Non-Tariff Barriers, Integration, and the Trans-Atlantic Economy

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Abstract:

1. Introduction

In the wake of the great recession and ancillary financial crises, the European Union and the United States launched a joint, ambitious effort in 2013 to negotiate a comprehensive trade and investment agreement. Known as the Transatlantic Trade and Investment Partnership Agreement (T-TIP), the negotiation process that has ensued is supposed to bring about tariff-free trade in goods, reduction of non-tariff barriers (NTBs) for goods and services, liberalization of public procurement markets, and greater cooperation on market regulation. Systemically, the negotiations have been characterized as both an important step forward for the multilateral trading system, and an existential threat to that same system. Given that the EU and US account collectively for a substantial share of global production and world trade in goods and services, these negotiations have the potential for a major economic impact on third countries.

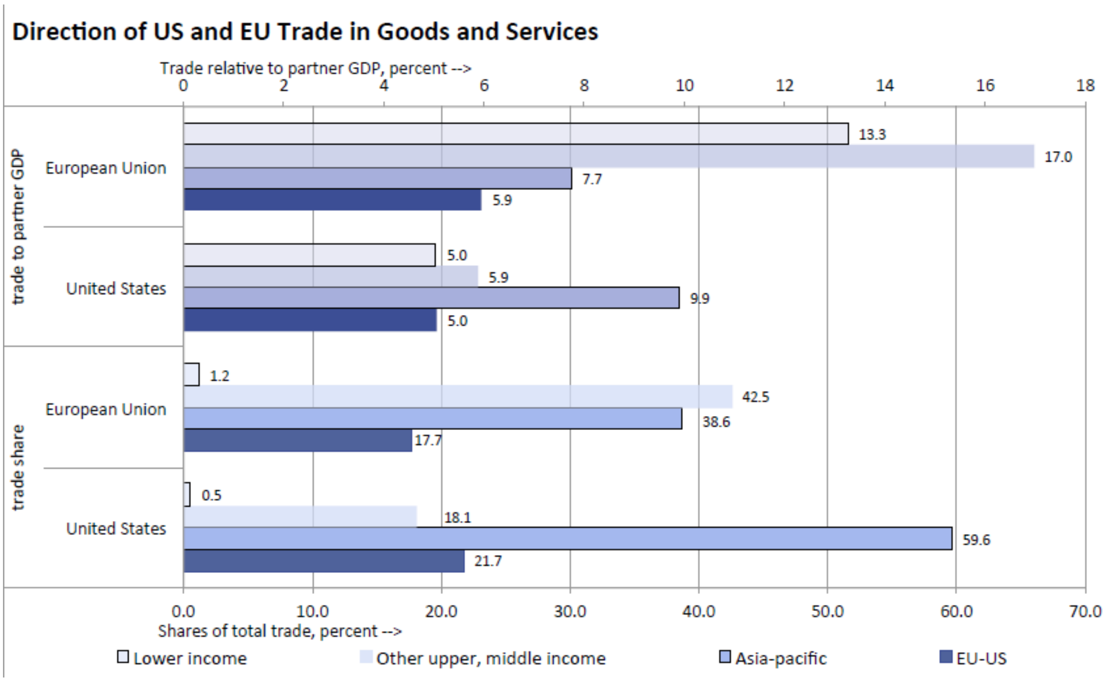
At this stage, the shape and coverage of a final T-TIP agreement remain uncertain. Indeed, the T-TIP would actually be as a set of trade agreements. While the negotiations are formally bilateral, the agenda means that they entail the 50 States in the US and the 28 Members of the EU. A successful agreement needs to take into account particularities of a great number of different partners and thus on substance amounts to a new type of mini-lateral agreement. It also needs to cover areas ranging from broad tariff concessions to sector-specific questions of regulation. While tariff reductions are relatively straightforward, an important ambition under T-TIP actually relates to greater coherence and convergence of regulatory standards. Any progress on regulatory convergence (and better cross-recognition of standards) would require enhanced cooperation in rule making. As such the agenda is not as straightforward as tariff elimination. Indeed, there is growing recognition that a successful T-TIP agreement would likely combine rapid liberalization in some areas (such as tariffs) with institutional mechanisms set up to allow progressive, long run liberalization in others. Such institutional mechanisms, if they offer solutions that can be translated to other situations, might then offer solutions to a broader set of countries that are also grappling with regulatory barriers to trade and investment. Alternatively, there is legitimate worry that they may instead offer new channels for discriminatory management of trade and investment flows.

The T-TIP is attention grabbing, in part, simply because of the magnitudes involved. From Table 1-1, together the two T-TIP partners accounted for 46 percent of global GDP and almost 60 percent of world trade. Yet most of this trade is not actually trans-Atlantic trade. Rather, despite their collective shares of world production and trade, trade flows between the two blocks is relatively low compared to their trade with other regions. This is again illustrated in the data in Table 1-1, but perhaps better visualized with Figure 1-1. Focusing first on directions of trade, the US has far more trade with Asia than it does with Europe. Asia counts for almost 60 percent of US exports and imports. Similarly, the region accounts for roughly 39 percent of EU exports and imports. Other upper and middle-income countries (Canada and Mexico primarily for the US, and EFTA and the Euro-Med economies for the EU) account for most of remaining trade.

To appreciate the context of T-TIP, both for the EU and US, but also for third countries, it is also useful to focus on trade intensity, reported in the Figure 1-1 as trade scaled by partner GDP. For example, EU and US trade with the world is valued at roughly 13 percent of global GDP. This means that for each $100 billion in global income, we see $13.3 billion in trade involving the EU and/or the US. In the case of Asia, for every $100 billion in GDP, there is $9.9 billion in trade (exports and imports) with the US, and $7.6 billion in trade with the EU. Asian trade with the EU and US combined is therefore worth 17.6 percent of Asian GDP.[1] Stark asymmetries are evident, especially with low-income countries. For low-income countries, while trade with the US and EU is worth 18.3 percent of their GDP, its worth roughly 0.2 percent of EU and US GDP.

[1] We are fully aware that scaling trade by GDP is not the same thing as quantifying the impact on GDP. It does however provide a useful metric for comparison.

Figure 1-1 Composition of Trade by Destination



note: trade excludes intra-EU flows. sources: IMF, COMTRADE, GTAP9.

Viewed in this context, though the EU and US account for high shares of GDP and trade, in a sense the flows between them seem relatively low. For example, while in Asia each $100 billion in exports is associated with $17.6 billion in trade with the EU and/or the US, a similar figure for the EU and US themselves tells us that for each $100 billion in transatlantic GDP, we see only $2.7 billion in trade in goods and services. In other words, scaled by GDP, the EU and US both have much more intense trade relationships with other countries and regions than they do with each other. Much of this is may be explained by economic structure. Both economies are mature, with high GDP shares derived from services: 75 percent of the EU value added is in services; 82.3 percent of US value added is in services. As services are less traded, this helps explain the lower bilateral flows. Such factors should be controlled for when we turn to gravity modelling, as otherwise we may mislead ourselves into thinking low trade intensity means high trade barriers. Yet even controlling for such factors, at this stage we should already note the sense reflected in the negotiating mandate that transatlantic trade underperforms. The logic is that with shifts in technology and organization of production toward more global and regional value chains that cross international borders, behind the border issues whose trade cost impacts were once second or third order are increasingly important. Without necessarily changing policy, what were once domestic regulatory issues have emerged as potential sources of NTB-related trade costs in a world of international production and associated returns to scale. To some extent, the US has dealt with these changes in NAFTA with respect to its North American partners (especially for motor vehicles). The same holds for Europe in the context of the EU single market. The T-TIP is approached with the combined NAFTA and EU single market experience helping to frame the current negotiations on regulatory divergence and mutual recognition of standards.

We have organized our discussion as follows. In Section 2, we focus first on important qualitative issues (i.e. things we do not try to quantify primarily because we can't) that help frame the more quantitative analysis that follows. In Section 3, we then turn to structural gravity modelling (i.e. estimating equations based on the trade equations in our computational model introduced in Section 4) to control for factors like economic structure and both physical and cultural distance that affect trade flows. On this basis, we gauge possible trade cost reductions under T-TIP, based on a mix of past experience with regional trade agreements (RTAs) with respect to goods trade, firm-based evidence on goods-based trade costs not addressed by past RTAs, and recent data from the World Bank, OECD, and WTO on services barriers and recent services commitments. With trade cost estimates in hand, we then turn to a computational model of the world economy in Section 4. This model reflects actual production and trade in 2011. On this basis, we discuss possible impacts of T-TIP based trade cost reductions for the EU and US economies, but also for third countries. Concluding comments, thoughts, and ruminations are offered in Section 5.

Table 1-1 GDP and Trade Orientation, 2011

	US	EU	EU & US
EU-US GDP			
billion dollars	14,991	17,645	32,636
share of world GDP	21.3	25.1	46.3
Trade with world			
billion dollars	4,096	5,036	8,241
share of world trade	29.4	36.2	59.3
share of own GDP	27.3	28.5	25.3
share of world GDP	5.8	7.2	13.0
Trade between EU & US			
billion dollars	891	891	891
share of own GDP	5.9	5.0	2.7
share of partner GDP	5.0	5.9	2.7
share of world trade	6.4	6.4	6.4
share of own trade	21.7	17.7	10.8
Trade with Asia, Pacific			
billion dollars	2,443	1,945	4,388
share of own GDP	16.3	11.0	13.4
share of partner GDP	9.9	7.7	17.6
share of world trade	17.6	14.0	31.5
share of own trade	59.6	38.6	53.2
Trade with other upper & middle income countries			
billion dollars	740	2,142	2,882
share of own GDP	4.9	12.1	8.8
share of partner GDP	5.9	17.0	22.8
share of world trade	5.3	15.4	20.7
share of own trade	18.1	42.5	35.0
Trade with low income countries			
billion dollars	22	58	80
share of own GDP	0.1	0.3	0.2
share of partner GDP	5.0	13.3	18.3
share of world trade	0.2	0.4	0.6
share of own trade	0.5	1.2	1.0

note: trade excludes intra-EU flows. sources: IMF, COMTRADE, GTAP9.

2. Regulation, politics, and keeping NTBs in context

It should be stressed that in contrast to reducing tariffs, the removal of NTBs is not so straightforward. There are many different reasons and sources for NTBs. Some are unintentional barriers while others reflect deliberate public policy. As such, for many NTBs, removing them is not possible because, for example, they require constitutional changes, unrealistic legislative changes, or unrealistic technical changes. Removing NTBs may also be difficult politically, for example because there is a lack of sufficient economic benefit to support the effort; because the set of regulations is too broad; or because consumer preferences or language preclude a change. Indeed even where public perception is not congruent with scientific evidence, we need to keep in mind that it's the public that votes, not the evidence. In recognition of these difficulties, we follow recent studies by focusing on the set of possible NTB reductions (known as "actionable" NTBs) given that many will remain in place. Of those NTBs that can feasibly be reduced, we focus on different levels of ambition for NTB reduction.[2]

This raises the issue of what might we plausibly expect to be the result of a successful T-TIP negotiation. In addition to differences over matters of fact (economics as a body of knowledge is far from settled on many positive issues with respect to what drives outcomes in national economies and their relationship to other economies), we expect difficulties to arise over matters of genuine differences in social goals and the way those goals are embedded in national legal orders and we also expect outcomes to be affected by distributive struggles in the national (and in the case of the EU, in the Community level) political arena.

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[2] In benchmarking studies leading into the T-TIP talks, such as ECORYS (2009), there was a strident debate between regulators and trade officials centred on semantics and acronyms. One man's barrier is another man's reasonable measure, or in other words regulatory measures might not be deliberate barriers. While noting the importance of this distinction in some circles, for simplicity here we will call all regulatory and non-tariff instruments that impede trade as non-tariff barriers (NTBs) while recognizing that some of these are perfectly legitimate measures, and in such cases the less pejorative term perhaps ought to be non-tariff measures (NTMs). Calling them all NTBs, we focus instead on dividing the trade-restricting aspects of all measures into those that can be reduced and those that cannot, defined elsewhere in this paper as "actionable" and "non-actionable" NTBs.

Consider first distributive politics. There is now a sizable literature, in Economics and Political Science, on the ways political struggles over the returns to trade (and the losses realized by particular households and sectors in both the short- and long-run) affect the outcomes of domestic trade politics and, more relevant for the purposes of this paper, the outcomes of trade negotiations (Grossman and Helpman, 1995a, b, Ornelas, 2005a). The usual goal of political economy papers in general is to explain deviations from optimal policies, so it is not surprising that most of this work emphasizes how politics cause deviations from "Liberal trade"(Krishna, 1998, Levy, 1997, Ornelas, 2005b).[3] Certainly in the case of T-TIP there is no shortage of special interests in both the US and Europe seeking to use the negotiations to either increase access to foreign markets or reduce access to domestic markets. In this paper we identify sectors that may gain and lose from liberalization of trade between the US and the EU, and it should not surprise us to discover that those sectors are actively lobbying their governments on those issues.[4]

At the same time, contemporary negotiations between the EU and the US take place in a context that offers interesting differences relative to expectations based on standard models. Most obviously, a substantial amount of trade between the US and the EU takes place in differentiated intermediate goods along the lines of Ethier (1982). At least since the classic paper of Balassa (1966), intra-industry trade (IIT) has been seen as less disruptive than inter-industry trade (Brülhart, 2002, Dixon and Menon, 1997, Menon and Dixon, 1997) and while this inference is not as well-grounded theoretically as we tend to think (Lovely and Nelson, 2000, 2002), there appears to be empirical support for the claim.[5] Thus, just as integration among the early members of what became the EU was eased by the relatively low adjustment costs to liberalization of trade, the

[3] Though Ethier (Ethier, 1998, 2001) and Ornelas (Ornelas, 2005a, 2008) are exceptions here.
[4] For example, US cultural industries seek strong intellectual property protections and increased access to European markets, while European producers in these sectors seek exemptions to protect national culture. An interesting case we note below is the US financial sector, which seeks regulatory harmonization not only to increase its presence in Europe but, perhaps more importantly, to secure reduced domestic regulation.
[5] Consistent with Lovely and Nelson (2000, 2002), Trefler (2004) finds that rationalization effects dominate in the long-run, but that short-term adjustment induced by rationalization involve non-trivial costs in the short-run.

sizable role of IIT in US-EU trade may similarly reduce adjustment cost-driven distributive politics. Similarly, the opportunity to rationalize nationally organized production on an international basis in sectors like motor vehicles, steel, and chemicals should produce support for integration where opposition is predicted in standard models. Consistent with this observation, the European motor vehicle industry is strongly behind the T-TIP (they have been primary drivers of political support, so to speak) while they were adamantly opposed to the EU-Korea agreement and are opposed to an EU-Japan agreement as well. In the first case, the most of the same firms operate on both sides of the Atlantic and see opportunity for rationalization, while in the second the situation is closer to the classic one of opposing firms.[6]

Distributive politics encourage us to treat opposition to liberalization as cynical special pleading. However, especially when we turn from straightforwardly protectionist barriers to trade to harmonization of regulations that are deeply rooted in domestic understandings of identity, the good life, national safety, et cetera, this inference becomes increasingly strained, even as self-interested groups re-purpose such arguments to their own advantage. Thus, while purely trade policy-related negotiations have become increasingly fraught as a result of domestic political opposition (witness the lengthening periods to resolution of multilateral trade agreements and the difficulty of American presidents in securing trade promotion authority), as soon as we consider issues like regulatory harmonization with some kind of non-trivial dispute resolution process, concerns about surrender of sovereignty are added to standard distributional conflicts. It is tempting to treat all such resistance as thinly veiled rent seeking, but this is not really a useful way to understand the underlying politics.[7] Consider three cases of relevance to T-TIP: regulation of cultural

[6] See for example Ramsey (2012) and Clark (2014). Lobbying is actually more complex, as Asian manufacturers also produce in the EU, and both Toyota and Hyundai are members of the European automakers association (ACEA).

[7] This is not to say that such rent seeking is not an essential part of the politics of trade policy. It certainly is. The point is to recognize that when opponents of liberalization refer to sovereignty concerns, it is precisely because they tap into powerful notions of community norms that they are effective. Treating them as simply bad faith is neither good politics, nor good analysis. The inherent difficulty of incorporating such concerns in systematic analysis makes it all the more

goods; food safety regulation; and financial regulation. In all of these cases, there are fundamental differences between parties engaged in the T-TIP negotiations.

Culture is inherently difficult to identify, but it goes to the heart of national identity. US firms currently dominate the global cultural marketplace. It is easy to see arguments for globalization as thinly veiled special pleading for US television and filmmakers, music and print publishers, et cetera. It is just as easy to see arguments against globalization as thinly veiled special pleading for national (read "non US") producers of the same goods. However, "culture wars" in the US make clear just how strong are claims about the link between culture and identity (Huntington, 2005). Especially in moments of economic uncertainty, "culture" and identity become strong instruments indeed in the political arena. The politics of culture will always be difficult and unpredictable precisely because they are not anchored in material interests but elicit strong responses at the ballot box.

Food safety regulation does not turn on quite such strongly intangible concerns, but still produces very different responses. Food safety is, of course, a shared value between citizens and governments of both the EU and the US, and yet the approaches are fundamentally different. The problem is that many technologies have uncertain future effects and, if the effects are at least plausibly sufficiently large, it is necessary to weigh the gains from admitting such goods into the food system against (possibly low probability) costs. US law emphasizes immediate scientific process. If chlorine washed chicken and genetically modified organisms cannot be shown to be dangerous with a high degree of certainty, there is a presumption that they should be permitted to enter the market. The European approach emphasizes instead the precautionary principle—i.e. to the extent that we might reasonably suppose that they constitute risks to the food system, proponents of sales of chlorine washed chicken or GMOs must prove that they are safe with a high degree of certainty. These are both reasonable, but debatable, principles for evaluating uncertain prospects (Gollier *et al.*, 2000,

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important that we recognize them where they may provide cause for us to be careful in our policy recommendations.

Sunstein, 2005). The statement that "both countries agree on the goal of food safety" only goes so far in resolving a fundamental legal difference about how to evaluate policies in pursuit of that goal. In addition, of course, parties facing redistributive effects from any harmonization can use legitimate differences between weighting of type-1 and type-2 error as tools in rent seeking.

Finally, it is widely understood, especially in the aftermath of the 2007-2008 global economic crisis and follow on currency and debt crises that optimal regulation of the financial sector involves a trade-off of the gains from efficiency against the (potentially catastrophic, if low probability) losses from financial crisis. The appropriate policy is affected not only by aggregate attitudes toward risk, but also by uncertainty about both sources of and appropriate responses to instability. Of particular relevance to T-TIP, the US has recently become more aggressive in response to financial risk. This leads to concerns about both what the appropriate policy is and active use of negotiations (especially by US financial institutions) to undermine domestic regulation (Johnson and Schott, 2013).

In all three of these cases, as well as many others (some of which are discussed elsewhere in this paper), these considerations make welfare evaluation difficult. It is generally the case that, in all three cases, harmonization that results in increased trade has a first-order welfare improving effect for all the usual reasons. Nonetheless, because these policies involve substantial uncertainties and externalities, those effects cannot be the whole story, especially from an expected welfare point of view. At the same time, precisely because of uncertainties about both technical details and true preferences, it is not at all clear how to incorporate such considerations in our analysis. We follow the keyless drunk in being systematic about those things that permit systematic evaluation and we remind the reader that this is only part of the story.[8] We console ourselves that both the EU and the US possess robust democratic

[8] For more on this, see (Freedman, 2010), who notes "It is often extremely difficult or even impossible to cleanly measure what is really important, so scientists instead cleanly measure what they can, hoping it turns out to be relevant."

political systems whose purpose, among other things is to make determinations about difficult social trade-offs.

3. Quantifying scope for trade cost reductions in T-TIP

We turn next to quantifying possible trade cost reductions under T-TIP. For tariffs this is relatively straightforward. For NTBs, on the other hand, it is less so. Therefore, we start with the easier task of describing tariffs. We then move on to estimates of trade cost reductions for goods in past RTAs, and estimates specific to the EU-US context. We save the most speculative for last – trade cost reductions for services.

a. Tariffs

Though both US and EU average tariffs are similar, there is heterogeneity when we break down tariff protection by sector. From Figure 3-1, the most striking cases are motor vehicles and processed foods. The EU tariffs on these products are substantially higher than corresponding US tariffs, and indeed far higher than the trade-weighted average MFN tariff for goods overall. For motor vehicles[9] the EU applies an average tariff (7.9 per cent) that is over seven times higher than the US. For processed food products, EU average tariffs (15.8 per cent) are more than three times higher than US average tariffs. Though primary agriculture appears relatively open, this is misleading. Protection in this sector takes the form of a wife variety of NTBs, as will be see in the next subsection.

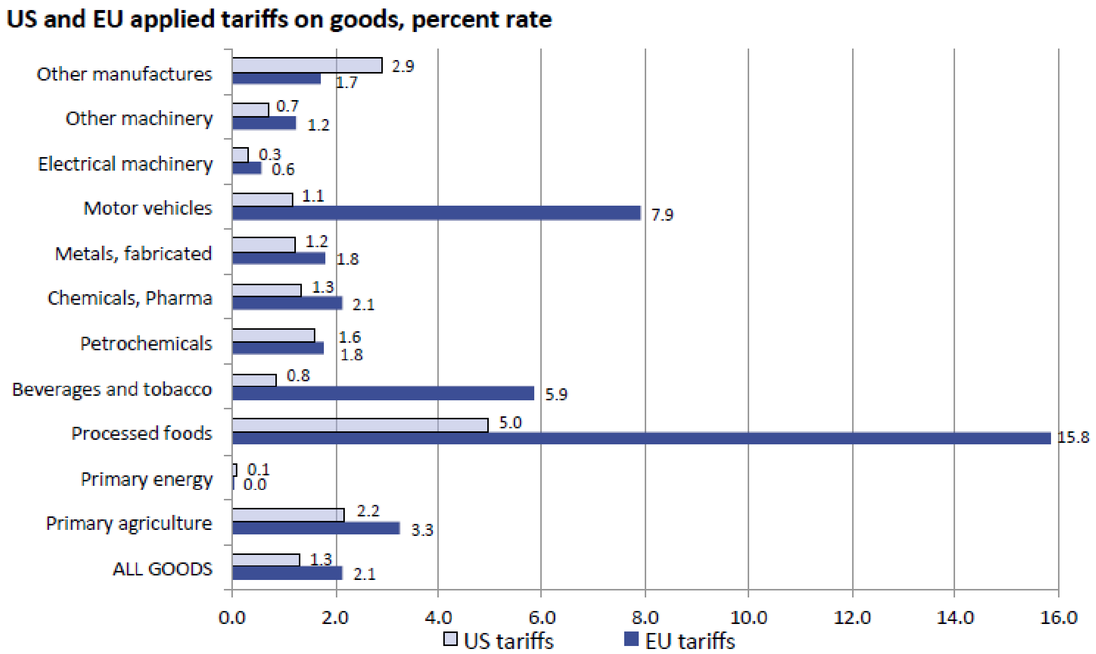
b. NTB liberalization in FTAs

We now turn to the trickier question of possible trade cost reductions linked to NTBs. As noted above, such cost savings may follow from cross-recognition of standards (a process where industry plays a central role) to acceptance of

[9] Motor vehicles sector in this case includes also parts and components.

regulations (a process where regulators need to find common ground and essentially trust the approach taken by comparable agencies on the opposite side of the pond) to even joint regulation and development of joint standards. None of this can be considered as easy. While examples such as "run drug trials once and not twice" might seem obvious places to start, as noted in Section 2, differences in social/political approach to risk and consumer protection render even the obvious into something more complex and murky.[10]

Figure 3-1 Applied (MFN) tariffs on trans-Atlantic trade



Source: WTO integrated database and the World Bank/UNCTAD WITS database.

Values reported are for 2011 and are trade-weighted.

One place to look, in terms of estimating possible reductions in trade costs, is the impact we observe from past trade agreements. The EU itself, for example, has been engaged in a decades long exercise not unlike the goals stated for the T-TIP. We have also seen other trade agreements, ranging from shallow tariff-only FTAs to relatively deep and comprehensive agreements, like the NAFTA. These may

[10] We invite the reader to look through firm survey responses to regulation in the ECORYS (2009) annex material, "Annex VI Business survey results", which provides examples on an industry basis of sources of cost differences when the same firms operate in multiple regulatory regimes.

provide some guidance on the magnitude of trade cost reductions that we might expect, if T-TIP ends of looking like the deeper end of existing agreements.

In formal terms, we have implemented a gravity model of trade, estimated in a cross-section of data for the year 2010 for goods at the level of aggregation used for our computational model, and comparable to earlier ECORYS (2009) aggregates.[11] This means we specify bilateral trade flows in levels as an exponential function of a log-linear index that is composed of three classes of determinants: exporter-specific factors (measuring supply potential of exporting countries), importer-specific factors (measuring demand potential of importing countries), and bilateral factors (measuring trade impediments in a broad sense). We specify exporter-specific and importer-specific factors as country fixed effects and parameterize bilateral factors in the log-linear index as a function of observable country-pair-specific variables. Thereby, we ensure that the parameters on the later exhibit a structural interpretation that permits using them in a subsequent comparative static analysis of a model that is calibrated to data on trade and production at the same level of aggregation, where the trade equations in the model are consistent with those in the gravity model itself.

A more technical discussion of the econometrics is provided in the annex.
For explanatory variables we include log bilateral distance, common border, common language, and former colonial ties. We also include a measure of political distance based on measures from the political science literature (polity).[12] We have also included the bilateral tariff margin granted in free trade agreements (measured as the difference between the most-favoured nation rate, which is subsumed under the importer-specific fixed effect, and the rate used in

[11] A mapping from these sectors for NACE is provided in the annex. We have used 2010 rather than 2011 because bilateral trade and tariff data, while available for the US and EU, were not available yet for a broad enough set of countries, and we made the decision to go with 2010 to gain dimensionality in the data used for the regression-based analysis.
[12] Shipping distances are based on actual shipping routes (Francois and Rojas-Romagosa, 2014), data on FTA rankings are from Dür *et al.* (2014), other geopolitical distance measures are from the CEPII database (Mayer and Zignago, 2011), and polity comes from the Quality of Governance (QoG) expert survey dataset (Teorell *et al.*, 2011). The political economy variables include pairwise measures of similarity, reflecting evidence that homophily is important in explaining direct economic and political linkages (De Benedictis and Tajoli, 2011).

a respective trade agreement. (This actually represents the negative of the preference margin.) Most important, in the present context, is that we have a measure of the depth of various FTAs from Dür, Elsig and Milewicz (2014). The depth-of-trade agreement variable takes on integer values ranging between unity for shallow agreements and seven for deep agreements. The EU is not technically an FTA, and we represent this with an additional dummy variable. This indicator variable for intra-European-Union relationships differentiates between the legal and institutional harmonization associated with EU membership, which clearly goes beyond the liberalization of policies in other agreements. [13]

Table 3-1 summarizes the relevant trade-cost-function parameters of the second-stage regression. (The parameters of the first-stage ordered-probit model are summarized in the Appendix.) Across all regressions presented in the table, the explanatory power – measured by the correlation coefficient between the model and the data, dubbed as pseudo-R2 – is quite high. The results suggest that overall as well as at sector-level, goods trade (in most sectors) rises (trade costs decline) with a larger preference margin granted in trade agreements, with a greater depth of an agreement, and with EU membership. The parameter on the (negative) tariff margin reflects what is referred to as the elasticity of trade with respect to tariffs.[14] With reference to the new trade literature on monopolistic competition and economies of scale, we

[13] We treat the trade policy variables as jointly endogenous and pursue a control-function approach to reduce the parameter bias flowing from that endogeneity. In essence we have expanded on the methodology of Egger *et al.* (2011) to encompass different types of trade agreements. This approach is discussed in detail in the Appendix. From a general perspective, such an approach relies on some instrumental variables which help splitting the variation in an endogenous variable – e.g., the integer-valued depth-of-agreement measure – into two components: one that contains exogenous variation only and one that contains also endogenous variation. In the present analysis, we assume joint normality of the endogenous variables and we base the control function on generalized Mills' ratios that are obtained from an ordered probit model of depth-of-trade agreements. Since intra-EU relationships are associated with a depth measure of seven, and tariff margins granted in agreements are correlated with the depth of agreements, a flexible function of depth-integer-specific Mills' ratios is capable of controlling for the endogeneity of all trade policy measured included in the analysis.

[14] This is often estimated at being between -3.5 and -7 for aggregate trade flows and varies largely across sectors. See for example Broda and Weinstein (2006).

Table 3-1 PPML-based gravity estimates for goods

	All Goods	Primary agriculture	Primary energy	Processed foods
tariff	-6.564 ***	-1.960 ***	-26.395 ***	-2.914 ***
distance	-0.529 ***	-0.629 ***	-0.896 ***	-0.596 ***
common colony	0.439 ***	0.542 ***	-0.079	0.477 *
common language	0.203 **	0.239 **	0.646 **	0.370 ***
common border	0.508 ***	0.630 ***	0.597 **	0.664 ***
polity	-143.627 ***	-30.255 ***	-52.614	50.248
former colony	0.229 **	0.228 **	0.621 **	0.406 ***
FTA depth	0.055 **	0.164 **	0.164 **	0.082 ***
EUN	0.451 ***	1.087 ***	1.574 ***	0.681 ***
observations	11,145	11,053	9,413	11,109
pseudo R2	0.8828	0.8306	0.6918	0.8806

	Beverages and tobacco	Chemicals and pharmaceuticals	Petro-chemicals	Metals, fabricated metals
tariff	-4.013 ***	-3.188 **	-9.032 ***	-5.304 ***
distance	-0.603 ***	-0.627 ***	-0.755 ***	-0.728 ***
common colony	1.255 ***	0.031	-0.251	0.223
common language	0.462 ***	0.151 *	0.213	0.036
common border	0.509 ***	0.370 ***	0.494 ***	0.587 ***
polity	167.547 *	45.513 *	46.158	-52.582 *
former colony	0.794 ***	0.378 ***	0.014	0.231 **
FTA depth	0.180 ***	0.021	0.192 ***	0.007
EUN	0.462 §	0.160	-0.118	0.778 ***
observations	11,087	11,123	10,854	11,065
pseudo R2	0.8219	0.9517	0.643	0.757

	Motor vehicles	Electronic equipment	Other machinery	Other manufacturing
tariff	-12.166 ***	-22.869 ***	-13.307 ***	-7.653 ***
distance	-0.312 ***	-0.364 ***	-0.473 ***	-0.526 ***
common colony	0.657 *	0.499 **	0.460 **	0.416 ***
common language	0.151	0.130	0.288 **	0.196 **
common border	0.467 ***	0.357 **	0.353 ***	0.471 ***
polity	41.944 ***	-241.980 ***	-168.209 ***	-115.083 ***
former colony	-0.289 **	0.128	0.331 ***	0.241 **
FTA depth	0.151 ***	0.028	0.057 ***	0.050 **
EUN	0.884 ***	1.141 ***	0.116	0.386 ***
observations	11,098	11,094	11,115	10,292
pseudo R2	0.8982	0.9372	0.9151	0.899

note: Cross section regressions based on 2010 data from COMTRADE, WITS, DESTA, CEPII as discussed in text. Regressions are PPML based and include source and destination fixed effects and correction for PTA endogeneity.

would refer to sectors with a larger (smaller) negative value of that elasticity as more (less) competitive. Accordingly, we would say that the results suggest that the competitive pressure is particularly high in primary energy production, electronic equipment, other machinery, and motor vehicles. On the contrary, it is particularly low in primary agriculture, chemicals and pharmaceuticals, and food and beverages.

A greater depth of trade agreements particularly benefits (directly, recall that the presented parameters measure only direct effects) all sectors except chemicals and pharmaceuticals, metals, and electronics. The coefficient estimates are to be interpreted as direct semi-elasticities. Hence, for all goods, a parameter of 0.18 means that bilateral goods trade will increase by 100x($e^{0.055}$(0.18)-1)≈5.7 percent per degree (between unity and seven) of greater depth of agreement. Since prices and incomes will adjust in general equilibrium, the "treatment effect" of greater agreement depth will vary across country-pairs, accruing to differences in endowments, technology levels, and trade costs.
EU membership, with all its provisions that are directly and indirectly related to goods trade, exhibits a direct semi-elasticity of 0.451, or 100x($e^{0.451}$-1)≈56.99 percent. Notice that this is bigger than the effect of switching from no agreement at all to a deep agreement of grade seven for non-EU countries. The direct gains from EU integration are particularly large for primary energy, primary agriculture, motor vehicles, and metals.

Table 3-2 Trade cost reduction estimates, AVEs for goods

	A	B	C	D	E
	intra-EU AVE savings	deep RTA AVE savings	ECORYS (2009) EU vs US	ECORYS (2009) US vs EU	Share of bilateral trade
GOODS	7.1	6.0	na	na	70.6
Primary agriculture	74.1	79.8	na	na	0.9
Primary energy	6.1	36.9	na	na	0.6
Processed foods	26.3	21.8	25.4	25.4	1.4
Beverages and tobacco	12.2	36.9	25.4	25.4	1.6
Petrochemicals	0.0	16.0	na	na	3.3
Chemicals, Pharmaceuticals	0.0	0.0	10.2	11.4	19.3
Metals, fabricated metals	15.8	0.0	5.3	9.0	5.1
Motor vehicles	7.5	9.1	14.0	14.2	5.9
Electrical machinery	5.1	0.0	6.0	6.8	3.1
Other machinery	0.0	3.0	0.0	0.0	23.2
Other manufactures	5.2	4.6	na	na	6.2

Table 3-2 summarizes the ad-valorem equivalents (AVEs) of non-tariff trade-cost factors in columns A and B. These are based on the regression coefficients in Table 3-1. To see what these AVEs are, let the generic ad-valorem tariff parameter be a and the coefficient on any non-tariff measure be b. Moreover, denote the average value of any generic non-tariff trade cost by c. Then, the AVE $\equiv 100x(e^{-bc/a}-1)$ measures the necessary percentage point adjustment of tariffs which is equivalent to eliminating the respective non-tariff cost. In the table, the trade cost indicator c is either EU Membership of the depth of a particular agreement. In essence the term bc is the trade volume effect, and dividing by the tariff coefficient gives the comparable tariff that would yield the same volume effect. In Table 3-2 we have computed two tariff-equivalents, one for cost-savings from EU membership (i.e., the deepest trade agreement in our sample) and one for estimated cost reductions following from the deepest observed FTAs (so indexed as 7). The results suggest that the tariff-equivalent effects of intra-EU preferences are largest for primary agriculture and processed foods, followed by metals and fabricated metals. We also observe differences in, both positive and negative, when comparing the EU estimates with deep FTAs. There are good reasons for this. Where we have countries with deeper underlying NTBs than in the EU context, there will be greater impact if they are removed. Critically, if barriers are not removed in an FTA, then we will not observe cost reductions, even if there are actually substantial underlying barrier.

Columns C and D in Table 3-2 provide another basis for analysis. These are from the ECORYS (2009) study of transatlantic NTBs. Those estimates are also gravity based, from a similar estimation framework to that reported in Table 3-1. The critical difference is that the estimates in columns C and D are based on firm survey pairwise rankings of market access conditions across markets (scored 0-100). On that basis, relative access conditions were found to vary systematically for intra-EU vs extra-EU trade (meaning EU trade with third countries). Converting those volume effects into trade cost equivalents, and applying additional information from the firm responses (the share of total NTB related costs that could realistically be removed by a mix of cross recognition and regulatory convergence) yields the results summarized in columns C and D. Essentially, columns A and B are estimates of what has been accomplished in existing trade agreements. Columns C and D, following a similar methodology, focus instead on possible cost savings in the trans-Atlantic context. For most sectors where we have available estimates in the second set of columns, the estimates are generally quite similar, especially is we focus on the intra-EU estimates as a benchmark. Interestingly, though tariffs on primary agriculture were shown above to be relatively low, from the estimates in Table 3-2 the impact of NTBs on this set of good is actually quite dramatic. In addition, there is clear evidence of substantial cost savings in the context of both deep RTAs and the EU itself.

We should comment on chemicals. From our own estimates, existing agreements have not yielded trade cost savings in this sector. Yet, from the business surveys and associated gravity analysis for this sector (columns C and D) econometric analysis identified potential cost savings that work out to roughly 10% of the value of goods traded. In the European context, a new set of EU standards, known by the acronym REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) was not agreed until 2007. It is scheduled to be phased in over a period lasting until at least 2018. In other words, even within the EU, the process of regulatory integration has a long way to go, and we should not be surprised to see no effects in columns A and B. Hence, though we know that motor vehicle producers have been strongly proactive in pursuing cost reductions within RTAs, for chemicals we interpret columns A and B as indicative of what has happened within RTAs and the EU (not so much so far) and what may potentially happen (substantial cost savings).

c. Services in the context of RTAs

Finally, we now turn to services. This is a difficult area both in RTAs and in the WTO, where services are covered by the General Agreement on Trade in Services, aka the GATS. (see Francois and Hoekman, 2010 for a general discussion of measurement problems). Fortunately, new sets of data have been released based on relatively detailed analysis of regulatory regimes in services, combined with assessments of how GATS and RTA commitments in services compare to policies actually in place. We will work in this section with estimates of trade restrictions in services from the World Bank (Borchert *et al.*, 2014), AVEs for trade barriers in services based on the World Bank data (Jafari, 2014), and assessments of GATS bindings and how these compare to RTA services commitments from the WTO (Roy, 2011 database updated 2013).

Table 3-3 below provides summary information for services for the EU and the US. The first two columns provide estimated AVEs of market access restrictions in services on the basis of the World Bank's STRI database (Jafari, 2014) and are comparable to estimates from other sources. They represent actual levels of market access. Columns C and D provide a different perspective. These provide scores from 0 to 100, where 0 means no binding commitments have been made and 100 means full commitments have been made to bind policies linked to market access for particular sectors. A similar message is provided by

Table 3-3 AVEs and market access commitments in services

	A	B	C	D	E
	AVEs of current policies		GATS, and best RTA		Share of bilateral trade
	EU	US	EU	US	
SERVICES	12.79	12.94	55.3, 64.4	55.4, 55.4	29.4
Construction	na	na	70.8, 83.3	83.3, 83.3	0.4
Air transport	25.00	11.00	66.3, 72.5	5.0, 28.8	3.1
Maritime	1.71	13.00	47.6, 63.1	0.0, 44	0.1
Other Transport	29.73	0.00	57.1, 71.4	42.9, 64.3	3.1
Distribution	1.40	0.00	71.9, 87.5	100, 100	1.0
Communications	1.10	3.50	75.0, 78.1	78.3, 78.3	1.1
Banking	1.45	17.00	42.7, 42.7	29.2, 33.3	5.0
Insurance	6.55	17.00	57.5, 57.5	40.0, 50.0	2.7
Professional and business	35.43	42.00	58.8, 62.5	57.5, 62.5	8.1
Personal, recreational	na	na	47.6, 50.9	91.5, 91.5	1.3
Public services	na	na	32.5, 36.7	19.2, 31.7	3.5

Source: WTO and World Bank. See text.

Borchert *et al.* (2011), who note that in general GATS commitments provide little in terms of bindings relative to actual policy. From columns C and D, many sectors are relatively unbound both in the GATS, but also in terms of the deepest commitments made by either the EU or the US within trade agreements. There are exceptions, such as the distribution sector, construction, and communications. Yet from columns A and B these sectors are relatively open anyway. Where we see the highest protection, in professional and business services, both the EU and US are highly protective, and they are reticent to make actual commitments in these sectors. Yet, from column E, business and professional services are the single most important set of services, in terms of trans-Atlantic trade. As such, while we see little evidence of actual liberalization under with the GATS or RTAs, there is great potential given the size of barriers (the AVEs in columns A and B) and the trade share (column E). On the US side, other standouts are banking and insurance (high barriers, little evidence of actual binding commitments) and maritime services (same story).

How do we interpret the data in Table 3-3? Based on past experience, neither the US nor the EU has shown a willingness to make binding commitments to open service sectors where protection actually matters. This does not mean we cannot speculate on a situation where we depart from past behavior. However, this means we will be embarking on numerical speculation, even more so than usual, when we include services in out numerical modeling.

4. Numerical modelling of T-TIP

We turn next to a numerical analysis of the impact of T-TIP based NTB cost reductions. This involves a multi-region CGE model of the global economy benchmarked to 2011. The structural features of the model are common to those used for the ECORYS (2009) and CEPR (2013) T-TIP assessments, as well as the EU-Canada (2009) joint assessment on the EU-Canada FTA. The model features a mix of monopolistic competition for industrial sectors and business services and Armington-based trade (i.e. CES demand with competitive markets) for other sectors. It also includes linkages between investment and the installed capital stock.[15]

In what follows, we first provide a broad overview of the model. We then develop a set of experiments based on our discussion in Section 3 of NTB-based cost reductions in FTAs. This is followed by discussion of the results of the computational experiments. We emphasize both EU-US effect and third country effects. With respect to third countries we also examine the possible importance of what are called "regulatory spillovers." Basically, with a deep agreement on NTBs, it has been argued that third countries might also benefit to a limited extent, in terms of some improvement in market access. The logic is that, with deep regulatory reform, at least some of the changes are likely to affect all players, and not just the EU and US firms, as redrafted regulations ***might not*** (but

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[15] The full set of CGE model files is available as an on-line annex and data/software archive. The model itself is implemented in GEMPACK. Monopolistic competition is modelled as explained in Francois *et al.* (2013), while investment linkages are based on "comparative steady-state" analysis, where we take the 2011 benchmark as a representative year on a timeline and solve for changes in that year along the timeline following policy experiments. See Francois *et al.* (1997) as well as Francois *et al.* (2005). The model runs on top of the GTAP database, version 9 (Hertel, 2013), which itself is benchmarked to 2011.

could be) be formulated to explicitly be applied differently to different countries. This is an obvious difference from preferential tariff reduction. In addition, as with investment treaties, firms may be able to relocate operational headquarters to qualify for better regulatory treatment. For example, where the US recognizes EU standards, firms in other countries might then find it easier to then meet US standards themselves. For example, Switzerland is already streamlining/harmonizing its technical regulations with the EU's through a mutual recognition agreement. Therefore Switzerland might be expected to actually benefit from realized MFN spillovers. For other countries (especially low income ones) this seems less plausible to us.

a. Overview of the model

Our computational model belongs to a class of models known as computable general equilibrium (CGE) models.[16] In the model there is a single representative or composite household in each region. Household income is allocated to government, personal consumption, and savings. In each region the composite household owns endowments of the factors of production and receives income by selling the services of these factors to firms. It also receives income from tariff revenue and rents accruing from import/export quota licenses. Part of the income is distributed as subsidy payments to some sectors, primarily in agriculture.

Taxes are included at several levels in the model. Production taxes are placed on intermediate or primary inputs, or on output. Tariffs are levied at the border. Additional internal taxes are placed on domestic or imported intermediate inputs, and may be applied at differential rates that discriminate against imports. Where relevant, taxes are also placed on exports, and on primary factor income. Finally,

[16] There are strong similarities to the recent class of structurally estimated general equilibrium models. Our trade equations are parameterized econometrics reflecting the first order equilibrium conditions for the computational model. However, we do not assume that all observed deviations in actual trade from predicted trade (i.e. not explained by pairwise distance or by size of markets) results from unobserved policy-based NTBs. As such, calibrating of fitted CES weights reflects a combination of variety effects, market size effects, and also underlying NTBs and taste differences not captured in the pairwise explanatory variables included in the econometric analysis. See Francois, Manchin and Martin (2013), (Hertel, 1997), Hertel (2013), De Melo and Tarr (1992), and Francois and Shiells (1994) for more discussion on these points.

where relevant (as indicated by social accounting data) taxes are placed on final consumption, and can be applied differentially to consumption of domestic and imported goods.

On the production side, in all sectors, firms employ domestic production factors (capital, labour and land) and intermediate inputs from domestic and foreign sources to produce outputs in the most cost-efficient way that technology allows. In some sectors, perfect competition is assumed, with products from different regions modelled as imperfect substitutes based on CES preferences (known as the Armington assumption).

Manufacturing and business services are modelled with monopolistic competition. Monopolistic competition involves scale economies that are internal to each firm, depending on its own production level. An important property of the monopolistic competition model is that increased specialisation at intermediate stages of production yields returns due to specialisation, where the sector as a whole becomes more productive the broader the range of specialised inputs. In models of this type, part of the impact of policy changes in final consumption follows from changes in available choices (the variety of goods they can choose from). Similarly firms are affected by changes in available choices (varieties) of intermediate inputs. Changes in available varieties also involve changes in available foreign varieties, in addition to domestic one. As a result, changes in consumer and firm input choices will "spill-over" between countries as they trade with each other.

Tariffs and tariff revenues are explicit in the standard GTAP database, and therefore can be directly incorporated into the model used here directly from the standard database. However, NTBs affecting goods and services trade, as well as cost savings linked to trade facilitation are not explicit in the database and we need to take steps to capture these effects. Where NTBs leads to higher costs, we follow the standard approach to modelling iceberg or dead-weight trade costs in the GTAP framework.[17] In formal terms, this means we model changes in the efficiency of production for sale in specific markets. In this sense, we can capture the impact that NTBs can have in raising costs when serving foreign markets. Where NTBs instead involve higher prices because of rents, we model this as additional mark-ups (higher prices) accruing to firms. Reduction of NTBs then involves a surrendering of the associated rents. From firm and regulator surveys (see ECORYS 2009) a good rule of thumb is a 50:50 split of the AVEs for NTBs into costs and rents.

b. Specifying the experiment

With computational model in hand, the next step is specifying our policy experiments. We base these on values in Figure 3-1, Table 3-2, and Table 3-3. For goods, we assume full tariff elimination. In addition, we generally use our AVE estimates of intra-EU trade cost reductions for the EU, and deep FTA trade cost reductions for the US. There are some exceptions to this rule however. Based on our discussion of chemicals and REACH in Section 3, we use the ECORYS estimates of trade cost savings for the chemicals sector, reflecting potential for trade cost reductions hoped for by industry but not seen in existing agreements. For beverages and tobacco, we use the lower EU estimate for application to the US, both because the ECORYS estimates lumped this sector with processed foods (where protection is systematically higher) and because protection in this sector tends to be higher in lower and middle income countries (so that the deep FTA estimates most likely overstate the US situation). Similar to chemicals, for motor vehicles we again take the ECORYS estimates. These are only somewhat higher than the EU and deep FTA estimates, but again reflect an objective to go beyond existing agreements. Finally, for metals, we use the ECORYS estimates for the US. All of there decisions, of course, reflect informed judgement calls.

The situation is trickier when it comes to services. At more cynical moments when working on this paper, we have considered it plausible to argue that an

[17] The original Francois (1999, 2001) approach has grown from a specialized extension in early applications to a now standard feature of the GTAP model with its incorporation by Hertel *et al.* (2001).

agreement will be signed that includes services but where, as in past agreements, nothing actually happens in terms of market access conditions for services. This is a view consistent with the pattern of values reported in Table 3-3. However, when in a more positive mood we are more inclined to give negotiators the benefit of the doubt. There is a stated objective of improving market access in services. Yet in some sectors (distribution in the US) we already have essentially free trade, and in others we are close (communications services). Based on statements of negotiators, worries about the manoeuvring of financial institutions to undercut regulation through T-TIP, and the deep commitments already made under Basel III, we do not expect real liberalization in finance (banking and insurance) under T-TIP even with an optimistic assessment. For the other sectors, we are more agnostic. Therefore, we have opted to include 50% reduction of AVEs from Table 3-3 for the remaining sectors (excluding finance), reflecting the rough rule of thumb that half of these AVEs might be eliminated with a real, deep set of commitments on services (meaning half of these costs are actionable). In what follows we will separate services from goods, so that reflecting the occasionally more cynical mood, we can also focus on a sub-experiment that excludes services liberalization. Our experiments (the tariffs and tariff equivalents for NTBs to be eliminated) are summarized in Table 4-1.

Table 4-1 Trade cost reductions in T-TIP scenario

	AVE % cost reductions		tariffs	
	EU NTBs	US NTBs	EU tariffs	US tariffs
GOODS	7.9	7.4	2.1	1.3
Primary agriculture	74.1	79.8	3.3	2.2
Primary energy	6.1	6.1	0.0	0.1
Processed foods	26.3	25.4	15.8	5.0
Beverages and tobacco	12.2	12.2	5.9	0.8
Petrochemicals	0.0	0.0	1.8	1.6
Chemicals, Pharmaceuticals	10.2	11.4	2.1	1.3
Metals, fabricated metals	15.8	9.0	1.8	1.2
Motor vehicles	14.0	14.2	7.9	1.1
Electrical machinery	6.0	6.8	0.6	0.3
Other machinery	0.0	0.0	1.2	0.7
Other manufactures	5.2	4.6	1.7	2.9
SERVICES	9.9	6.7		
Construction	4.6	2.5		
Air transport	12.5	5.5		
Maritime	0.9	6.5		
Other Transport	14.9	0.0		
Distribution	0.7	0.0		
Communications	0.6	1.8		
Banking	0.0	0.0		
Insurance	0.0	0.0		
Professional and business	17.7	21.0		
Personal, recreational	4.4	2.5		
Public services	*	*		

Note: For construction we have started from values reported by ECORYS as the recent World Bank AVE estimates for services do not cover construction. Goods and Services aggregates are all trade weighted based on bilateral trade flows.

c. Estimated effects from T-TIP implementation

Table 4-2 summarizes our estimates of national income changes, measured as changes in real household consumption (meaning nominal household incomes by region are deflated by changes in prices), under our core T-TIP scenario. In the table, we provide a breakdown along the elements of the scenario (tariffs, goods NTBs, and services NTBs) and also across regions. For both the US and the EU, the primary action comes from goods liberalization rather than services. This is seen by comparison of columns D and E. Indeed, for goods, NTBs dominate by far the benefits of tariff reductions. In our goods only scenario (column D), the EU gains 0.91 percent in terms of annual real consumption, and the US gains roughly 0.51 percent. This is an increase in annual levels of consumption where we have essentially assumed the agreement had already been in place in 2011. Column F provides a different view. Here we use a discount function V(F), where we assume a gradual phase in, so that 10% of the change is realized in year one, 20% in year 2, etc and full realization of this change is realized by year 10. We further assume we start from an economy other wise like that in 2011, we use a discount rate of 3.5%, and we focus on 20 years of changed real income changes. On this basis, the ambitious agreement yields a stream of income gains worth a lump sum or onetime payment of 12.0 percent of GDP for the EU, and 6.2 percent for the US. Strikingly, the accumulated costs for third countries, especially for EFTA members, Turkey, and the Asia-Pacific partners of the US (the TPP grouping) is comparable, in terms of accumulated loss, to US gains. What we see therefore, from columns D, E, and F is that a classic, discriminatory approach to T-TIP could be costly for third countries.

Table 4-2 Real national income effects in core T-TIP scenario

Real income (household utility from private consumption), percent change

	A	B	C	D=A+B	E=A+B+C	F=V(E)
	tariffs	NTBs goods	NTBs services	total goods only liberalization	total goods and services liberalization	discounted lumpsum equivalent
European Union	0.10	0.86	0.17	0.96	1.14	12.03
United States	0.10	0.41	0.08	0.51	0.59	6.21
EFTA	-0.12	-0.50	-0.01	-0.62	-0.63	-6.66
Turkey	-0.19	-0.34	-0.01	-0.52	-0.53	-5.61
Other Europe	-0.01	-0.06	0.00	-0.06	-0.06	-0.67
Mediterranean	-0.01	-0.05	0.00	-0.06	-0.06	-0.58
Japan	-0.03	-0.12	0.00	-0.15	-0.15	-1.60
China	-0.03	-0.05	0.00	-0.08	-0.08	-0.82
Other TPP countries	-0.10	-0.45	0.00	-0.55	-0.55	-5.82
Other Asia	-0.01	-0.07	-0.01	-0.08	-0.08	-0.90
Other Middle Income	-0.01	-0.03	0.00	-0.04	-0.04	-0.45
Low Income	0.02	0.09	0.01	0.11	0.11	1.18

Source: CGE estimates. Note discounting V(E) function assumes 20 year horizon and 3.5% discount rate, with phased 10 year implementation to reach full effects in column E.

As noted in the introduction to this section, there are expectations of possible trade cost reductions for third countries. These are collectively referred to as "regulatory convergence spillovers" or "NTB reduction spillovers." To repeat the logic we discussed earlier, if the US and the EU launch a process of regulatory streamlining and mutual recognition, *and if* this process proves to be relatively non-discriminatory, there may be ancillary benefits to third countries. In effect, it may become easier to access to the combined EU-US market, in terms of regulatory barriers, than it was for the two distinct markets. Apart from informal discussion with industry and negotiators, where firms do seem to believe such potential benefits are lurking in the shadows, we have little basis for knowing exactly how large such spillovers might be. Even so, in Table 4-3 we report estimated impacts of such spillovers. What we have done, starting from the results reported in Table 4-2, is to further assume that 20% of the NTB cost reductions realized by US firms accessing the EU, and EU firms accessing the US, also accrue to third countries accessing those same markets.

Table 4-3 Real national income effects from spillovers

Real income (household utility from private consumption), percent change

	F	G	H=E+F+G	I=*V*(H)
	Spillovers to high income	Spillovers to middle and low income	total inclusive of spillovers	discounted, lumpsum equivalent
European Union	0.07	0.32	1.53	16.23
United States	0.13	0.16	0.88	9.29
EFTA	1.25	-0.09	0.53	5.62
Turkey	0.94	-0.01	0.40	4.19
Other Europe	0.46	-0.10	0.29	3.12
Mediterranean	-0.09	0.41	0.27	2.85
Japan	0.26	-0.01	0.10	1.07
China	-0.04	0.34	0.22	2.30
Other TPP countries	0.99	-0.04	0.40	4.26
Other Asia	-0.06	0.24	0.10	1.04
Other Middle Income	-0.02	0.11	0.05	0.50
Low Income	-0.18	0.07	0.01	0.09

Source: CGE estimates. Note discounting *V*(H) function assumes 20 year horizon and 3.5% discount rate, with phased 10 year implementation to reach full effects in column H.

Comparison of column F in Table 4-2 with column I in Table 4-3 illustrates a relatively important point. The form that mutual recognition of standards and regulatory cooperation might take under T-TIP is rather central to the whole affair. With some NTB harmonization between the EU and US leading to an effective reduction in costs for third countries, benefits might, potentially, then be expected for third countries, especially upper and middle-income countries. This is one possible negotiation path, and if followed also yields the highest gains for the US and EU as well. However, it certainly is not the only path, and indeed a more protectionist approach might be more responsive to lobbying interests. Under such an alternative approach, if the solution for negotiated reduction of differences in regulatory systems is to establish some sort of deliberately discriminatory country of origin based mutual recognition mechanism for conformity assessments under divergent national regulations, third country exporters would then be worse off. The official narrative assumes that such spillover benefits will be realized. The magnitudes involved suggest that regardless of assumptions, it is in the interest of third countries to be rather aggressive in ensuring that non-tariff aspects of T-TIP actually are not structured to be deliberately exclusive and discriminatory.

5. Final caveats: adjustment costs matter

An issue of considerable significance that we are not able to address in this paper is the transition between equilibria (i.e. the short-run adjustment to our trade policy shock). Trade economists are well aware that, in standard competitive models, the main source of long-run gain from trade is specialization and that (loosely speaking) the only way to secure large gains from trade is for policy to induce large adjustments in production structure (Ethier, 2009). This of course implies that, in standard competitive models, policies changes associated with large gains from trade will also be associated with potentially large transitional costs (mostly in the form of unemployment, forgone wages, and mobility costs—including such things as loss of asset value from housing). While there is not a lot of research on this queston, the best efforts suggest that the costs are non-trivial. For example, Jacobson, LaLonde and Sullivan (Jacobson *et al.*, 1993a, b) estimate that an average displaed worker loses $80,000 in lifetime earnings and Kletzer (2001) estimates that the average displaced worker suffers a 13% pay cut as a result of trade displacement.[18] We have already noted that research on intraindustry trade suggests that these costs may be mitigated when similar countries (i.e. the US and the EU) liberalize due to the major role of, presumptively less disruptive, intraindustry trade. Unfortunately, more recent theoretical and empirical work on trade with heterogeneous firms qualifies this last presumption, making this an issue of some concern when evaluating the effects of a major exercise in liberalization like the T-TIP.

In the standard model (as well as in models of monopolistic competition), firms are presumed to be identical. Recent empirical research suggests that this assumption is dramatically falsified (Bernard *et al.*, 2007, 2012). Starting with Melitz (2003), a sizable body of theory and empirical research has developed based on the insight that firms are heterogeneous and studying how that heterogeneity interacts with international trade (Melitz and Redding, 2015, Redding, 2011). In fact, this leads to an interesting form of complexity: on the

[18] Davidson and Matusz (2004) is a convenient summary of results in this area, while Davidson and Matusz (2010) collects the authors' important work extending standard models to incorporate unemployment.

one hand, heterogeneous firm models provide an additional source of gains from trade as more efficient firms displace less efficient firms, thus raising productivity (Melitz and Redding, 2013, Melitz and Trefler, 2012); on the other, the firm-level adjustment means that there is explicit attention to short-run adjustment on the firm margin that is associated with at least transitional unemployment as (within sector) inefficient firms close and efficient firms expand. A number of recent papers have analysed adjustment to a shock which is quite relevant to the T-TIP case—the US-Canda free trade agreement (and its extension via NAFTA). Starting especially with Trefler (2004) and applying firm-level data, these papers have examined the effect of integration with the US on Canada (e.g. Baggs, 2005, Baggs and Brander, 2006, Breinlich and Cuñat, 2010, LaRochelle-Côté, 2007, Lileeva, 2008, Lileeva and Trefler, 2010). The main result here is that, in the short run relatively inefficient firms exit, creating unemployment; but in the long run productivity rises and unemployed workers are absorbed. Note well that this is precisely in the context of models of the Krugman sort (except with heterogeneous firms). That is, even though rationalization may dominate intersectoral adjustment, the within sector, short-run effects will still be negative and, potentially, substantially negative. From a political perspective, the short-run negative effects may be every bit as significant as the long-run efficiency effects. Countries with well-functioning welfare states should find it easier to liberalize in the face of such shocks than countries that lack such institutions.

APPENDIX – gravity estimates of NTB cost reductions

Empirical model outline

In this appendix, we describe the basic procedure to control for endogeneity in selection into trade agreements. For the gravity estimates reported in Section 3 of the paper, we follow Santos Silva and Tenreyro (2006) and Egger, Larch, Staub and Winkelmann (2011) in employing a generalized-linear exponential-family model for estimating gravity models. One merit of such models is that, unlike ordinary least squares on the log-transformed model, they obtain consistent parameters in the presence of heteroskedasticity even if it is unknown whether the disturbance term is log-additive or level-additive. Furthermore, in line with Terza (1998, 2009), (Greene, 2002), Greene (2012), Terza *et al.* (2008), and Egger, Larch, Staub and Winkelmann (2011), we apply a control-function approach which, under a set of assumptions summarized below, is capable of absorbing the endogeneity problem and obtaining consistent parameter estimates, including the partial treatment effects of interest.

Formally, we employ imports of country *j* from country *i*, X_{ij}, as the dependent variable and specify it as an exponential function of a linear index of the form

(A1) $X_{ij} = \exp(d_{ij}a_d + t_{ij}a_t + e_i + m_j + c(z_{ij}))u_{ij}$

where d_{ij} is a PTA-depth measure (a scalar or a vector, depending on the specification), t_{ij} is a vector of observable (log) trade-cost measures (such as log distance, ….), $(a_d', a_t')'$ is a conformable parameter vector, $\{e_i, m_j\}$re catch-all measures of exporter- and importer-specific factors (estimated as parameters on i-specific and j-specific binary indicator variables, respectively. Moreover,

(A2) $c(z_{ij}) = h_{ij}a_h = (h_{1,ij}, \dots, h_{D,ij})a_h$,

is a control function which is derived from the assumption of multivariate normality of the disturbances between the processes of selecting into depth δ=1,…,D and the stochastic term about X_{ij}. The application here represents an innovation on the existing literature, which generally focuses on binary selection in the case of trade agreements.

The control function absorbs the potential endogeneity bias (i.e., the correlation of d_{ij} with the disturbances). After introducing a binary indicator variable $1[d_{ij} = \delta]$ which is one if the statement in square brackets is true and zero else, the elements $h_{\delta,ij}$ for δ=1,…,D are defined as follows.

(A3) $h_{\delta,ij} = \frac{\phi(z_{ij}a_{\delta,z})(1-1[d_{ij}=\delta]\Phi(z_{ij}a_{\delta,z}))}{\Phi(z_{ij}a_{\delta,z})}$

These are referred to as inverse Mills' ratios (for $d_{ij} = \delta$) in the literature (see, e.g. Wooldridge, 2010). They depend on the density, $\phi(z_{ij}a_{\delta,z})$, and the cumulative distribution function, $\Phi(z_{ij}a_{\delta,z})$, which, in a reduced form, depends on common observable characteristics, z_{ij}, and the depth-specific parameter vector $a_{\delta,z}$.

Notice that the assumption about multivariate normality is specific here, since selection into states δ is mutually exclusive (a country-pair can only apply a single level of depth δ of an agreement). This means that we can think of the variance-covariance matrix for each country-pair *ij* where we order the data such that the terms for the *D* latent variables generating $h_{\delta,ij}$ appear at the top and the stochastic term for X_{ij} appears at the bottom. Apart from diagonal elements throughout, this matrix would then contain only non-zero elements in the bottom row and the right column.

A somewhat different approach to the control function could be based on an ordered probit model about $d_{ij} = \delta$ rather than individual probit models for each state δ. This approach would be somewhat more parsimonious in terms of the number of parameters to be estimated. In contrast to the aforementioned approach, this procedure would be based on δ-specific elements $h_{\delta,ij}$ for δ=1,…,D which are defined as

(A4) $$h_{\delta,ij} = \frac{\phi(\mu_{\delta-1} - z_{ij}a_z) - \phi(\mu_{\delta} - z_{ij}a_z)}{\Phi(\mu_{\delta} - z_{ij}a_{\delta,z}) - \Phi(\mu_{\delta-1} - z_{ij}a_{\delta,z})}$$

Notice that $\mu_{\delta-1}$ and μ_{δ} are depth-specific, implicitly-determined threshold values which determine whether country-pair *ij* is in regime $\delta - 1$ versus δ. Hence, in contrast to $h_{\delta,ij}$ estimated from individual probit models as in (A3) above and say *DK* parameters (where *K* is the number of parameters per probit equation), their counterparts in (A4) are estimated based on only *D+K-1* parameters (where the *K-1* are the parameters on $\{\mu_1, \dots, \mu_D\}$, excluding μ_0, which is part of the *D* parameters in the base model).

Basic assumptions

The control-function approach outlined above rests on three basic assumptions. First, that the disturbances of the latent variables determining selection into a particular depth of trade agreements and the outcome equation (for X_{ij}) are multivariate normal, whereby the stochastic terms for each country-pair ij are drawn independently from but identically to those of other pairs. In the present case, they are bivariate normal for each and every level of depth, δ. Second, the universe of instruments collected in z_{ij} (which includes all determinants of the outcome model except for the elements in h_{ij} and some additional identifying regressors, see Cameron and Trivedi (2005)) should be independent of the multivariate error terms (i.e., the instruments should be exogenous). Third and finally, the variances of the latent processes determining selection-into-agreement-depth are normalized to unity.

Reference

Baggs, Jen**.** (2005). “Firm Survival and Exit in Response to Trade Liberalization.” *Canadian Journal of Economics/Revue canadienne d'économique*, V.38-#4, 1364-83.

Baggs, Jen and James A. Brander**.** (2006). “Trade Liberalization, Profitability, and Financial Leverage.” *Journal of International Business Studies*, V.37-#2, 196.

Balassa, Bela**.** (1966). “Tariff Reductions and Trade in Manufacturers among the Industrial Countries.” *The American Economic Review*, V.56-#3, 466-73.

Bernard, Andrew B.; J. Bradford Jensen; Stephen J. Redding and Peter K. Schott**.** (2007). “Firms in International Trade.” *Journal of Economic Perspectives*, V.21-#3, 105-30.

____**.** (2012). “The Empirics of Firm Heterogeneity and International Trade.” *Annual Review of Economics*, V.4, 283-313.

Borchert, Ingo; Batshur Gootiiz and Aaditya Mattoo (2011). “Services in Doha: What’s on the Table,” in W. Martin and A. Mattoo eds, *Unfinished Business? The Wto’s Doha Agenda.* Washington, DC: World Bank/CEPR, 115-43.

____**.** (2014). “Policy Barriers to International Trade in Services: Evidence from a New Database.” *The World Bank Economic Review*, V.28-#1, 162-88.

Breinlich, Holger and Alejandro Cuñat (2010). “Trade Liberalization and Heterogeneous Firm Models: An Evaluation Using the Canada-US Free Trade Agreement,” *CEPR Discussion Paper*, #DP7668.

Broda, Christian and David Weinstein**.** (2006). “Globalization and the Gains from Variety.” *Quarterly Journal of Economics*, V.121-#2, 541-85.

Brülhart, Marius (2002). “Marginal Intra-Industry Trade: Towards a Measure of Non-Disruptive Trade Expansion,” in P. J. Lloyd and H.-H. Lee eds, *Frontiers of Research on Intraindustry Trade, Basingstoke, Palgrave-Macmillan.* New York: Palgrave Macmillan, 109-30.

Cameron, Adrian Colin and P. K. Trivedi (2005). *Microeconometrics: Methods and Applications*. Cambridge ; New York: Cambridge University Press.

CEPR (2013). "Reducing Transatlantic Barriers to Trade and Investment: An Economic Assessment," Report prepared by J.F. Francois, M. Manchin, H. Norberg, O. Pindyuk, and P. Tomberger, under implementing Framework Contract TRADE10/A2/A16.

Clark, J. (2014). "European Carmakers Oppose EU-Japan Trade Deal," *Automotive News Europe* (May), http://europe.autonews.com/article/20140509/ANE/140509806/european-carmakers-oppose-eu-japan-trade-deal.

Davidson, Carl and Steven Matusz (2004). *International Trade and Labor Markets: Theory, Evidence, and Policy Implications*. Kalamazoo: W.E. Upjohn Institute.

____ (2010). *International Trade with Equilibrium Unemployment*. Princeton: Princeton University Press.

De Benedictis, Luca and Lucia Tajoli**.** (2011). “The World Trade Network.” *The World Economy*, V.34-#8, 1417-54.

De Melo, Jaime and David G. Tarr (1992). *A General Equilibrium Analysis of US Foreign Trade Policy*. Cambridge, Mass.: MIT Press.

Dixon, Peter B. and Jayant Menon**.** (1997). “Measures of Intra-Industry Trade as Indicators of Factor Market Disruption*.” *Economic Record*, V.73-#222, 233-47.

Dür, Andreas; Manfred Elsig and Karolina Milewicz**.** (2014). “The Design of International Trade Agreements: Introducing a New Database.” *Review of International Organizations*, V.Forthcoming.

ECORYS (2009). "Non-Tariff Measures in EU-US Trade and Investment – an Economic Analysis’, ," Report prepared for European Commission (Directorate-General for Trade), Reference: OJ 2007/S 180-219493.

Egger, Peter; Mario Larch; Kevin E. Staub and Rainer Winkelmann**.** (2011). “The Trade Effects of Endogenous Preferential Trade Agreements.” *American Economic Journal: Economic Policy*, V.3-#3, 113-43.

Ethier, Wilfred J**.** (2009). “The Greater the Differences, the Greater the Gains?” *Trade and Development Review*, V.2-#2, 70-78.

Ethier, Wilfred J. (1982). “National and International Returns to Scale in the Modern Theory of International Trade.” *American Economic Review*, V.72-#3, 389-405.

____**.** (1998). “Regionalism in a Multilateral World.” *Journal of Political Economy*, V.106-#6, 1214-45.

____**.** (2001). “The New Regionalism in the Americas: A Theoretical Framework.” *North American Journal of Economics and Finance*, V.12-#2, 159-72.

European_Commission_and_the_Government_of_Canada (2009). "Assessing the Costs and Benefits of a Closer EU-Canada Economic Partnership," joint report, Brussels and Ottawa.

Francois, Joseph F. (1999). "Economic Effects of a New WTO Agreement under the Millennium Round," report to the European Commission Trade Directorate.

____ (2001). "The Next WTO Round: North-South Stakes in New Market Access Negotiations," Centre for International Economic Studies Adelaide, ISBN 0-86396 474-5.

Francois, Joseph F. and Bernard Hoekman**.** (2010). “Services Trade and Policy.” *Journal of Economic Literature*, V.48-#3, 642-92.

Francois, Joseph F.; Miriam Manchin and Will Martin (2013). “Market Structure in Multisector General Equilibrium Models of Open Economies,” in B. D. Peter and W. J. Dale eds, *Handbook of Computable General Equilibrium Modeling.* Elsevier, 1571-600.

Francois, Joseph F.; Bradley McDonald and Hakan Nordstrom (1997). “Capital Accumulation in Applied Trade Models,” in J. Francois and K. A. Reinert eds, *Applied Methods for Trade Policy Analysis.* Cambridge: Cambridge University Press, 364-82.

Francois, Joseph F. and Hugo Rojas-Romagosa (2014). “Melting Ice Caps and the Economic Impact of Opening the Northern Sea Route,” .” *World Trade Institute NCCR working paper*, #NA.

Francois, Joseph F. and Clinton R. Shiells (1994). *Modeling Trade Policy: Applied General Equilibrium Assessments of North American Free Trade*. New York: Cambridge University Press.

Francois, Joseph F.; Hans Van Meijl and Frank Van Tongeren**.** (2005). “Trade Liberalization in the Doha Development Round.” *Economic Policy*, V.20-#42, 349-91.

Freedman, David H. (2010). “Why Scientific Studies Are So Often Wrong: The Streetlight Effect,” Discover Magazine (July-August):26. .” *Discover Magazine*, V.July-August, 28.

Gollier, Christian; Bruno Jullien and Nicolas Treich**.** (2000). “Scientific Progress and Irreversibility: An Economic Interpretation of the ‘Precautionary Principle’.” *Journal of Public Economics*, V.75-#2, 229-53.

Greene, William (2002). *Limdep Version 8.0 Econometric Modeling Guide, Volume 2*. Plainview, NY: Econometric Software.

____ (2012). *Econometric Analysis*. New Jersey: Prentice Hall.

Grossman, Gene M. and Elhanan Helpman**.** (1995a). “The Politics of Free-Trade Agreements.” *American Economic Review*, V.85-#4, 667-90.

____. (1995b). "Trade Wars and Trade Talks." *Journal of Political Economy*, V.103-#4, 675-708.

Hertel, Thomas W. (1997). *Global Trade Analysis: Modeling and Applications*. New York: Cambridge University Press.

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

Hertel, Thomas W.; Terrie L. Walmsley and Ken Itakura**.** (2001). "Dynamic Effects of the" New Age" Free Trade Agreement between Japan and Singapore." Journal of Economic Integration 16.4: 446-484." *Journal of Economic Integration*, V.16-#4, 446-84.

Huntington, Samuel (2005). *Who Are We?: The Challenges to America's National Identity*. New York: Simon & Schuster.

Jacobson, Louis S.; Robert J. Lalonde and Daniel G. Sullivan (1993a). *The Costs of Worker Dislocation*. Kalamazoo, Mich.: W.E. Upjohn Institute of Employment Research.

____. (1993b). "Earnings Losses of Displaced Workers." *American Economic Review*, V.83-#4, 685-709.

Jafari, Yaghoob (2014). "Foreign Discriminatory Barriers to Services Providers and Estimates of the Ad Valorem Equivalents (Aves) of the Regulatory Barriers in the 11 Services Sectors for 103 Countries," *World Bank Staff working paper*,

Johnson, Simon and Jeffrey J Schott (2013). "Financial Services in the Transatlantic Trade and Investment Partnership," *Peterson Institute for International Economics, Policy Brief*, #13-26.

Kletzer, Lori (2001). *Job Loss from Imports: Measuring the Costs*. Washington, DC: Institute for International Economics.

Krishna, Pravin**.** (1998). "Regionalism and Multilateralism: A Political Economy Approach." *Quarterly Journal of Economics*, V.113-#1, 227-51.

LaRochelle-Côté, Sébastien**.** (2007). "Tariff Reduction and Employment in Canadian Manufacturing
Réductions Tarifaires Et Emploi Dans Le Secteur Canadien De La Fabrication." *Canadian Journal of Economics/Revue canadienne d'économique*, V.40-#3, 843-60.

Levy, Philip I. (1997). "A Political-Economic Analysis of Free-Trade Agreements." *American Economic Review*, V.87-#4, 506-19.

Lileeva, Alla**.** (2008). "Trade Liberalization and Productivity Dynamics: Evidence from Canada." *Canadian Journal of Economics*, V.41-#2, 360-90.

Lileeva, Alla and Daniel Trefler**.** (2010). "Improved Access to Foreign Markets Raises Plant-Level Productivity…for Some Plants." *The Quarterly Journal of Economics*, V.125-#3, 1051-99.

Lovely, Mary E. and Douglas R. Nelson**.** (2000). "Marginal Intraindustry Trade and Labor Adjustment." *Review of International Economics*, V.8-#3, 436-47.

____**.** (2002). "Intra-Industry Trade as an Indicator of Labor Market Adjustment." *Weltwirtschaftliches Archiv-Review of World Economics*, V.138-#2, 179-206.

Mayer, Thierry and Soledad Zignago (2011). "Notes on Cepii's Distances Measures: The Geodist Database," *No. 2011-25*, #2011-25.

Melitz, Marc J. (2003). "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica*, V.71-#6, 1695-725.

Melitz, Marc J. and Stephen Redding (2013). "New Trade Models, New Welfare Implications," *NBER Working Paper*, #18919.

Melitz, Marc J. and Stephen J. Redding (2015). " Heterogeneous Firms and Trade," in E. Helpman, K. S. Rogoff and G. Gopinath eds, *Handbook of International Economics.* Elsevier, 1-54.

Melitz, Marc J. and Daniel Trefler**.** (2012). "Gains from Trade When Firms Matter." *The Journal of Economic Perspectives*, V.26-#2, 91-118.

Menon, Jayant and PeterB Dixon**.** (1997). "Intra-Industry Versus Inter-Industry Trade: Relevance for Adjustment Costs." *Weltwirtschaftliches Archiv*, V.133-#1, 164-69.

Ornelas, Emanuel**.** (2005a). "Endogenous Free Trade Agreements and the Multilateral Trading System." *Journal of International Economics*, V.67-#2, 471-97.

____**.** (2005b). "Trade Creating Free Trade Areas and the Undermining of Multilateralism." *European Economic Review*, V.49-#7, 1717-35.

____**.** (2008). "Feasible Multilateralism and the Effects of Regionalism." *Journal of International Economics*, V.74-#1, 202-24.

Ramsey, M. (2012). "Europe Auto Makers Seek to Revise Korea Trade Deal," *Wall Street Journal* (May), http://online.wsj.com/news/articles/SB100014240527023047437045777379660009987348.

Redding, Stephen J. (2011). "Theories of Heterogeneous Firms and Trade." *Annual Review of Economics*, V.3, 77-105.

Roy, Martin (2011). "Services Commitments in Preferential Trade Agreements: An Expanded Dataset," *WTO Staff Working Paper*, #ERSD-2011-18.

Santos Silva, J.M.C. and Silvana Tenreyro**.** (2006). "The Log of Gravity." *Review of Economics and Statistics*, V.88-#4, 641-58.

Sunstein, Cass R (2005). *Laws of Fear: Beyond the Precautionary Principle*. New York: Cambridge University Press.

Teorell, Jan; Carl Dahlström and Stefan Dahlberg (2011). "The QoG Expert Survey Dataset," University of Gothenburg: The Quality of Government Institute.

Terza, Joseph V. (1998). "Estimating Count Data Models with Endogenous Switching: Sample Selection and Endogenous Treatment Effects." *Journal of Econometrics*, V.84-#1, 129-54.

____**.** (2009). "Parametric Nonlinear Regression with Endogenous Switching." *Econometric Reviews*, V.28-#6, 555-80.

Terza, Joseph V.; Anirban Basu and Paul J. Rathouz**.** (2008). "Two-Stage Residual Inclusion Estimation: Addressing Endogeneity in Health Econometric Modeling." *Journal of Health Economics*, V.27-#3, 531-43.

Trefler, Daniel**.** (2004). "The Long and Short of the Canada-U. S. Free Trade Agreement." *American Economic Review*, V.94-#4, 870-95.

Wooldridge, Jeffrey M. (2010). *Econometric Analysis of Cross Section and Panel Data*. Cambridge, Mass.: MIT Press.