderson and Wincoop (2004), and Baldwin and Taglioni (2006).

[6] World Bank (2008).

[7] To illustrate, the NAFTA dummy for US-Mexican trade would not have a value of 1 until 1994.

[8] The distinct trade agreements are: European Union (EU), European Free Trade Area (EFTA), EU bilateral free trade agreements (EU FTAs), North American Free Trade Area (NAFTA), Southern Common Market (Mercosur), Chile, Mexico, Australia, and Singapore bilateral free trade agreements (CMAS FTAs—separately distinguished because these are truly free trade countries), ASEAN Free Trade Area (AFTA), South Asia Free Trade Agreement (SAFTA), and all other customs unions and free trade agreements.

[9] On estimation methods in panel data analysis, see for instance Wooldridge (2002) and Hsiao (2003). We use STATA statistical software to estimate both the fixed-effects and random-effects variants of our gravity model. The random-effects estimates are derived using the standard STATA panel data routine (STATA 2007). The fixed-effects estimates, on the other hand, are derived using a multi-step estimation routine, developed recently by Plumper and Troeger (2007). Unlike the usual fixed-effects estimation method, the Plumper-Troeger routine has the advantage of yielding reliable coefficient estimates for time-invariant explanatory variables such as distance and land area, in addition to time-varying variables such as joint GDP and the FTA indicator variables.

Table 3 **Gravity Model Fixed-Effects Estimates for Merchandise Trade by SITC Categories, Specifying Principal Free Trade Agreements, 1976-2005**

	Food, Live Animals (SITC 0)	Beverages, Tobacco (SITC 1)	Crude Materials (SITC 2)	Mineral Fuels (SITC 3)	Fats & Oils (SITC 4)	Chemicals (SITC 5)	Material Manufs. (SITC 6)	Machinery, Transport Eq. (SITC 7)	Misc. Manufs. (SITC 8)
Distance	-0.81***	-0.77***	-0.88***	-1.32***	-0.49***	-1.14***	-1.08***	-0.88***	-0.94***
Joint GDP	0.12***	0.01***	0.14***	0.06***	-0.09***	0.20***	0.19***	0.09***	0.07***
Joint GDP per capita	-0.02***	0.16***	0.03***	0.18***	0.16***	0.00	0.00	0.24***	0.14***
Common language	0.28***	0.04***	-0.36***	-0.39***	-0.43	0.14***	-0.05***	-0.03***	0.13***
Common border	0.59***	0.31***	0.51***	0.33***	0.54***	0.33***	0.67***	0.83***	0.59***
Landlocked	-1.11***	-0.34***	-1.00***	-1.55***	-1.03***	-0.84***	-0.96***	-0.83***	-0.89***
Island	0.19***	0.11***	0.01	0.36***	0.04***	-0.04***	0.07***	0.08***	0.04***
Land area	0.21***	0.21***	0.25***	0.33***	0.24***	0.16***	0.19***	0.21***	0.16***
Common colonizer	-0.89***	-0.10***	-0.49***	0.22***	-0.36***	-0.86***	-0.62***	-0.92***	-1.03***
Ever a colony	2.21***	2.15***	1.83***	1.52***	1.25***	1.65***	1.78***	2.14***	2.28***
Common country	1.28***	0.73***	1.78***	0.47**	1.34***	2.52***	2.20***	3.10***	2.79***
GSP	0.29***	0.23***	0.22***	0.13***	-0.09***	0.34***	0.41***	0.36***	0.34***
EU	0.73***	0.76***	0.19***	0.17***	0.54***	0.26***	0.32***	0.31***	0.13***
EFTA	0.12***	-0.30***	-0.39***	-0.29***	0.22***	-0.05	-0.08***	-0.06	0.02
EU FTAs	0.19***	0.40***	0.15***	0.03	0.16***	0.20***	0.45***	0.45***	0.56***
NAFTA	0.61***	0.99***	0.37***	0.71***	1.67***	0.68***	0.88***	0.47***	0.93***
Mercosur	0.01	1.09***	0.03	1.33***	0.73***	-0.01	0.39***	0.24**	0.87***
CMAS FTAs	0.82***	1.03***	0.30***	0.80***	0.62***	0.45***	0.26***	0.26***	0.27***
AFTA	0.96***	1.91***	0.99***	1.52***	1.29***	1.10***	1.24***	1.99***	1.54***
SAFTA	0.52***	1.25***	0.45***	0.65***	0.85***	1.00***	0.90***	1.04***	1.70***
Other FTAs	0.43***	0.01	0.17***	0.44***	0.35***	0.32***	0.44***	0.26***	0.52***
Constant	2.68***	2.22***	-0.33***	2.48***	4.79***	1.81***	1.47***	0.45***	3.87***
R-squared	0.80	0.77	0.81	0.76	0.74	0.85	0.85	0.86	0.87
Observations (Thousands)	236	141	214	122	96	215	254	244	249
Clusters (Thousands)	18	13	17	12	10	17	18	18	18

Notes: Fixed-effects estimates are obtained by a method of vector decomposition, based on a 3-step FE/OLS routine developed by Plumper and Troeger (2007). The dependent variable is log real trade. Distance, joint real GDP, joint real GDP per capita, joint land area, and joint real FDI stocks are measured in log terms. Estimates for year-effects and for indicators of FTA members' trade with non-member countries are not reported. *,**,*** denote statistical significance at the 10, 5, and 1 percent levels.

Trade agreements represented by dummy variables are: European Union (EU), European Free Trade Area (EFTA), EU bilateral free trade agreements (EU FTAs), North American Free Trade Area (NAFTA), Southern Common Market (Mercosur), Chile, Mexico, Australia, and Singapore bilateral free trade agreements (CMAS FTAs), ASEAN Free Trade Area (AFTA), South Asia Free Trade Agreement (SAFTA), and all other customs unions and free trade agreements.

Observations are the number of individual country years of trade data. Clusters are the number of export country-import country-SITC category combinations in the panel data set underlying the fixed-effects estimation procedure.

that the specified explanatory variables contribute significantly to explaining variations in bilateral trade flows.[10] For instance, as expected, the distance between partners reduces bilateral trade, while the joint GDP levels of partners expands bilateral trade in the model (holding other factors constant).[11] The individual influences of other explanatory

[10] The overall power of the explanatory variables in the regression equation is usually given by the R-squared statistic. Although the R-squared statistic is generally 0.75 or higher for the fixed-effects estimates in Table 2, the statistic may be inflated somewhat in value owing to the Plumper-Troeger multi-stage estimation procedure. In Table 3, random-effects estimates yield R-squared values that are about 0.25 or higher (0.50 or higher for SITC 5 through 8).

[11] The economic theory underlying the gravity model suggests that when the model is applied to aggregate data for trade between countries worldwide, the estimated coefficient for the joint GDP variable should approximate unity. Our estimation results, however, generally find values for this coefficient that are substantially less than unity, especially in the case of the fixed-effects estimates. One explanation is that the

Table 4 **Gravity Model Random-Effects Estimates for Merchandise Trade by SITC Categories, Specifying Principal Free Trade Agreements, 1976-2005**

	Food, Live Animals (SITC 0)	Beverages, Tobacco (SITC 1)	Crude Materials (SITC 2)	Mineral Fuels (SITC 3)	Fats & Oils (SITC 4)	Chemicals (SITC 5)	Material Manufs. (SITC 6)	Machinery, Transport Eq. (SITC 7)	Misc. Manufs. (SITC 8)
Distance	-0.90***	-0.77***	-0.93***	-1.23***	-0.56***	-1.24***	-1.25***	-1.07***	-1.11***
Joint GDP	0.55***	0.38***	0.66***	0.42***	0.32***	0.73***	0.83***	0.76***	0.77***
Joint GDP per capita	-0.22***	-0.03***	-024***	0.01	-0.05***	-0.21***	-0.32***	-0.09***	-0.21***
Common language	0.39***	0.19***	-0.03	-0.23***	-0.11*	0.36***	-0.28***	0.34***	0.57***
Common border	1.09***	0.77***	1.02***	0.86***	0.78***	0.72***	0.93***	1.13***	0.83***
Landlocked	-0.87***	-0.08***	-0.62***	-1.11***	-0.47***	-0.60***	-0.51***	-0.43***	-0.52***
Island	0.33***	0.19***	0.20***	0.32***	0.20***	-0.19***	0.28***	0.32***	0.34***
Land area	0.01	0.02*	0.01	0.11***	0.04***	-0.07***	-0.10***	-0.09***	-0.15***
Common colonizer	-0.12**	0.61***	0.27***	0.69***	0.29***	0.07	0.05	0.09	-0.16***
Ever a colony	1.95***	1.90***	1.46***	1.29***	1.06***	1.31***	1.30***	1.69***	1.72***
Common country	0.20	0.12	0.47	0.14	0.59	1.34***	0.61	1.25*	0.88
GSP	0.60***	0.22***	0.33***	0.03	0.20***	0.42***	0.50***	0.58***	0.58***
EU	0.84***	0.95***	0.29***	0.20***	0.70***	0.32***	0.35***	0.39***	0.20***
EFTA	1.10***	0.35**	0.85***	0.22	0.67***	1.06***	1.27***	1.32***	1.51***
EU FTAs	0.26***	0.48***	0.28***	0.07	0.28***	0.33***	0.58***	0.60***	0.71***
NAFTA	0.59***	1.12***	0.42*	0.86***	1.81***	0.70***	0.88***	0.57***	0.98***
Mercosur	0.01	1.12***	0.19	1.31***	0.96***	0.16	0.52***	0.36*	1.02***
CMAS FTAs	0.79***	1.01***	0.29***	0.82***	0.67***	0.43***	0.24***	0.23***	0.23***
AFTA	0.83***	1.84***	0.87***	1.41***	1.38***	0.89***	1.02***	1.77***	1.33***
SAFTA	0.83***	1.21***	0.75***	0.72***	1.17***	1.33***	1.25***	1.38***	2.04***
Other FTAs	0.47***	0.13	0.20***	0.40***	0.40***	0.39***	0.49***	0.34***	0.57***
Constant	-11.00***	-9.05***	-16.74***	-8.60***	-8.25***	-15.59***	-17.44***	-19.40***	-17.20***
R-squared	0.37	0.28	0.41	0.76	0.22	0.48	0.50	0.86	0.52
Observations (Thousands)	236	141	214	122	96	215	254	244	249
Clusters (Thousands)	18	13	17	12	10	17	18	18	18

Notes: The dependent variable is log real trade. Distance, joint real GDP, joint real GDP per capita, joint land area, and joint real FDI stocks are measured in log terms. Estimates for year-effects and for indicators of FTA members' trade with non-member countries are not reported. *,**,*** denote statistical significance at the 10, 5, and 1 percent levels.

Trade agreements represented by dummy variables are: European Union (EU), European Free Trade Area (EFTA), EU bilateral free trade agreements (EU FTAs), North American Free Trade Area (NAFTA), Southern Common Market (Mercosur), Chile, Mexico, Australia, and Singapore bilateral free trade agreements (CMAS FTAs), ASEAN Free Trade Area (AFTA), South Asia Free Trade Agreement (SAFTA), and all other customs unions and free trade agreements.

Observations are the number of individual country years of trade data. Clusters are the number of export country-import country-SITC category combinations in the panel data set underlying the fixed-effects estimation procedure.

variables are also sensible. A common language and border between countries tends to expand bilateral trade. So too does being an island economy, having had a colonial relationship with a trading partner, or being a recipient of trade preferences under the generalized system of preferences (GSP).[12] In addition to distance, the principal "resistance

coefficient on the fixed-effects term may be highly correlated with the coefficient that would otherwise be estimated for the joint GDP term, and thereby reduce the value of the joint GDP coefficient. In addition, our estimation of the gravity model uses disaggregated, rather than aggregate, trade data, and this may partly explain the unexpected results for the joint GDP variable. Finally, in theory the expected sign of the joint GDP per capita variable is uncertain, depending upon whether the variable is interpreted as an indicator of human and physical capital or not.

[12] Under the generalized system of preferences, a number of advanced countries extend trade preferences to less developed countries on a nonreciprocal basis. The GSP programs of major industrial and other countries are monitored by the UN Conference on Trade and Development, including through a series of manuals describing the individual programs (UNCTAD 2005).

factors" identified by the gravity model are the status of being a landlocked country and, in the fixed-effects version of the model, being a member of a country pair with a common colonizer (e.g., India and Kenya – former UK colonies).

In Tables 3 and 4, the estimation results for the FTA indicator variables are "framed" by a border for emphasis. Like the other explanatory variables, they are widely statistically significant. Most important, they are also generally positive in value, indicating that trade between FTA members typically expands significantly as a consequence of the agreements.[13]

Beyond attesting to the general robustness and explanatory power of our gravity model, the estimation results do differ importantly across the commodity categories and the estimation methods considered in Tables 3 and 4. Lengthy discussion of the differences is beyond the scope of the present study, except with respect to the estimation results for the NAFTA variable. The NAFTA coefficient estimates are of prime importance because our methodology in assessing the TAP Proposal is to use the NAFTA coefficient estimates to calculate the expected increase in FTZ shipments to the US under the Proposal. We assume that trade agreement parity for manufacturing firms operating in FTZ subzones will have a similar impact on shipments from the subzones to the US customs territory as the demonstrated positive impact that NAFTA has already exerted on exports to the United States, and continues to show in the estimates for our present gravity model.[14]

Table 5 summarizes the coefficients estimates for NAFTA reported in Tables 3 and 4, by estimation method and trade category. The table also reports the trade impact elasticity corresponding to each coefficient estimate. This elasticity indicates the expected response of bilateral trade to adoption of NAFTA.[15] Thus, for instance, the coefficient estimates for foods and live animals imply that bilateral trade among Canada, Mexico, and the US is 81-to-84 percent higher under NAFTA than it would be in the absence of the free trade agreement among the three countries.[16]

Both the fixed-effects and the random-effects estimates for the NAFTA coefficients are uniformly positive and statistically significant. The coefficient estimates for crude materials are the lowest in value (implying trade impacts of 44-to-52 percent), whereas those for fats and oils are the greatest in value (implying trade impacts of 434-to-511 percent). In general, however, the estimates for the NAFTA coefficients tend to range in value from about 0.5 (machinery and transport equipment) to 0.9 (beverages and tobacco, material manufactures, and miscellaneous manufactures), implying trade impacts between 60 percent and 150 percent.

With the possible exception of fats and oils, the fixed-effects and the random-effects estimates for the NAFTA coefficient in each trade category are fairly close in value to one another. However, the fixed-effects estimates tend to be somewhat smaller in value than the random-effects estimates. To avoid the possibility of unduly biasing upward our calculations of the economic benefits of the TAP Proposal, we simply adopt the trade impact elasticities implied by the fixed-effects estimates for the NAFTA coefficients in our gravity model.

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[13] As mentioned previously, not reported individually in Tables 3 and 4 are the estimated year-effects representing global influences on trade over the estimation period 1976-2005, and the "cross" FTA indicators that indicate the influence of the FTAs on trade by member countries with non-member countries. With regard to the latter FTA indicators, it is interesting to note that estimated coefficients are widely positive and significant. In other words, the FTAs appear to stimulate not only intra-bloc trade but also trade with countries outside the trading blocs – an unexpected form of "trade diversion". For further discussion, see DeRosa and Hufbauer (2007).

[14] In our view, the estimated coefficients for NAFTA are consistent with the experience of similar FTAs around the globe, especially those that incorporate comprehensive, thoroughgoing reforms, not only to trade in goods and services but also to domestic and foreign investment. On the broader topic of the US experience under NAFTA, see Hufbauer and Schott (2005).

[15] Trade expansion between FTA partners is usually measured in percentage terms. Given the log-linear specification of the gravity model, the impact of a free trade agreement on bilateral trade can be computed in percentage terms as 100*[exp(bfta) – 1.00]. In this expression, bfta is the estimated coefficient for the dummy variable representing the presence of a free trade agreement, and exp(bfta) is the value of the natural number e raised to the exponent bfta. For example, if the coefficient bfta is 0.66, then the value of exp(bfta) is 1.93, and the percentage expansion in trade is estimated as 100*[1.93 – 1.00], which equals 93 percent.

[16] As discussed in the next section, the trade categories highlighted in Table 5 are those that most closely match the manufactures produced in US foreign-trade zones.

3. Quantitative Results

To carry out the quantitative analysis of the impacts of the TAP Proposal, we draw on our gravity model fixed-effects estimates for NAFTA, and the derived trade impact elasticities, summarized in Table 5 by 1-digit SITC. Specifically, we apply our gravity model coefficients to the data on US imports for domestic consumption of manufactures shipped by FTZ subzones in FY2005, reported in Table 1.[17] The estimates, however, are "tempered" by the shares in total US imports of goods imported under the eleven presently established US FTAs and six prospective US FTAs identified in Table 2. FTA shares in recent US imports range between about 20 percent and about 40 percent across the broadly defined categories of manufactures produced in FTZ subzones.[18]

Table 5 Fixed-Effects versus Random-Effects Coefficient Estimates for the NAFTA Indicator Variable in the Gravity Model

SITC Section	Description	NAFTZ Coefficient Estimate		Trade Impact Elasticity (%)	
		Fixed-Effects	Random-Effects	Fixed-Effects	Random-Effects
0	Foods and live animals	0.61 ***	0.59 ***	84	81
1#	Beverages and tobacco	0.99 ***	1.12 ***	168	207
2	Crude materials	0.37 **	0.42 *	44	52
3#	Mineral fuels	0.71 ***	0.86 ***	103	135
4	Fats and oils	1.67 ***	1.81 ***	434	511
5#	Chemicals	0.68 ***	0.70 ***	97	101
6#	Material manufactures	0.88 ***	0.88 ***	141	142
7#	Machinery and transport equip.	0.47 ***	0.57 **	60	77
8#	Miscellaneous manufactures	0.93 ***	0.98 ***	153	166

Sources: Tables 3 and 4.
Notes: Hatch marks (#) denote broad trade categories in which firms operating in US FTZ subzones shipped manufactures to the US for domestic consumption during FY2005. *,**,*** indicate statistical significance of coefficient estimates at the 10, 5, and 1 percent levels. Trade impact elasticites are computed as 100*[exp(estimate)-1], where exp is the exponential operator on the NAFTA coefficient estimate.

In addition to the impacts of the TAP Proposal on shipments of merchandise from the subzones to the US, we estimate the associated gains in subzone employment using direct labor requirements per million dollars of gross output in US industries in 2005.[19] This calculation is complicated, however, by the fact that even though the FTZ shipments data are the combined value of the US and foreign intermediate inputs that are transformed to final products as they move through the subzones to the US marketplace, they do not include the value added to the production process by the services of US labor and capital. This shortcoming of the data is overcome by integrating into our analysis computed ratios of value-added to intermediate inputs in US industries that manufacture the same products shipped from subzones. Thus, our estimates of the FTZ employment impacts of the TAP Proposal are based on the impacts of the Proposal on the gross output of the subzones, inclusive of the contribution of US labor, capital, and other possible primary factors of production.

Likewise, we also estimate the requirements for added investment in fixed assets in the subzones in response to the TAP proposal. These requirements are estimated using computed capital-to-labor ratios in the US industries producing similar products as the subzones, again based on data for 2005.[20]

[17] The authors investigated an alternative approach using data on subzone shipments of manufactures to the US from raw US trade statistics compiled by the US Census Bureau by 2-digit categories of the US Harmonized Tariff Schedule. The effort, however, proved too difficult because of irregularities found in the data that could not be explained satisfactorily.
[18] The trade, industry, and other parameters underlying the quantitative analysis are tabulated in the Appendix, by the broad categories of manufactures produced in the FTZ subzones.
[19] US Bureau of Economic Analysis (2008).
[20] US Bureau of Economic Analysis (2008) and US Census Bureau (2008).

Finally, our computations include two indicators of the benefits of the TAP Proposal to the general US economy. The first indicator is wage gains to new workers drawn to the FTZ subzones, above what they would earn in similar industries elsewhere in the US economy. The second indicator is gains to subzone producers themselves, arising from the standard "Harberger analysis" of supply-side gains from the expansion of output in a sector under generally competitive conditions.[21] To quantify the first effect, we draw on recent wage and salary data for US industries and on the widely acknowledged research by Lewis and Richardson (2001), who report that, on average, workers in export-oriented multinational firms operating in the US enjoy earnings that are about 7 percent higher than their counterparts in the same US industries. To quantify the second effect, we apply textbook methods to compute the producer gains resulting from the increase in subzone shipments of manufactures to the US, taking into account US MFN tariff rates and the foreign content of the subzone shipments to the US customs territory approximated by the "foreign status" percentages in Table 1. In both instances, these indicators of the gains to the US economy provide estimates of the increase in US GNP that would be attributable to the adoption of the TAP Proposal.

Results

Table 6 presents our estimates for FTZ subzones of the impacts of the TAP Proposal on US customs duties, US imports for consumption, employment, and fixed investment by the major categories of manufactures produced in the zones. Additionally, Table 7 presents the employment impacts reported in Table 6 distributed by FY2005 shares across the more than 250 subzones located throughout the 50 United States and Puerto Rico.

The TAP Proposal results in forgone US customs duty revenues of an estimated $186 million per year. This fiscal loss amounts to about 38 percent of total US customs duty collections on imports from subzones in FY2005. Reflecting the prominence of autos and other transport equipment in subzone manufactures, the largest losses in US customs duty collections ($146 million) occur with respect to subzone shipments to the US of vehicles, other transport equipment, and related parts and accessories.

Table 6 Impacts of the TAP Proposal on US Customs Duties and Domestic Imports, FTZ Employment and Investment, and the US Economy under Current and Prospective US Free Trade Agreements
(Millions of Dollars and Numbers of Employees)

Subzones by Product Category	Forgone Customs Duties	Additional US Domestic Imports	FTZ Employment Gains	FTZ Additional Investment	US Economy Benefits		
					Wage Gains	Producer Gains	Total US Benefit
All Subzones	**186**	**66,002**	**95,021**	**24,593**	**394**	**136**	**530**
Manufactured foodstuffs	1	75	251	32	1	1	2
Mineral products	12	43,718	14,262	14,197	82	32	114
Chemicals	5	2,080	5,431	1,590	27	15	42
Textiles & apparel	7	140	2,224	126	5	3	8
Base metals & metal products	0	188	2,018	167	6	1	7
Machinery	3	2,208	14,373	2,050	53	9	62
Transport equipment	146	15,913	44,883	4,899	170	66	237
Professional equipment	10	958	5,046	1,025	28	6	34
Miscellaneous manufactures	3	724	6,532	508	21	2	23

Source: Authors' calculations based on shipments, employment, and fixed assets of FTZ subzones and US industries in FY2005, shares of current and prospective US free trade agreement (FTA) partners in US imports in 2006, and gravity model estimates of the impacts of NAFTA on US bilateral trade, all by major product or industry categories. US wage gains under the TAP Proposal reflect an average 7 percent earnings premium that US workers enjoy in export-oriented multinational firms operating in the United States, as reported by Lewis and Richardson (2001).

[21] Harberger (1954, 1971). The Harberger analysis of supply-side (or producer) gains from removing a tariff involves measuring the difference between the market price of a good and the marginal cost of producing the good, computed over the increment of increased production of the good after removing the tariff. Diagrammatically, it is the area of the "Harberger triangle" bounded above by the market price of the good and below by the output (or supply) schedule for the good, as seen in familiar demand-supply diagrams found in many economic textbooks. For a recent discussion, see Hines (1999).

Table 7 **Impacts of the TAP Proposal on Employment in Foreign-Trade Subzones under Current and Prospective US Free Trade Agreements, by State** (Numbers of Employees)

State	Subzones
All States	**95,021**
Alabama	**1,590**
Alaska	182
Arizona	846
Arkansas	0
Califronia	**2,699**
Colorado	0
Connecticut	27
Delaware	15
Florida	**4,006**
Georgia	167
Hawaii	675
Idaho	0
Illinois	**2,422**
Indiana	151
Iowa	0
Kansas	20

State	Subzones
Kentucky	**1,078**
Louisiana	272
Maine	0
Maryland	685
Massachusetts	653
Michigan	943
Minnesota	10
Mississippi	**1,492**
Missouri	30
Montana	0
Nebraska	0
Nevada	371
New Hampshire	149
New Jersey	**1,335**
New Mexico	0
New York	**970**
North Carolina	**987**

State	Subzones
North Dakota	0
Ohio	**26,983**
Oklahoma	**1,782**
Oregon	12
Pennsylvania	**2,101**
Puerto Rico	**3,750**
Rhode Island	0
South Carolina	630
South Dakota	0
Tennessee	**23,748**
Texas	**13,529**
Utah	0
Vermont	0
Virginia	96
Washington	600
West Virginia	0
Wisconsin	15
Wyoming	0

Sources: Table 6, NAFTZ (2007a), and authors' calculations.
Note: The top-15 states in terms of subzone employment gains are highlighted.

The forgone US customs revenues are dwarfed by the gravity model estimates of increased US "imports" from FTZ subzones under the TAP Proposal, totaling $66 billion. In percentage terms, the overall increase in US imports from FTZ subzones is equivalent to 20 percent of total subzone shipments to the United States in FY2005. The increased FTZ shipments of manufactures to the United States are predominantly petroleum and other mineral products ($45 billion) and transport equipment ($16 billion), followed at some distance by machinery and chemicals (both about $2 billion).

The forgone US customs collections under the TAP Proposal also seem a very small price in exchange for the estimated overall subzone gains in employment and long-term fixed investment. The TAP Proposal generates 95 thousand additional full-time equivalent jobs – about 33 percent of total subzone employment in FY2005. This remarkable employment gain is concentrated in FTZ subzones producing transport equipment (45 thousand jobs), machinery (14 thousand jobs), and mineral products (also 14 thousand jobs). However, the estimated employment gains are also appreciable for the subzones producing miscellaneous manufactures (7 thousand jobs), chemicals (5 thousand jobs), and professional equipment (5 thousand jobs). Because employment is distributed widely among the subzones across the United States, sizable gains in employment are enjoyed by subzones in a number of states, as reported in Table 7. The largest job gains accrue to manufacturing subzones in Ohio (27 thousand jobs), Tennessee (24 thousand jobs), Texas (14 thousand jobs), and Florida (4 thousand jobs).[22]

Estimated at nearly $25 billion in Table 6, the requirements for additional fixed assets in the FTZ subzones are no less remarkable than the requirements for additional subzone workers. However, the large projected increase in FTZ subzone plant and equipment needs is driven mainly by the enormous added capital requirements of producing mineral products under the TAP proposal. Based on a capital-labor ratio of $1 million per employee,[23] the mineral products-producing subzones require additional plant and equipment investment of $14 billion. In the other FTZ

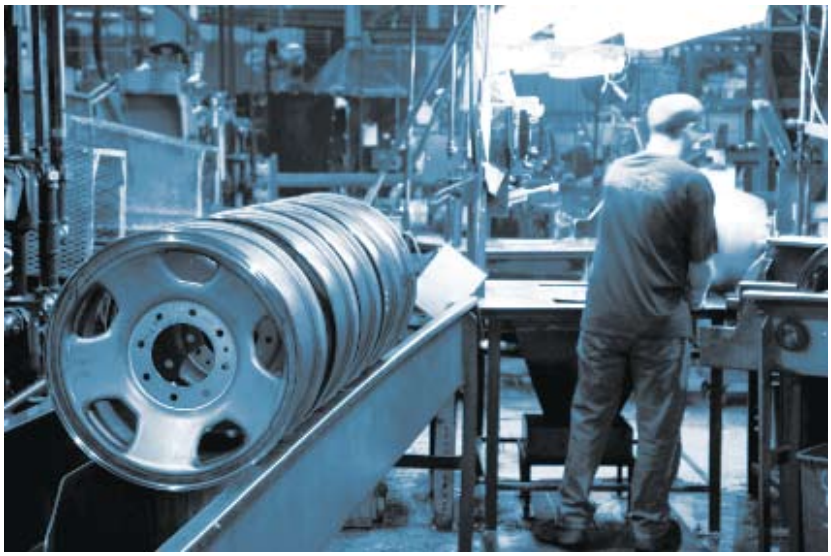
[22] The top-15 states (including Puerto Rico) with substantial gains in subzone employment additionally include Florida, Puerto Rico, California, Illinois, Pennsylvania (2-to-4 thousand jobs); Oklahoma, Alabama, Mississippi, New Jersey, Kentucky (1-to-2 thousand jobs); and North Carolina and New York (950 to 1 thousand jobs).
[23] See the Appendix, Table 8

manufacturing zones, capital-labor ratios are generally less than about $150 thousand per employee. Thus, the requirements for added fixed investment are substantially lower in the non-mineral products subzones, between no more than $200 million (manufactured foods, textiles and apparel, and metal products) and about $5 billion (transport equipment).

Finally, we come to the estimated benefits to the US economy, as enjoyed by both the new workers and the new firms expected to be attracted to FTZ subzones as a consequence of adopting the TAP Proposal. The expansion of manufacturing in the subzones under the Proposal will attract US workers from lower paid jobs in the US economy, and provide them new and better paid employment by the multinational firms operating in the zones. Applying the research-based rule of thumb propounded by Lewis and Richardson (2001) that workers in export-oriented multinational firms operating in the United States earn on average about 7 percent higher wages and salaries than their counterparts in the same US industries, we find that the TAP Proposal results in premium wage gains to the US economy totally nearly $400 million. This gain to US economy results from reallocating the US labor force towards more productive jobs in the FTZ subzones, particularly the zones that manufacture transport equipment ($170 million in wage premium gains), mineral products ($82 million), machinery ($53 million), and professional equipment and chemicals (both about $28 million).[24]

In Table 6, the producer gains garnered by the new and existing firms responsible for increasing FTZ shipments to the US market under the TAP proposal also represent gains to the US economy. Estimated at $136 million, the producer gains are somewhat smaller than the wage gains to new workers attracted to the subzones. Nonetheless, as calculated by the standard “Harberger analysis”, the gains to producers are still substantial, especially for the new and established subzone firms manufacturing transport equipment ($66 million), mineral products ($32 million), and chemicals ($15 million).

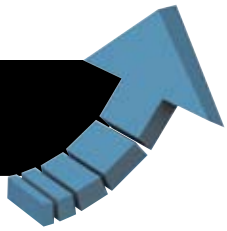
On a combined basis, the wage and producer gains to the US economy under the TAP Proposal total $530 million. To be sure, this amount is tiny compared to the size of the US economy, currently about $14 trillion. However, annual gains of $530 million reached over the medium term will appreciably outweigh the annual projected loss of $186 million in customs duties to the US Treasury. Moreover, our gravity model estimate of the gain to the US economy far exceeds the gain that is likely to be predicted by computable general equilibrium (CGE) models of US trade and economic activity. In our view, CGE models significantly understate the probable trade response to FTA conditions (which the TAP Proposal seeks to ensure for FTZs). That response, derived from the NAFTA experience, underlies our calculation of the TAP Proposal gains.[25]



[24] Our estimates of the wage premium from reallocation of workers in the US workforce may be on the low side because the new subzone jobs might also entail a mix of higher skill occupations than jobs found elsewhere in the US economy.

[25] It should also be noted that a simple partial equilibrium model of subzone production and trade, based on estimated price elasticities – the sort of model used commonly by trade policy analysts twenty years ago – would find an overall gain to the US economy of far less than $100 million. For an introduction to general equilibrium and partial equilibrium models used in trade policy analysis, see for instance Francois and Reinert (1997).

4. Conclusion



The TAP Proposal advanced by the National Association of Foreign-Trade Zones (NAFTZ 2007b) seeks to ensure that US Foreign-Trade Zone Program will support the competitiveness of US-based manufacturing. Specifically, it seeks to level the playing field for FTZ-based manufacturing firms that use imported intermediate inputs but find themselves disadvantaged today in the US marketplace by competing foreign products imported under the duty-free provisions of the rapidly expanding network of US bilateral free trade agreements.

Using gravity model estimates of the impacts of the TAP Proposal on FTZ subzone shipments of manufactures to the United States – using inputs that meet the national content and other requirements of current US FTAs – we find that the $186 million annual fiscal cost of the Proposal to the US Government is dwarfed by the economic benefits of the Proposal. Not only do subzone firms increase their shipments of manufactures to the US market by 20 percent and boost their employment rolls by 95 thousand workers, but also, as a result of the reallocation of US labor and capital resources to more productive uses in the subzones, the US economy itself enjoys an annual gain of $530 million in net benefits over the medium-term.

This overarching conclusion of our quantitative analysis, which clearly supports the TAP Proposal, comes with some cautionary notes regarding our methodology and estimates. Our estimates of the economic impact of the TAP Proposal, particularly those describing the increased subzone shipments of manufactures to the US and the associated increases in subzone employment and investment, should be regarded as depicting the medium-term outcome of adopting the TAP Proposal, as based on the activity levels of the multinational firms operating in US FTZs in FY2005 and those of potential US-based entrants to the subzones of comparable firm-size and producing similar products. Conceivably the TAP Proposal might induce new entrants to the US FTZ program that are dominant producers in an industry, such as the major US auto producers. If so, that would lead to the manufacture of finished products on a much larger scale than witnessed in FTZ subzones before. Our estimates might not fully capture the impacts of the Proposal on FTZ shipments and employment of such a dramatic shift in the character of the US-based firms utilizing the new competitive advantages of operating in FTZ subzones.

Also importantly, short-term adjustment to the Proposal may fall short of the estimates presented here owing to the limited capacity of new or existing FTZ-based manufacturing firms to invest and expand their output and employment rapidly. Prime examples are the FTZ-based firms in the highly capital-intensive petroleum and mineral products sector, which in recent years have found their plans for desired expansion of refinery capacity curtailed not only by the complexities of the petroleum-based fuel blends demanded in the US market, but also by increasingly stringent environmental standards regulating the construction of new US refineries.

Finally, with regard to our estimates of wage gains resulting from adoption of the Trade Agreement Parity Proposal, it should be emphasized that our estimate of the wage premium assumes a fully employed US economy. By our methodology, the FTZ subzone employment gains do not increase total US employment; rather, they shift workers from lower-paid to higher-paid jobs, thereby raising the overall productivity of the US economy. However, in a slow-growth or recessionary US economy marked by unemployment (the sort of economy looming in 2008), our estimates of the wage gains in this report could significantly underestimate the actual benefits to the US economy, if the TAP Proposal boosts total US employment.

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Appendix

Table 8 TAP Proposal Analysis Parameter Values by FTZ Subzone Categories of Manufactures

Subzones by Product Category	Trade & Industry Codes			FTA Share in US Imports	US MFN Tariff	Gravity Model Estimates		US Industry Parameters, 2005				
	HS Sec.	SITC Sec.	NAICS Code			NAFTA Coefficient	Impact Elasticity	FTE/ GO($Mn)	W&S($)/ FTE	II/ GO	VA/ II	FA($Mn)/ FTE
Manufactured foodstuffs	IV	1	311, 312	38%	26.9%	0.99	1.69	2.47	38,690	0.73	0.36	0.13
Mineral products	V	3	324	35%	0.3%	0.71	1.03	0.27	82,606	0.84	0.19	1.00
Chemicals	VI	5	325	22%	2.2%	0.68	0.97	1.60	72,320	0.61	0.63	0.29
Textiles & apparel	XI	8	315, 316	25%	6.8%	0.92	1.51	8.40	31,243	0.53	0.89	0.06
Base metals, metal products	XV	6	332	40%	2.1%	0.87	1.39	5.55	43,013	0.52	0.93	0.08
Machinery	XVI	7	333	35%	1.5%	0.47	0.60	3.99	53,023	0.61	0.63	0.14
Transport equipment	XVII	7	3361-3363	48%	2.4%	0.47	0.60	2.26	54,223	0.80	0.25	0.11
Professional equipment	XVIII	8	334	25%	2.8%	0.92	1.51	3.40	77,952	0.65	0.55	0.20
Miscellaneous manufactures	XX	8	339	20%	2.6%	0.92	1.51	4.50	46,048	0.50	1.01	0.08

Sources: US Bureau of Economic Analysis (2008), US Census Bureau (2008), World Bank (2008), and authors' calculations.

Key to industry parameters:

FA = Fixed assets
FTE = Full-time equivalent employee
GO = Gross output
II = Intermediate inputs
VA = Value-added
W&S = Wages and salaries

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