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Eddy Bekkers and Hugo Rojas-Romagosa

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Abstract[*]

The reduction of non-tariff measures (NTMs) has become the key policy variable to evaluate modern and deep free trade agreements (FTAs), such as the Transatlantic Trade and Investment Partnership (TTIP). In this chapter we overview the two main approaches to estimating NTM reductions associated with the implementation of FTAs. We then detail how these reductions are estimated in different impact assessment studies of TTIP, we compare and analyse the main differences in these estimations and how they affect the overall economic impact of TTIP. We find that accounting for differences in the expected NTM reductions can explain a large share of the discrepancies regarding the overall potential economic effects between different impact assessments of TTIP.

Keywords

Non-tariff measures, trade cost estimations, gravity models, CGE models, quantitative trade models, Transatlantic Trade and Investment Partnership

[*] The opinions expressed in this article should be attributed to its author. They are not meant to represent the positions or opinions of the WTO and its members and are without prejudice to Members' rights and obligations under the WTO. Any errors are attributable to the authors.

1 Introduction

Many recent free trade agreements (FTAs) are deep or comprehensive agreements that contain a large number of provisions on non-tariff measures (NTMs). This contrasts with the traditional shallow trade agreements that focused mainly on tariff reductions. Therefore, one the main tasks of trade economists asked to predict the welfare effects of deep FTAs is to translate the NTM-provisions into overall welfare effects. This can be achieved in two steps. First, the particular NTM-provisions need to be translated into trade cost reductions, and second, welfare effects of the trade cost reductions are calculated with a general equilibrium model.

In this chapter we provide a detailed overview of the different approaches to calculate the trade cost reductions of NTM-provisions in FTAs and their associated welfare effects. Moreover, we focus our analysis on different impact assessment studies over the Transatlantic Trade and Investment Partnership (TTIP) between the US and the EU. In the different studies three types of reductions in trade costs are identified: first, a reduction or full elimination of tariffs; second, a reduction in NTMs between the EU and the US; and third, a reduction in NTMs between the EU and the US with third countries as a result of regulatory harmonisation –the so-called spillover effects.

We distinguish between the two main approaches to calculate the reductions in NTMs: the bottom-up approach and the top-down approach. The bottom-up approach identifies the NTMs already in place between FTA partners and specifies scenarios for the expected trade cost reductions associated with this specific FTA. The top-down approach estimates the trade cost reductions from past FTAs, imposing that the expected trade cost reductions of the specific FTA in case, will be similar as in comparable agreements from the past. In general, most studies use the concept of ad valorem equivalent (AVE) of an NTM, which is the equivalent ad valorem trade cost for a particular NTM. Some studies allow for differences in expected overall AVE trade cost reductions conditional on the depth level of the agreement. Some studies account separately for the reductions in tariffs and NTMs, whereas other studies do not explicitly model tariffs, calculating the expected overall AVE trade costs reductions associated with TTIP without distinguishing between tariffs and NTMs.

We start this chapter with an outline of the different approaches to the estimation of trade cost reductions associated with NTM provisions in FTAs in Section 2. Then we introduce the different TTIP impact assessment studies in Section 3, while in Section 4 we compare the predicted trade cost reductions for all studies. In Section 5 we then explore the impact of trade cost reductions on predicted welfare effects, the influence of the employed trade elasticities and we discuss the sensitivity of the results to different modelling assumptions. We conclude in Section 6.

2 Calculating NTM reductions associated with FTAs

Since tariff levels are low for many countries negotiating deep FTAs like TPP, TTIP and CETA, the largest impact in these agreements will come from changes in NTMs. Thus, the proper estimation of expected trade cost reductions associated with provisions on NTMs has become a critical element for assessing the potential economic impacts of modern FTAs. To determine the welfare effects of deep FTAs with provisions on NTMs, researchers first have to calculate the associated reductions in trade costs. In this section we explain the two approaches to map the NTM provisions into associated reductions in trade costs. Before discussing the two approaches to calculating the trade cost reductions, we first point out how NTMs are modelled as trade costs.

2.1 Modelling trade costs caused by NTMs

The typical approach in the literature is to assume that NTMs generate resource-dissipating costs. Firms have to spend resources -i.e. time, working hours, financial resources– to comply with differences in national regulations and with barriers to trade. Such resource-dissipating costs are modelled in international trade using the concept of iceberg trade costs, where a fraction of goods "melts away" in transit from one country to another, and this fraction corresponds with the resources used or dissipated to deal with the particular NTM.

More formally, denoting iceberg trade costs for goods exported from i to j as τ_{ij}, means that τ_{ij} units have to be exported by country i to deliver one unit in country of destination j. Hence, $\tau_{ij} - 1$ units are lost or "melted away" when transporting the good. The implication is that the cost of selling a good from i to j is given by $\tau_{ij} c_i$, where c_i is the marginal cost of production in exporter i.

We define iceberg trade costs without any NTMs in place as $\tau_{ij}^{noNTM} = 1 + C_{ij}$, where C_{ij} encompasses all trade costs except for tariffs and non-tariff measures, such as international transport costs and other costs related to distance, language, and other barriers to trade. Iceberg trade costs inclusive of an NTM are defined as $\tau_{ij}^{NTM} = (1 + C_{ij})(1 + AVE_{ij}^{NTM})$, where AVE_{ij}^{NTM} is the ad valorem equivalent of an NTM, a concept often used to express the size of trade costs associated with an NTM. The AVE of an NTM is defined as the percentage increase in trade costs because of the NTM being present:

$$AVE_{ij}^{NTM} = \frac{\tau_{ij}^{NTM}}{\tau_{ij}^{noNTM}} - 1 \tag{1}$$

To calculate the AVE of an NTM, the empirical literature has employed two methods (Berden and Francois, 2015). First, the price-based method relates the price difference between countries to NTMs, controlling for other observable variables and fixed effects. Second, the value-based method estimates a gravity equation relating the value of trade between countries to NTMs, controlling again for other observable variables and fixed effects. Since all studies on TTIP discussed in this chapter employ value-based methods, we explain how the iceberg trade costs associated with an NTM, τ_{ij}^{NTM}, can be calculated with this method.

Starting with a generic theoretical gravity equation, the bilateral trade value between country i and j inclusive of bilateral tariffs, V_{ij}, can be expressed as follows:[1]

$$V_{ij} = \frac{\left((1 + t_{ij})\,\tau_{ij}\right)^{-\theta} Y_i E_j}{\Pi_i \Omega_j} \tag{2}$$

where t_{ij} is the ad-valorem tariff rate, Y_i the total output of exporter i, E_j is total expenditures in country j, θ is the trade elasticity, and Π_i and Ω_j are the outward and inward multilateral resistance terms, respectively. The outward term denotes the attractiveness for exporter i to export to other destinations, and the inward term expresses the attractiveness for importer j to import from other sources. Failure to control for multilateral resistance leads to omitted variable bias (cf. Yotov et al., 2016).

From the theoretical formulation in Equation (2), the empirical gravity specification can be written as:

$$V_{ij} = \exp\left(\beta' C_{ij} - \theta \ln(1 + t_{ij}) + \gamma_c \ln NTM_{ij}^c + \gamma_d NTM_{ij}^d + \eta_i + \nu_j\right) \varepsilon_{ij} \tag{3}$$

NTMs can consist of both continuous variables, NTM_{ij}^c, which are included in logs in the estimation and discrete variables, NTM_{ij}^d, which are included in levels. C_{ij} is captured by the standard gravity bilateral variables affecting the value of trade (e.g. distance, tariffs, common border, common language and colonial past). η_i and ν_j are the exporter and importer fixed effects and ε_{ij} is an error term.

Comparing Equations (2) and (3), we see that iceberg trade costs can be written as $\tau_{ij} = \exp\left(-\frac{\beta' C_{ij} + \gamma_c \ln NTM_{ij} + \gamma_d NTM_{ij}}{\theta}\right)$.[2] We can now define the AVE of an NTM –i.e. the percentage change in iceberg trade costs as a result of the presence of this NTM– for both continuous and discrete variables. For continuous variables the AVE of an NTM is defined as the percentage change in iceberg trade costs as a result of increasing the NTM-variable by 1%:

$$AVE_{ij}^{NTM^c} = \frac{d \ln \tau_{ij}}{d \ln NTM_{ij}^c} \tag{4}$$

If the NTM_{ij} is a dummy variable, the associated AVE is defined as the change in iceberg trade costs by switching the value of the NTM-dummy (NTM_{ij}) from 0 to 1:

$$AVE_{ij}^{NTM^d} = \frac{\tau_{ij}\Big|NTM_{ij}^d = 1 - \tau_{ij}\Big|NTM_{ij}^d = 0}{\tau_{ij}\Big|NTM_{ij}^d = 0} \tag{5}$$

[1] As shown by Head and Mayer (2014) many theoretical trade models can be expresses using this generic gravity equation.

[2] When running simulations the importer and exporter fixed effects in the theoretical gravity equations will change as a result of changing the values of the NTM variable, but this does not affect the calculation of the change in iceberg trade costs as a result of the NTM.

We can determine the two AVEs by combining the theoretical gravity equation in (2) with the empirical gravity equation in (3). This gives:

$$\frac{d\ln V_{ij}}{d\ln NTM_{ij}^{c}} = \frac{d\ln V_{ij}}{d\ln \tau_{ij}}\frac{d\ln \tau_{ij}}{d\ln NTM_{ij}^{c}} \tag{6}$$

$$\frac{V_{ij}\left|NTM_{ij}^{d}=1\right.}{V_{ij}\left|NTM_{ij}^{d}=0\right.} - 1 = \left(\frac{\tau_{ij}\left|NTM_{ij}^{d}=1\right.}{\tau_{ij}\left|NTM_{ij}^{d}=0\right.}\right)^{-\theta} = \exp\left(\gamma_{d}\right) \tag{7}$$

The expressions for the AVEs as defined in equations (4)-(5) can now easily be written as follows:

$$AVE_{ij}^{NTM^{c}} = -\frac{\gamma_{c}}{\theta} \tag{8}$$

$$AVE_{ij}^{NTM^{d}} = \exp\left(-\frac{\gamma_{d}}{\theta}\right) - 1 \tag{9}$$

Equation (3) shows that the coefficient on tariffs can be employed to identify the trade elasticity θ, used in the counterfactual experiments. This procedure is followed in some of the TTIP studies (Francois et al., 2013; Egger et al., 2015; Aichele et al., 2014).

Of course equation (8) is an approximation which becomes increasingly poor when the change in the continuous NTM-measure (entered in logs in the gravity equation) becomes large. In that case we can better use the exact expression for the change in the NTM-measure of a continuous measure, from the old to the new level, so from $NTM_{ij}^{c,0}$ to $NTM_{ij}^{c,1}$ and denoted by $AVE_{ij}^{\Delta NTM^{c}}$. For completeness we also define the AVE associated with the change in a discrete variable (entered in levels in the gravity equation) from $NTM_{ij}^{d,0}$ to $NTM_{ij}^{d,1}$, $AVE_{ij}^{\Delta NTM^{d}}$:

$$AVE_{ij}^{\Delta NTM^{c}} = \frac{\tau_{ij}\left|NTM_{ij}^{c}=NTM_{ij}^{c,1}\right.}{\tau_{ij}\left|NTM_{ij}^{c}=NTM_{ij}^{c,0}\right.} - 1 = \exp\left(-\frac{\gamma^{c}\ln\frac{NTM_{ij}^{c,1}}{NTM_{ij}^{c,0}}}{\theta}\right) - 1 = \left(\frac{NTM_{ij}^{c,1}}{NTM_{ij}^{c,0}}\right)^{\frac{\gamma_{c}}{\theta}} - 1 \tag{10}$$

$$AVE_{ij}^{\Delta NTM^{d}} = \frac{\tau_{ij}\left|NTM_{ij}^{d}=NTM_{ij}^{d,1}\right.}{\tau_{ij}\left|NTM_{ij}^{d}=NTM_{ij}^{d,0}\right.} - 1 = \frac{\exp\left(-\frac{\gamma^{d}NTM_{ij}^{d,1}}{\theta}\right)}{\exp\left(-\frac{\gamma^{d}NTM_{ij}^{d,0}}{\theta}\right)} - 1 \tag{11}$$

Some studies calculate the percentage change in iceberg trade costs using an approximation. The relative change in the value of trade as a result of changing a zero/one variable like NTM is written as follows:[3]

$$\frac{\partial\ln V_{ij}}{\partial NTM_{ij}^{d}} = \frac{\partial\ln V_{ij}}{\partial\ln \tau_{ij}}\frac{\partial\ln \tau_{ij}}{\partial NTM_{ij}^{d}} \tag{12}$$

[3] Our notation is somewhat loose here, since NTM_{ij}^{d} is a discrete variable. Formally, we should write $AVE_{ij}^{NTM^{d},appr} = \frac{\tau_{ij}\left|NTM_{ij}^{d}=1\right. - \tau_{ij}\left|NTM_{ij}^{d}=0\right.}{\tau_{ij}\left|NTM_{ij}^{d}=0\right.}$.

From the gravity equation in (3) we have:

$$\frac{\partial \ln V_{ij}}{\partial NTM_{ij}} = \exp(\gamma_d) - 1 \tag{13}$$

Combining equations (12)-(13) gives for the percentage change in iceberg trade costs:

$$\frac{\partial \ln \tau_{ij}}{\partial NTM_{ij}} = -\frac{\exp(\gamma_d) - 1}{\theta} \tag{14}$$

The exact change in iceberg trade costs instead is given in equation (9). For larger values of γ, equation (14) becomes an increasingly poor approximation of the exact expression in equation (17). For example with $\gamma = 1.21$ and $\theta = 7$, we would find a percentage change in τ_{ij} of -33.6% instead of the -15.9% based on equation (9). Kee et al. (2009) use equation (14) to calculate the AVE of NTMs. The AVE of an NTM is defined as the percentage change in iceberg trade costs, thus implicitly assuming that iceberg trade costs without the NTMs are equal to one. Since the level of trade costs without NTMs is unknown, this is a natural normalisation. But as we have shown with our numerical example, equation (14) is an approximation and it seems better to use equation (9) to calculate the gravity-inferred AVE.

2.2 Two approaches to calculate NTM-related trade cost reductions

The previous subsection has equipped us with the necessary tools to understand the differences between the two approaches to calculate the reduction in trade costs as a result of NTM provisions in FTAs: the bottom-up approach and top-down approach. To compare the expected trade cost reductions in the two approaches, we have to calculate the ad valorem equivalents of the introduction of an FTA.

2.2.1 Bottom-up approach

The bottom-up approach first calculates the size of NTMs already in place between FTA partners and then makes assumptions, or specifies scenarios, to infer the potential reductions in NTMs that can be expected from the implementation of that particular FTA. So, these studies start with initial levels of AVEs associated with current NTMs in place, and then impose scenarios for the percentage reductions in these NTMs or the AVEs of the NTMs as a result of the conclusion of an FTA.

Oftentimes the size of NTMs is estimated at the sector-level using detailed micro data –i.e. firm-level surveys and product-level data, and sometimes in combination with expert opinion. For instance, Francois et al. (2013) infer the size of NTMs based on business surveys with about 5,500 data points. These data are mapped into AVEs by estimating sector-level gravity equations. Fontagné et al. (2013) estimate the size of NTMs in goods based on product level data from the UNCTAD-TRAINS database for NTMs in goods, and estimate the size of NTMs in services at the sector level based on importer fixed effects in each country relative to a benchmark country with the lowest level of NTMs judged by the amount of trade (Fontagné et al., 2011). In Section 3.2 we provide a detailed explanation of the specific estimations used in both papers.

To compare the bottom-up studies with the top-down studies we have to calculate the implied AVE of the FTA based on the AVEs of NTMs in place and scenarios for the reductions in these NTMs. We can do this in two ways, using either assumed percentage reductions in NTMs or assumed percentage reductions in the AVEs of NTMs. The first approach to calculate the AVEs of an FTA in bottom up studies can be chosen when NTM-levels have been calculated based on gravity estimation and all estimation details are available. We can then apply equations (10)-(11) imposing a percentage reduction in the NTM from NTM_{ij}^{d0} to NTM_{ij}^{d1}. We see that for calculation of the associated AVE, $AVE_{ij}^{\Delta NTM^d}$ in case of a discrete NTM measure, we need the estimated coefficients and trade elasticities, respectively γ^d and θ.

The second approach to infer the AVEs of an FTA based on bottom-up studies can be followed when only initial AVEs of NTMs are available and scenarios for the percentages by which these AVEs are reduced. Defining the initial level of AVE in the bottom-up studies as $AVE_{ij}^{NTM,NO-FTA}$ and a percentage change in these AVEs as $pc\_AVE_{ij}^{FTA} = \frac{AVE_{ij}^{NTM,FTA} - AVE_{ij}^{NTM,NO-FTA}}{AVE_{ij}^{NTM,NO-FTA}}$, (in the CEPR and CEPII studies for example typically 25%), we can calculate AVE of the FTA, AVE_{ij}^{FTA}, (so the percentage change in iceberg trade costs) as:

$$
\begin{aligned}
AVE_{ij}^{FTA} &= \frac{\tau_{ij}^{FTA} - \tau_{ij}^{NO-FTA}}{\tau_{ij}^{NO-FTA}} = \frac{1 + AVE_{ij}^{NTM,FTA} - 1 + AVE_{ij}^{NTM,NO-FTA}}{1 + AVE_{ij}^{NTM,NO-FTA}} \\
&= \frac{AVE_{ij}^{NTM,NO-FTA}}{1 + AVE_{ij}^{NTM,NO-FTA}} pc\_AVE_{ij}^{FTA} \qquad (15)
\end{aligned}
$$

For example, an initial AVE of 9.3% and a reduction by 25% as in the CEPR study for services in the EU leads to a percentage reduction in iceberg trade costs of 2.1%, $\frac{9.3}{109.3} 25\% = 2.1\%$.

A somewhat different version of the bottom-up approach can be found in the study on the effects of Trans-Pacific Partnership (TPP) by Ciuriak et al. (2016). This is an ex-ante study of the expected effects of TPP that is based on the negotiated treaty text to infer expected trade cost reductions.[4] In particular, this study maps the TPP treaty text into trade cost indicators such as the OECD's services trade restrictiveness index (STRI). Hence, they identify provisions in the text that lead to changes in trade cost indicators, controlling for what has been dubbed as "legal inflation" – i.e. provisions in treaties that do not effectively reduce trade costs (Horn et al., 2009). These changes in the trade cost indicators can then be mapped into

[4] In contrast, since negotiations are still ongoing on TTIP, there is still no final treaty text that can be used.

associated AVEs (so percentage reductions in iceberg trade costs) based on gravity estimations with these trade cost indicators.

2.2.2 Top-down approach

The top-down approach infers the expected reductions in NTM trade costs exclusively based on gravity estimation. Therefore, this method does not calculate initial levels of NTMs but determines the trade cost reduction associated with an FTA directly from a similar specification as in Equation (3). In particular, calculating the iceberg trade costs reductions as a result of an FTA ($\widetilde{\tau_{ij}^{FTA}}$) using the top-down approach is straightforward: the variable NTM_{ij} has to be replaced by FTA_{ij} in Equation (3), to estimate:

$$V_{ij} = \exp\left(\beta' C_{ij} - \theta \ln\left(1 + t_{ij}\right) + \delta FTA_{ij} + \lambda T_{ij} + \eta_i + \nu_j\right) \varepsilon_{ij} \tag{16}$$

where FTA_{ij} can be either a dummy variable that indicates the presence of an FTA between i and j or an index that determines the "depth" of the FTA between both countries. T_{ij} are the tariffs from Comparing equations (2) and (16), we observe that iceberg trade costs can be written as $\tau_{ij} = \exp\left(-\frac{\beta' C_{ij} + \delta FTA_{ij}}{\theta}\right)$. The associateed AVE of an FTA can then be calculated based on the change of the FTA-dummy, FTA_{ij}, from 0 to 1:[5]

$$AVE_{ij}^{FTA} = \frac{\tau_{ij}^{FTA} - \tau_{ij}^{NO-FTA}}{\tau_{ij}^{NO-FTA}} = \exp\left(-\frac{\delta}{\theta}\right) - 1 \tag{17}$$

The coefficient on the FTA variable (δ) assesses by how much FTAs have increased trade in the past and can thus be used to determine the percentage change reduction in iceberg trade costs as a result of the FTA. Note that in this specification both the tariffs and non-tariff measures associated with an FTA are grouped. Some studies, on the other hand, explicitly include tariff levels in equation (16), which allows to separately identify the NTM components associated with the implementation of the FTA. In this case, equation (17) will estimate AVE_{ij}^{NTM} –i.e. the AVE reduction associated only with the NTM provisions in the FTA, independent of any tariff reductions in the agreement.

As discussed into detail in Section 3.2, the studies using the top-down approach differ with respect to the level of aggregation of trade data used (sectoral versus aggregate), whether endogeneity of FTAs is accounted for or not, and whether the trade elasticities are estimated structurally (from the same gravity equation) or not. For instance, some studies (Felbermayr et al., 2015, 2013; Carrère et al., 2015) employ a simple 0-1 FTA dummy, implying that TTIP would generate the same trade cost reduction between EU countries and the US as FTAs have done on average in the past. On the other hand, Egger et al. (2015) and Aichele et al. (2014) instead

[5] Again, the importer and exporter specific terms will change with different FTA values, but this does not affect the iceberg trade costs estimations.

consider the depth of an FTA and model TTIP as the move from no FTA to a deep FTA. Another important difference is that in the first set of studies the trade elasticity is taken from the literature, whereas in the studies employing the depth of FTAs the trade elasticities are estimated structurally with the gravity equation.

2.3 Comparing both approaches

When comparing both methodological approaches, there are advantages and drawbacks from each. On the one hand, the bottom-up approach requires a data-intensive process (i.e. the use of micro-data and surveys) that provides detailed information on different trade costs associated with NTMs. This process also provides asymmetric bilateral trade cost data, which reflects initial country- and sector-specific trade cost levels, and thus, the potential for reductions when negotiating FTAs.

On the other hand, the top-down approach can be applied using standard gravity datasets and econometric specifications, which makes it a less data and analytical-intensive process. In addition, when properly specified, this approach can also inform about non-observable trade costs that are overlooked by the bottom-up approach. However, this more straightforward approach also comes at the cost of assuming symmetric trade cost reductions, which disregard different initial NTM values by country and sector.

3 Overview of studies on TTIP

This section provides a brief introduction to the different studies that will be compared in this chapter. In general, the studies can be divided between CGE-based models and structural gravity (SG) models.[6] After this overview, we conduct a more systematic comparison of the way trade cost reductions are modelled in each TTIP study.

3.1 General characteristics of the TTIP studies

3.1.1 CEPR Study (Francois et al., 2013)

The most influential and mostly cited economic analysis of TTIP has been the CEPR study (Francois et al., 2013) using a CGE-based analysis.[7] This study employs a CGE model to simulate the expected economic impact of TTIP.[8] The model's main features are intermediate linkages, multiple sectors and production factors,

[6]See Bekkers and Rojas-Romagosa (2017) for a detailed discussion of the differences between both modelling frameworks, and the related TTIP economic effects.

[7]This is the reference study by the European Commission and DG Trade (cf. European Commission, 2013) and the study discussed by most commentators (see for example The Economist, 2013; Rodrik, 2015; Wolf, 2015; The Guardian, 2015; Mustilli, 2015). The relevance of this study is highlighted by the request of the European Parliament to conduct an independent evaluation of this study, which was done by Pelkmans et al. (2014).

[8]The study uses a variant of the GTAP CGE-model. The main characteristics and references to the standard GTAP model are detailed in Hertel and Tsigas (1997) and Hertel (2013).

endogenous capital accumulation, monopolistic competition and the inclusion of international transport margins, export subsidies, import tariffs and other taxes. The CEPR study uses the GTAP-8 database (base year 2007), with 20 sectors and 11 regions, where the EU is treated as a single region rather than 28 disaggregated countries. A baseline scenario for 2027 is then projected by endogenising productivity growth such that macroeconomic aggregates in the baseline are equal to long-term GDP projections from the OECD and UN population projections.

The study explores the economy-wide impacts of several TTIP scenarios, of which reducing tariffs and NTMs are the most important. As an outcome of the CGE analysis, detailed simulation results are provided for expected changes in GDP, household disposable income, overall aggregate and bilateral export and import flows, trade diversion effects (from/to intra-EU, US and third-countries), terms-of-trade, tariff revenues, sectoral output and sectoral trade flows. The sustainability impact also includes detailed results on changes in wages for high- and low-skill workers, sectoral employment by skill level, labour displacement measures, changes in CO2 emissions and land use. Finally, the study provides GDP and trade effects for third-countries.

3.1.2 CEPII study (Fontagné et al., 2013)

The CEPII study starts with a description of the current trade and investment relations between the EU and the US. Given the limited average level of the import tariffs between both regions (2% in the US and 3% in the EU), they predict that these tariffs will not be the most important topics in the TTIP negotiations.[9] As with the CEPR study, this study finds that the corresponding levels of protection provided by the non-tariff measures are much higher on average than those provided by the tariffs. They also find that these differ significantly across sectors. Thus, they state that the significant negotiation topics at the macroeconomic level are on non-tariff measures, regulation in services, public procurement, geographical indication of origin and investment. They argue that these topics are contentious and provide an overview of each topic. The sector-specific trade barriers, together with NTMs and other contentious topics explain the overall sensitivity of the TTIP negotiations.[10] Finally, to assess the macroeconomic effects of TTIP they use the MIRAGE CGE model (Bchir et al., 2002) that similar to the CGE model in the CEPR study, provides a broad set of economic outputs.[11]

[9] However, they do acknowledge that tariffs will be important for some sensitive sectors: for both the EU and US dairy products, clothing and footwear are sensitive. Furthermore, steel items are sensitive for the US and meat products for the EU.

[10] As in other studies reviewed here, they acknowledge that not all of the different aspects of the negotiations can be incorporated into a model.

[11] This CGE model is also related to the GTAP-class models.

3.1.3 Egger et al. (2015)

Egger et al. (2015) examine the potential impact of TTIP with a hybrid approach that combines a CGE economic model with structural estimation of the trade elasticities and the expected trade cost reductions to generate estimates of the welfare effects for the EU, United States and third countries. The study follows a two-step approach. In the first step a gravity model is employed to yield estimates of reductions in trade costs. These values are then used as inputs in the second step where a CGE model simulates the economy-wide effects. This study focuses on and reports largely the same outcome measures as Francois et al. (2013). The CGE model employed in Egger et al. (2015) is also very similar to the model in Francois et al. (2013). The main difference with respect to the CGE application is that Egger et al. (2015) use the more recent GTAP-9 database with base year 2011 instead of the older GTAP-8 database with base year 2007.

3.1.4 Felbermayr et al. (2015)

The study by Felbermayr et al. (2015) is a typical structural gravity (SG) application based on a one-sector model with both a gravity equation to determine the trade costs associated with the TTIP experiment and a general equilibrium equation to calculate the welfare effects, where both equations follow directly from the theoretical gravity model. Baseline trade costs are calibrated to the fitted/predicted values of the estimated gravity equation. The paper does not follow the structural gravity literature in the determination of the parameters of the model, since the trade elasticity –a crucial parameter in the calculation of the welfare effects– is not estimated structurally, but is taken from the literature (i.e. Egger et al., 2011; Egger and Larch, 2011).

3.1.5 Felbermayr et al. (2013)

Felbermayr et al. (2013) explore the effects of TTIP on both trade and welfare and on the labour market. This is done with two distinct SG models. The first model explores the impact on trade, GDP and welfare for 126 countries, whereas the second model is limited to 28 countries due to the lack of available labour market data for more countries. The first model is identical to the model employed by Felbermayr et al. (2015) except for the variables included in the gravity equation.

3.1.6 Aichele et al. (2014)

To date, the study by Aichele et al. (2014) is the most sophisticated SG-based study on TTIP. These researchers use a multi-country and multi-sector Ricardian trade model with national and international input-output linkages identical to the model employed by Caliendo and Parro (2015) to study the impact of tariff reductions as a result of NAFTA. Counterfactual outcomes are calculated employing so-called exact hat-algebra with baseline import shares calibrated to actual import shares as in the CGE-approach.

3.1.7 Carrère et al. (2015)

Carrère et al. (2015) use a multi-sector SG approach to determine the real wage and unemployment effects of TTIP by including labour market frictions and equilibrium unemployment in an Eaton-Kortum-type trade framework. The authors also present welfare effects based on a weighted average of real wage and unemployment effects. A salient feature of this study is that the negative unemployment effects dominate the positive real wage effects in their setup, which generate overall negative welfare effects in some countries. The negative unemployment effects stem from a reallocation of workers from sectors with less labour market frictions and smaller equilibrium unemployment to sectors with more labour market frictions and higher equilibrium unemployment.

3.2 NTM reductions in each TTIP study

In this section we explain how each particular impact assessment study estimates the associated trade cost reductions from implementing TTIP.

3.2.1 Francois et al. (2013)

Francois et al. (2013) take into account the three types of trade cost reductions associated with FTAs: tariffs, NTMs and spillover effects. To determine the size of reductions in NTMs as a result of TTIP, this study follows a bottom-up approach, taking four steps. First, the size of NTMs is inferred from business surveys (with about 5,500 data points). Firms from a particular country i are asked to rank the overall restrictiveness of an export market j between 0 and 100. The bilateral indexes are aggregated per sector to importer j specific indexes. This aggregated number defines the size of NTMs for imports into country j. The import-specific indexes are then included in a standard gravity regression –as in Equation (3)– by interacting the NTM measures with dummies for intra-EU, intra-NAFTA and transatlantic trade. Actionable NTMs between the EU and the US are then defined as the difference in the ad valorem equivalent trade costs of the NTMs (using estimated tariff elasticities in goods, while for services a trade elasticity of 4 is used) for US-EU trade, intra-EU trade (NTMs into the EU), for US-EU trade and intra-NAFTA trade (NTMs into the US). Comparing these trade cost estimates, the actionable NTMs to be negotiated in TTIP consist of the difference in costs perceived by businesses surveyed of importing into an EU country from the US in comparison to importing into the same EU country from another EU country.

Second, NTMs are divided into two categories: cost-increasing barriers and rent-creating barriers.[12] On the basis of the Ecorys (2009) survey and expert judgement,

[12]See Box 1 in Francois et al. (2013) for more details.

on average (across sectors) 60% of the NTMs are cost-increasing. The other 40% of the claimed increase in prices as a result of NTMs, can be attributed to rents. The implication of these rents is that with existing NTMs firms have more market power and thus set higher prices.[13]

Third, the study assumes that only a fraction of NTMs can be reduced, as it is not possible to remove them because of legal, institutional or political constraints.[14] It is then assumed that 50% of the ad valorem equivalent of estimated NTMs can be reduced, or as they term it, are actionable.[15]

Fourth, as part of the TTIP experiment only a fraction of the actionable share of NTMs is assumed to be lowered as a result of signing TTIP. Different scenarios are employed, but the baseline scenario has a 50% reduction in the actionable NTMs. The result of combining the actionability share with the share of actionable NTMs reduced (both 50%) is that NTMs are expected to fall by 25% with TTIP.

3.2.2 Fontagné et al. (2013)

The CEPII study uses the estimates for NTMs in goods from the study by Kee et al. (2009) and their own CEPII estimates (Fontagné et al., 2011) for NTM values in services. Kee et al. (2009) estimate AVE NTMs using a 0-1 dummy variable on NTMs at a very detailed product (tariff line) level (HS6) using the UNCTAD's TRAINS database. To consolidate this information, they then regress import values per country and tariff line (corrected for endogenous tariffs) on the (instrumented) NTM-dummies, constraining the coefficients to be positive. Thus, their calculations are based on product-level import equations that consolidate information from several sources, in particular, the NTMs already contained in the UNCTAD-TRAINS database. Finally, trade elasticities are estimated based on the Feenstra (1994) approach –using identification by heteroskedasticity– and these are then used to obtain the NTM AVE values.

Fontagné et al. (2011) estimate NTMs in services using a residuals method based on the importer fixed effect in each importer country relative to the importer fixed effect in a benchmark country with the highest value of predicted trade relative to actual trade. The importer fixed effect of the benchmark country defines trade costs in the most liberalised country and thus, in the country with the largest scope for trade liberalisation. These estimates generate NTM AVEs of cross-border trade flows in services for nine services sectors and 65 countries from the GTAP database.

[13] It is not clear from the description of the simulations whether prices are really reduced by 40% of the ad valorem equivalent of the actionable NTMs as a result of the TTIP experiment or whether the 60%/40% cut only serves to determine the share of NTMs that is cost-increasing.

[14] These limitations in reducing NTMs stem from legal and even constitutional restrictions, political and consumer sensibilities and technical limitations, among others. See Egger et al. (2015) for a more detailed discussion on this topic.

[15] The share is based on expert opinions, cross-checks with regulators, legislators and businesses opinions taken from the business survey in Ecorys (2009). More details are in Box 1 in Francois et al. (2013).

The CEPII study then employ a 25% reduction in their estimated NTM AVE values, based on the same arguments used in Francois et al. (2013) –i.e. the level of actionability (50%) times the expected level of NTMs that can be actually negotiated in TTIP (also 50%).

3.2.3 Felbermayr et al. (2013) and Felbermayr et al. (2015)

Both these studies follow a top-down approach as in Equation (16) separately accounting for tariffs and using a dummy variable for FTAs. So instead of calculating the ad valorem equivalent TTIP with the depth of FTAs, they use a simple zero-one dummy for all FTAs. The two studies only differ with respect to the number of countries included in the gravity estimation and the control variables employed.[16] The gravity equation is estimated with PPML accounting for endogeneity of FTAs, based on the approach in Egger et al. (2011). The two studies do not report the AVEs of their TTIP experiment, since they directly calculate the change in income, multilateral resistances and welfare as a result of the change in the FTA dummy from 0 to 1. However, the NTM AVE values can be easily obtained from Equation (17), using their estimated FTA coefficient (δ) and the employed trade elasticity (θ).

3.2.4 Egger et al. (2015)

This study calculates the reduction of NTMs in goods employing a top-down approach, while the reduction in NTMs in services is calculated with a bottom-up approach. To calculate the reductions in NTMs on manufacturing goods, a gravity equation as in Equation (16) is estimated including the depth of FTAs, while controlling for FTA endogeneity following the approach in Egger and Larch (2011). To measure the depth of FTAs the authors use the index of the FTA-depth proposed by Dür et al. (2014) which ranges from 0 to 7, where TTIP is assumed to be a deep FTA with the maximum value of a FTA-depth of 7.[17] Based on the estimated trade elasticities (δ), the NTM AVEs are calculated as moving from no FTA (index=0) to a deep FTA (index=7).

The AVEs of trade restrictions in services are taken from Jafari and Tarr (2015) based on the World Bank's STRI database (Borchert et al., 2014). Both for manufacturing goods and services the remaining steps are the same as in Francois et al. (2013). Hence, NTMs are split up into cost-increasing and rent-generating NTMs and only the share of actionable NTMs are assumed to be reduced under TTIP. In this study the share of cost-increasing NTMs is again 50%, but in contrast to the CEPR study, the share of actionable NTMs is assumed to be now 100% (instead of 50%), which is consistent with the presumption that TTIP will be a deep FTA. On the other hand, the share of actionable NTMs in services varies by scenario. In one

[16]The exact approach in Felbermayr et al. (2013) can be found by consulting the companion study (Felbermayr et al., 2013a).

[17]In terms of the coding of FTA-depth this means that the FTA should contain provisions on all seven topics identified by Dür et al. (2014).

scenario there is no reduction in services NTMs and in the other scenario NTMs for non-financial services fall by 50%.

3.2.5 Aichele et al. (2014)

NTM reductions in this study are defined as a reduction in iceberg trade costs calculated using a top-down approach and separately accounting for tariff effects. A gravity model following Equation (16) is estimated including dummies for shallow and deep FTAs. A shallow FTAs is defined as an FTA with a score between 0 and 3 in the FTA depth index from Dür et al. (2014), and a deep FTAs is defined as an FTA with an index between 4 and 7. The FTA dummies are instrumented by employing a measure for trade contagion proposed by Baldwin and Jaimovich (2012). To determine the reduction in overall iceberg trade costs for goods this study uses the estimated trade elasticities, whereas for services a trade elasticity of 5.9 is used, based on estimates from Egger et al. (2012). Then they assume that the AVE NTM reductions associated with TTIP can be calculated by shifting their FTA-dummy definition from 0 (shallow FTA) to 1 (deep FTA).

3.2.6 Carrère et al. (2015)

This study accounts for reductions in NTMs following the top-down approach in Equation (16) with a 0-1 FTA dummy and separately estimating the effect of tariffs. Although they use data on 35 sectors for their SG model, the gravity equation is estimated by pooling all sectors. Thus, this study estimate a single trade elasticity of 3.17 and a coefficient on the FTA-dummy of 0.52. Hence, despite having data at the sectoral level, only an aggregate NTM trade cost reduction is calculated.

4 Comparison of trade cost reductions between studies

In this section we do quantitative comparisons of the explicit and implicit trade cost values employed in each TTIP study and explain why there are significant differences in these estimations between studies. First, we explain differences in trade cost estimations when using the gravity model, and then we compare the iceberg trade cost reductions in each study.

4.1 Comparing trade cost estimations using the gravity estimations

The TTIP studies can be compared quantitatively based on the AVEs of the introduction of TTIP (or phrased differently the percentage reduction in iceberg trade costs as a result of implementing TTIP), $AVE_{ij}^{FTA} = \frac{\tau_{ij}^{FTA}}{\tau_{ij}^{NO-FTA}} - 1$. For example, from Felbermayr et al. (2013) and Felbermayr et al. (2015) we can directly calculate the percentage change in iceberg trade costs using equation (17) with δ the coefficient on the FTA dummy and θ the assumed trade elasticity. A trade elasticity of 7 in the baseline and estimates of δ of respectively 1.24 and 1.21 generate the numbers displayed in Table 1.[18][19] For the bottom-up studies we employ the initial levels of AVEs of NTMs reported in the studies and apply percentage reductions in these AVEs. For services in the EU in the Egger et al. study for example, we apply the formula in equation (15) on an initial AVE of 17.6% and a 25% in the AVE (see Table 1) would lead to an AVE of TTIP of $AVE_{TTIP}^{ser,Egger} = \frac{0.176}{1.176} * -25\% = -7.5\%$.[20]

4.2 Ad valorem equivalents of the introduction of TTIP in different studies

To make the TTIP experiment comparable across studies we report the AVE as a result of TTIP in Table 1. The bottom-up studies (Francois et al., 2013; Fontagné et al., 2013) report initial levels of NTMs and assume that the NTMs will be reduced by a fraction of the initial level. The top-down studies report the effect of (deep) FTAs on trade flows in gravity estimations. In Subsection 4.1 we have discussed how the AVEs (percentage reductions in iceberg trade costs) of TTIP can be calculated with the two approaches. For the studies reporting trade cost reductions at sectoral levels, we calculate a weighted average for the three main sectors –agriculture, manufactures and services– based on more disaggregated sub-sectors. The weights are given by the amount of trade from the EU to the US for US NTMs and from the US to the EU for EU NTMs (using trade data from the GTAP-9 database).

The weighted iceberg trade cost reductions reported in Table 1 show that the differences are large, ranging from 2.5% reduction in trade costs in Francois et al. (2013) to 16.2% in Felbermayr et al. (2013). In addition, Table 1 shows that services trade contributes relatively little to the overall reduction in trade costs. Given that services trade is only about 6% of total bilateral trade between the two regions, its contribution to the total trade cost reduction is also small. In general we find that the studies working with a bottom-up approach based on micro-data on NTMs (Fontagné et al., 2013; Francois et al., 2013) come to smaller trade cost reductions than the top-down approaches based on average FTA effects (the rest of the studies). Both approaches are subject to criticism. In the bottom up approach the share of NTMs that will be reduced as a result of TTIP is hard to motivate and a percentage like 25% or 50% always seems somewhat arbitrary. Furthermore, NTM data are often of poor quality with negative estimated AVEs for many products. The top-down approach, on the other hand, can be criticised for the fact that it is debatable whether TTIP will create similar NTM effects as in past deep-FTAs. Moreover, modellers

[18] See Table 3 in Felbermayr et al. (2015) and Table II.2 in Felbermayr et al. (2013a).

[19] To calculate the average AVEs in Aichele et al. (2014) we can use the same methodology but we need to do some additional calculations, since the authors report different estimated trade elasticities and deep FTA dummies for more than 30 sectors. In particular, we first calculated the percentage changes in iceberg trade costs for the different sectors based on the estimated tariff elasticities and the coefficients for shallow and deep FTAs (in Tables 1 and 2 in Aichele et al. (2014)) and then calculated the weighted average AVEs for agriculture, manufacturing and services. We calculate AVEs per sector using the following formula, $\frac{\tau^{FTA}}{\tau^{NO-FTA}} - 1 = \exp\left(-\frac{\beta_{shallow}+\beta_{deep}}{\theta}\right) - 1$.

[20] 7.5% deviates from the 6.7% reported in Table 1 because the numbers in the table are based on trade-weighted average AVEs of TTIP.

Table 1: Trade-weighted average percentage iceberg trade cost reductions

		AVE NTM initial levels			TTIP experiment: percentage change iceberg trade costs		
	Weighted averages	EU	USA	both regions	EU	USA	both regions
CEPR study	**Overall**	**10.6**	**14.3**	**12.5**	**-2.3**	**-2.8**	**-2.5**
	Agriculture/Primary	-	-	-	-	-	-
	Manufacturing	11.9	16.3	14.3	-2.5	-3.1	-2.8
	Services	9.3	10.0	9.7	-2.1	-2.1	-2.1
Egger et al., 2015	**Overall**	**16.5**	**16.5**	**16.5**	**-12.4**	**-13.6**	**-13.0**
	Agriculture/Primary	15.9	15.9	15.9	-15.9	-15.9	-15.9
	Manufacturing	15.9	17.0	16.5	-15.9	-17.0	-16.5
	Services	17.6	15.4	16.6	-6.7	-6.0	-6.4
CEPII study	**Overall**	**38.8**	**37.0**	**37.9**	**-6.5**	**-7.7**	**-7.1**
	Agriculture/Primary	48.2	51.3	48.8	-8.1	-8.5	-8.3
	Manufacturing	42.8	32.3	37.0	-7.5	-6.1	-6.9
	Services	32.0	47.3	39.0	-6.1	-8.0	-7.1
Aichele et al., 2014	**Overall**				**-12.7**	**-13.8**	**-13.2**
	Agriculture/Primary				-52.5	-52.5	-52.5
	Manufacturing				-16.5	-17.6	-17.1
	Services				-5.2	-4.6	-4.9
Felbermayr et al., 2013	**Overall**				**-16.2**	**-16.2**	**-16.2**
Felbermayr et al., 2015	**Overall**				**-15.9**	**-15.9**	**-15.9**
Carrere, 2015	**Overall**				**-15.1**	**-15.1**	**-15.1**

Sources: Own estimations based on NTMs and trade cost reductions estimates from referred studies and bilateral sector-specific US-EU trade data from the GTAP-9 database.

need to pay attention to estimation details of choosing the proper instrument, the correct FTA measure and the adequate functional form of the gravity equation (PPML).[21]

Comparing the studies within the two groups reveals that the CEPII study generates much larger NTM levels than the CEPR study. Furthermore, it is encouraging that the average trade cost reduction in the study by Aichele et al. (2014) is similar to the reduction in Egger et al. (2015), given that a similar methodology was used. Both studies calculate the impact of a move from no FTA to a deep FTA based on the same depth of FTA data. The difference is the operationalisation. Egger et al. (2015) maintain the 0-7 scale, whereas Aichele et al. (2014) convert this scale into two dummies, one for shallow FTAs and one for deep FTAs. For the agriculture sectors, nonetheless, there are notable differences, where Aichele et al. (2014) find much larger trade cost reductions than Egger et al. (2015). There are three important differences between the two gravity estimates. First the instruments used are different. Second, the estimation method differs: PPML in Egger et al. (2015)

[21] All studies using the top down approach account for endogeneity of FTAs, although in a different way. All studies estimate the gravity equation using PPML, except for Aichele et al. (2014) who use Instrumental Variables (IV).

versus IV in Aichele et al. (2014). Finally, Egger et al. (2015) include a separate dummy for trade between EU members, thereby driving down the coefficient on the FTA-depth variable.

To summarise, it is difficult to give a value judgement on the expected trade cost reductions corresponding with TTIP. However, given the limitations on their estimation techniques, we consider that the approximately 16% NTM reductions reported in Felbermayr et al. (2013) and Felbermayr et al. (2015) seem over-estimated. In particular, these studies do not account for the depth of FTAs and assume that TTIP will be similar to any average FTA in the past. This is an unrealistic assumption since most FTAs have strongly focused on relatively large tariff reductions in the past, but these are not possible within TTIP given the relatively low existing tariff levels. Furthermore, the effect of TTIP seems to rise significantly by not including a separate dummy for intra-EU trade. Carrère et al. (2015), moreover, do not account for the depth of FTAs and fail to correct for the endogeneity of FTAs. Therefore, we conclude that a reasonable lower bound for the average trade cost reduction as a result of TTIP is the 3% values in Francois et al. (2013) and a reasonable upper bound is the 13% values in Egger et al. (2015) and Aichele et al. (2014).

5 Relation between trade cost reductions and the expected economic effects of TTIP

In this section we first summarise the main economic effects from each study, using the welfare effects (i.e. real GDP and income changes) as our comparison variable.[22] We then relate the discrepancies in these overall economic effects to the trade cost reductions assumed in each study.

5.1 Expected welfare effects from TTIP

5.1.1 CEPR Study (Francois et al., 2013)

The main economic finding from the CEPR study is that an ambitious and comprehensive transatlantic trade and investment agreement could bring positive economic gains for both regions of 0.4% of real GDP for the US and 0.5% for the EU, when comparing the baseline GDP level in 2027 with the simulated GDP level after the TTIP. EU exports to the US are expected to increase by 28%, while total exports increase 6% in the EU and 8% in the US. Other scenarios are also evaluated, were results are expected to be lower than an ambitious TTIP agreement.

5.1.2 CEPII study (Fontagné et al., 2013)

In general, the expected economic effects of TTIP in the CEPII study are similar to those of the CEPR study. As in the CEPR study, around 80% of the expected trade

[22] See Bekkers and Rojas-Romagosa (2017) for a comprehensive analytical and quantitative comparison of these studies.

expansion would stem from lowered non-tariff measures. Overall, both regions will obtain non-negligible GDP and real income effects, in the long run, of around 0.3%. Results for alternative scenarios are presented as well, first distinguishing between the effects of tariff elimination and NTM reductions, second using the Ecorys (2009) NTM levels as reference and third including third country spillover effects from regulatory harmonisation.

5.1.3 Egger et al. (2015)

The main economic result from the scenario that includes tariff elimination and reduction in NTMs in goods is that estimated gains in real income are situated between 1% and 2.25% for the United States and EU, respectively.

The bilateral trade growth in this paper (80%) is much higher than in the CEPR study (28%). Correspondingly, the real income effects are also higher now (about four times the results in the CEPR study). The main reason for the higher bilateral trade is that NTMs were estimated differently –as explained above.[23]

5.1.4 Felbermayr et al. (2015)

Felbermayr et al. (2015) come to relatively large welfare effects of TTIP. They find that TTIP can yield real income gains for the EU of 3.9% and 4.9% for the US.[24] They also report robustness checks, and in particular, they calculate the welfare effects employing the average FTA coefficient of 0.36 reported in the literature survey by Head and Mayer (2010). As a result the welfare effects are much smaller. Switching off the extensive margin channel hardly changes the effects since the estimated coefficient of the FTA dummy in the selection equation (i.e. whether there is trade or not) is small. Finally they also evaluate the effect of including the spillover effects, which magnifies the positive welfare effects as in other studies.

5.1.5 Felbermayr et al. (2013)

This study finds the largest welfare effects of all the studies. For instance, for the USA and Great Britain this study estimates an increase in welfare (i.e. equivalent variation) of 13.4% and 9.7%, while the average welfare increase in the EU is about 8%. Also remarkable are the welfare losses of third countries (9.5% in Canada, 7.2% in Mexico and 7.4% in Australia).[25]

[23]Egger et al. (2015) also have more recent data on NTMs in services and have a pessimistic (no real changes in trade in services) and optimistic perspective (real changes in all services sectors but finance).

[24]This study does not report changes in trade flows and focuses exclusively on welfare effects.

[25]It is unclear, however, why the welfare effects are so large in comparison to the CGE studies, but also in comparison to similar studies (i.e. Felbermayr et al., 2015). Bekkers and Rojas-Romagosa (2017) presents an extensive comparison of TTIP , which can explain these discrepancies.

5.1.6 Aichele et al. (2014)

This paper finds that TTIP will generate real per capita income changes of 2.1% for the EU and 2.7% for the US. These gains are achieved through strong bilateral trade increases of 171% (from the USA to the EU) and 216% (from the EU to the USA), spurred mainly by NTM reductions. Interestingly, the real income effects from this study are somewhat larger –and the trade flows more than double– than those in Egger et al. (2015) even though the trade cost reductions are similar in both studies.

5.1.7 Carrère et al. (2015)

This study report effects of TTIP on real wages, unemployment and welfare. Welfare is a weighted average of the real wage and unemployment. Since we only use real income as our comparison variable, we do not take into account their unemployment effects.[26] In particular, we use their real wage effects as the main welfare variable from this study. The authors find positive but relatively small real wage effects of 0.3% in the USA and on average 0.2% in the EU.

5.2 Impact of estimated trade cost reductions on predicted welfare effects

The different studies discussed in this chapter all map the estimated trade cost reductions as a result of TTIP into projected welfare effects. This is done employing either CGE-models or structural gravity models. In Bekkers and Rojas-Romagosa (2017) we compare these two approaches and also evaluate the impact of differences in model structure on predicted welfare effects. Here we limit ourselves to evaluating the impact of variation in trade cost reductions on predicted welfare effects with a flexible CGE-model, also evaluating the impact of variation in trade elasticities.[27]

Figure 1 displays the percentage change in welfare in the EU as a function of percentage changes in iceberg trade costs between the EU and the US for three values of the trade elasticity, $\theta = 3$, $\theta = 5$, and $\theta = 7$. The figure shows that for the intermediate value of the trade elasticity of 5, reported as the median value in Head and Mayer (2014), welfare gains from reductions in iceberg trade costs rise more than proportionally with the reduction in iceberg trade costs. For example, a doubling of the reduction in trade costs from 4% to 8% raises the welfare gains from 0.2% to more than 0.4%. The figure shows furthermore that the relation is convex, i.e. at larger trade costs the impact of a change in iceberg trade costs becomes larger.

From the figure we can also draw clear conclusions on the impact of the size of the trade elasticity on the welfare effects of reductions in iceberg trade costs between FTA partners. At larger trade elasticities the effect of reductions in trade costs becomes larger and the difference rises with the size of the trade cost shock.

[26] These are analysed in detail in Bekkers and Rojas-Romagosa (2017).

[27] The specific model employed is a simplified CGE version that is closer to the structural gravity models. For a detailed description see Bekkers and Rojas-Romagosa (2017).

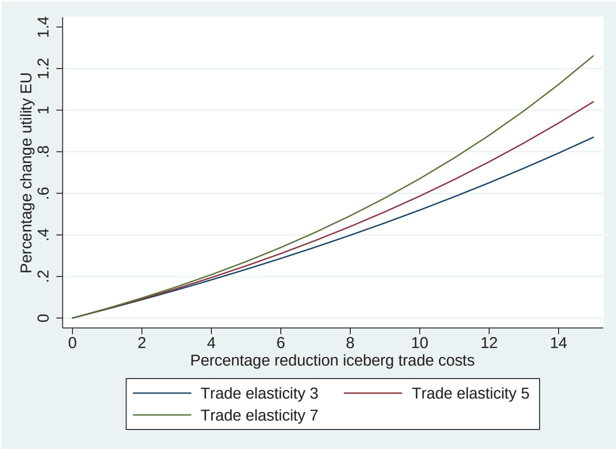

Figure 1: Welfare changes in the EU as a function of changes in iceberg trade costs $\widehat{\tau_{ij}^{NTM}}$ for various values of the trade elasticity

Source: Own calculations with flexible CGE-model as described in Hertel and Tsigas (1997), Hertel (2013), and Bekkers et al. (2017)

For example, for a trade cost reduction of 14%, the predicted welfare gain for the EU is only about 0.8% with a trade elasticity of 3 and about 1.2% with a trade elasticity of 7. These findings seem at odds with the result in the literature on the welfare gains from trade (Arkolakis et al. (2012)) that the welfare gains from trade are larger at a smaller trade elasticity, corresponding with the intuition that love-of-variety forces are stronger at a lower trade elasticity, making it more valuable to be able to import. Their result, however, is about the welfare gains from trade and not from trade liberalisation. We have seen in Figure 1 that a larger trade elasticity raises the gains from trade liberalisation, because trade responses are bigger in this case.

However, since the top-down AVE trade cost reduction estimation requires the specification of a trade elasticity (see Equation (1), then the overall estimated iceberg trade costs are conditional on the trade elasticity. In particular, a higher trade elasticity results in lower iceberg trade costs. Therefore, the relation between welfare effects, trade cost reductions and trade elasticities are conditional on how the trade costs are associated (or not) with particular trade elasticity values.

5.3 Spillover effects

Another importance source of divergencies in estimated trade cost reductions comes from the so-called spillover effects –i.e. changes in trade costs in third countries that are related to the NTM reductions between the TTIP partners. These spillover effects were first introduced in the discussion on TTIP by Francois et al. (2013), distinguishing between direct and indirect spillovers. Direct spillovers occur when third countries find it less-costly to export to the EU and the US as a result of

TTIP. Indirect spillovers take place when third countries partially take over the harmonised standards in the EU and US, resulting in lower trade costs between third-countries and for exports from the EU and US to third countries. The spillover effects stem from the expectation that TTIP will lead to improved regulatory cooperation between the EU and the US and that this new regulatory framework will become a global standard. Harmonisation of regulations will make it less costly to comply with the fixed costs of exporting to the EU and US market: these costs have to be incurred only once if regulations are harmonised.

The obvious effect of modelling spillovers is that negative trade diversion effects on third countries become smaller. The assumption of positive spillover effects is not uncontroversial. When two countries harmonise standards, they will also replace old standards, possibly agreed upon with third countries. This might make it more difficult for third countries to comply with the new standards, thus generating cost increases instead of cost reductions. The empirical literature on the scope for spillover effects is summarised in Baldwin (2014), although he organises the discussion around the concept of "negative trade diversion". When a country signs a deep FTA it might improve the functioning of its services sector, implement stricter rules on competition policy and streamline its government procurement, for example. To a large extent these measures are non-discriminatory in nature, thus also generating benefits for non-members. The studies cited in Baldwin (2014) indicate that the scope for negative trade diversion is very limited: in most cases trade with non-FTA partners also increases when an FTA is signed. This does not provide, however, conclusive evidence for the presence of direct spillover effects: trade with non-FTA partners might also increase after an FTA has been signed because countries signing an FTA might be implementing other types of reforms together with signing an FTA.

Only Francois et al. (2013) works with direct and indirect spillover effects in their main simulations, whereas most other studies report the effects of spillovers in the robustness checks. All studies, however, follow Francois et al. (2013) by assuming that direct spillovers (third countries exporting to the EU) are 20% of the trade cost reductions between the EU and the US and indirect spillovers are 10% (third countries exporting to each other).[28]

When we analyse the spillover effects, Table 2 shows that the economic effects of including spillovers varies considerably within studies. Whereas Fontagné et al. (2013) and Felbermayr et al. (2015) find that the spillover effects raise welfare by about two thirds, the other studies find effects in the range of 20% to 25%.[29] We can explain the large effect in Felbermayr et al. (2015) by the way baseline trade costs

[28]For example, if there is a 5% total trade cost reduction between the EU and US, the direct spillover (i.e. 20% over total trade costs) will represent an additional 1% total trade cost decrease for third countries exporting to the US or EU and an additional 0.5% indirect spillover reduction (i.e. half the size of the direct spillover decrease) for EU and US export costs to third countries and for trade between third countries.

[29]The large effects in Fontagné et al. (2013), however, could be explained from the fact that this study only reports effects rounded to one decimal. While the absolute differences are less significant.

are modelled in their single-sector model. As discussed below, this approach biases the effects of trade cost reductions upwards and thus, also the effect of spillovers. Thus, by excluding both these studies as outliers, we conclude that including 20% direct and 10% indirect spillovers is expected to have additional welfare increases on the TTIP-partners of about 25%.

Table 2: Estimated TTIP welfare effects, with and without spillover effects

	Without spillovers		With spillovers		Relative difference
	EU	USA	EU	USA	
CEPR study	0.4	0.3	0.5	0.4	20.8%
CEPII study	0.3	0.3	0.5	0.5	66.7%
Egger et al. 2015	2.3	1.0	3.0	1.1	26.5%
Aichele et al. 2014	2.1	2.7	2.7	3.4	25.4%
Felbermayr et al. 2015	3.9	4.9	7.8	7.1	67.7%

Source: Own estimations based on reported results from cited studies.

6 Summary and conclusions

Average tariff levels have been decreasing steadily after the Second World War. As a consequence, the relative importance of non-tariff measures has been rising, and in the latest deep FTAs there has been an special emphasis on how trade facilitation mechanisms, behind-the-border measures and the harmonisation and mutual recognition of regulations can yield substantial decreases in NTMs. As such, the estimation of these potential NTM reductions has become a key variable to properly estimate the expected economic effects of these deep FTAs.

In this chapter we detailed how NTMs can be calculated using two different estimation techniques: bottom-up or top-down. In particular, we detail and compare how seven different impact assessments of TTIP have estimated the potential trade cost reductions from this agreement, why there are some significant discrepancies in the cost reduction values, and how these differences can explain the different expected welfare effects that come out of these studies.

The main finding of this chapter is that a reliable and transparent estimation of the NTM trade cost reductions associated with FTAs, is indeed a key issue to ultimately evaluate these agreements and yield reliable economic impacts. We find that accounting for differences in the expected NTM reductions can explain a large share of the discrepancies regarding the overall potential economic effects of TTIP.

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Author contacts:

Eddy Bekkers *

WTO

Rue de Lausanne 154

1202 Genève

Switzerland

E-mail: eddybekkers@gmail.com

* The opinions expressed in this article should be attributed to its author. They are not meant to represent the positions or opinions of the WTO and its members and are without prejudice to Members' rights and obligations under the WTO. Any errors are attributable to the authors

Hugo Rojas-Romagosa

CPB

P.O. Box 80510

2508 GM The Hague

The Netherlands

and

WTI

Hallerstrasse 6

3012 Bern

Switzerland

Email: romagosa17@gmail.com