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Atlantic versus Pacific Agreement in Agri-food Sectors: Does the Winner Take it All?

Highlights

RESEARCH AND EXPERTISE ON THE WORLD ECONOMY

Abstract

Keywords

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RESEARCH AND EXPERTISE ON THE WORLD ECONOMY

Atlantic versus Pacific Agreement in Agri-food Sectors: Does the Winner Take it All? [1]

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Introduction

Since the beginning of the 2000s, preferential trade agreements have proliferated. However, their impact on trade and economic growth was up to recently rather limited (Erixon, 2013). In 2008, only 16% of world trade benefited from preferential tariffs (WTO, 2011). Things are now changing with the emergence of the so-called mega-trade deals. Regional openness is becoming a major challenge for countries, while multilateral liberalization – following the collapse of the Doha round negotiations – tends to be relegated to the sidelines.

These mega-trade deals are seen as a way to compensate unsuccessful multilateral negotiations, to cope with issues not yet tackled by the World Trade Organization (WTO), and to benefit from the dynamic economic growth taking place in some areas (Francois, 2014). They are comprehensive agreements, which are often going beyond tariffs, by integrating markets. Given their size and ambitions, they are fundamentally different from the old regional trade agreements and are likely to have systemic implications for the world economy (Cernat, 2013; Erixon, 2013). They will set the framework for future regional and multilateral negotiations. Their achievement (or failure) will shape the future distribution of world trade flows.

The Transatlantic Trade and Investment Partnership (TTIP) and Trans-Pacific Partnership (TPP) currently under negotiation are perfect illustrations of these mega-trade deals. First, they involve countries that respectively represent 53% and 44% of world GDP. Second, they aim at removing trade barriers in a wide range of sectors to make the exchanges of goods and services between partners easier. The TTIP involves the US and the EU and deals with the removal of the remaining tariffs and the harmonization of the non-tariff measures (NTMs), while the TPP currently includes the US and 11 other countries and focuses mainly on tariffs. Policy makers' expectations are very strong for both agreements. On November 14, 2009, President Obama committed the US to engage "with the TPP countries with the goal of shaping a

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regional agreement that will have broad-based membership and the high standards worthy of a 21st century trade agreement." Just after the launch of the TTIP negotiations on February 13, 2013, the EU Commission President Barroso declared "A future deal will give a strong boost to our economies on both sides of the Atlantic."

The potential competition between these two mega-deals, as well as the effects on third countries is an open question. For the TTIP and TPP countries respectively, the cost of a non-agreement is not simply the statu quo in terms of trade but potentially an isolation from dynamic markets, especially in case of success for the concurrent agreement. Similarly, both agreements may indirectly affect third countries. Without being officially part of them, China already has a central position in TPP negotiations.[2] Anticipating the potential consequences that a TPP deal could have for the economy, Chinese authorities recently started to look more closely to the on-going discussions and may join the future negotiations.

While such agreements involve the whole economy, negotiations in some sectors and services are more sensitive. Despite its relative small share in global output and in terms of employment, agriculture is without a doubt a hot topic.[3] Issues raised usually relate to the fears of population for food security, food safety, lower health and environmental standards. Cultural differences may also complicate the TTIP negotiations in agri-food sectors. In terms of risk management, Europeans advocate the precautionary principle and worry about the 'risk proven approach' largely favored by the US. At the same time, due to the current level of protection, agri-food flows across TTIP and TPP countries are relatively weak compared to manufactured exchanges, and significant trade potentials exist.

This paper provides a simulation of the trade and welfare impacts that could be expected from these two mega-trade deals. Our focus is on agri-food sectors, so using a computable general equilibrium model (CGE) is of particular interest. Such analysis allows to highlight the sector effects of a trade deal and the global interactions between markets. We rely on the CGE model MIRAGE.[4] This model has several significant features compared to other models in the literature. In a nutshell, it comprises a refined baseline (including sector-specific assumptions on total factor productivity, with a specific treatment for agri-food) and it interacts with the Market Access Map (MAcMap-HS6) database allowing for refined modeling of tariffs and trade liberalization scenarios.

Our contributions to the existing literature on the quantification of mega-deals' effects, and more precisely on the TTIP and TPP, are fourfold. First, our paper affords a detailed assessment of these two agreements' impact on agri-food trade. With the current set of negotiating countries,

[2] This fact is well understood by the US. In his State of the Union address on January 20, 2015, President Obama restated the significance of TPP and TTIP negotiations for the US, underlining the benefits for the country from writing the trade rules instead of leaving this task to others (e.g. China) http://www.whitehouse.gov/the-press-office/2015/01/20/remarks-president-state-union-address-january-20-2015.

[3] Cultural and audiovisual services are also sensitive and currently excluded from the TTIP negotiations.

[4] The version used here is nicknamed MIRAGE-e 1.0.

both agreements cover 12% of world agri-food trade flows in 2012 (excluding intra-EU trade). The impact is further decomposed by negotiating country and sector.

Second, CGE simulations require the use of accurate measures of trade policies. The agri-food sector is still significantly affected by public interventions. For tariff barriers, we rely on the MAcMap-HS6 database, which offers a disaggregated, exhaustive and bilateral measurement of the applied protection set by importing countries on each product. It includes tariff preferences, tariff rate quotas, and the ad valorem equivalents (AVEs) for all non-ad valorem duties. Besides, we estimate AVEs of NTMs, which are further used as an input in the CGE simulations. These AVEs are computed at the product level using countries' notifications of sanitary and phytosanitary measures (SPS) and technical barriers to trade (TBT) to the WTO. We rely on Kee et al. (2009)'s method, which consists in estimating the trade effects of these NTMs and then converting them into AVEs using import demand elasticities.

Third, our paper contributes to the literature on CGE evaluation of trade deals by introducing more differentiation between countries in terms of the NTMs' effects through aggregation, and departing from the usual assumption that the cost effect of NTMs is a pure efficiency loss. Furthermore, the economy – and especially the agri-food sector – is modeled with as much detail as possible. We consider 31 distinct sectors, and among them 17 deal with agri-food products. In terms of reference scenario, we consider progressive but full phasing out of tariffs and 25% cut in NTMs for the TTIP deal. As regard the Pacific partnership, current negotiations mainly deal with tariff barriers, even if future discussions may be extended to NTMs' removal. TPP reference scenario therefore simulates progressive but full phasing out of tariffs only.

Fourth, we test the sensitivity of our results by considering different trade liberalization schemes. More precisely, we assume various levels of tariffs and NTMs' cuts. Furthermore, we simulate alternative boundaries for the TPP Agreement: deep integration with NTMs' removal besides to tariff cuts, and broad geographic coverage with extra members such as China, India and South Korea among others.

Our results first suggest that both Agreements may have comparable effects in terms of magnitude on world agri-food trade flows. Furthermore, the US would be the main winner in the agri-food sectors, though an Atlantic deal would overall be more profitable to them than the Pacific one. The US apply lower tariffs than their potential FTA partners on their imports and their production is specialized in sectors facing high NTMs in destination markets. In addition, our results suggest that the impact of both agreements could be (almost) additive for the US and not competing, due to a relatively elastic supply of agri-food products despite the similarity of US offensive interests on Pacific and Atlantic markets.

In terms of trade diversion, our results show that the Pacific countries have more to loose from the conclusion of an Atlantic-only partnership than the EU from the achievement of a Pacific-only agreement. This is mainly due to their relative specialization that is not equally fitted for the US market. Finally, the magnitude of the effects could be significantly affected by the form taken by the TPP agreement. While a deeper agreement (including NTM cuts) could significantly reduce the EU agri-food exports to the US (price competition is more impacted by NTMs than tariffs), a broader TPP including among others China and India would not affect EU agri-food exports much – even triggering trade increases in some specific sectors. This last result may be explained by the complementarity in terms of specialization between potential TPP members and the EU.

Our paper proceeds as follows. We provide an overview of current TTIP and TPP negotiations, as well as trade patterns, applied tariffs and NTMs in Section 1. We then present the CGE modeling framework in Section 2 and detail the simulation scenarios in Section 3. Section 4 reports and compares the impacts of both agreements taken separately, while Section 5 checks the sensitivity of these results to the simultaneity and characteristics (boundaries and trade liberalization) of the two agreements. We conclude in Section 6.

1. Atlantic and Pacific trade patterns

This section presents the main characteristics of both TTIP and TPP trade deals in terms of negotiations, issues at stake, current flows and protection. As mentioned in the introduction, the key feature of both deals is their gigantic size. In 2012, the current TPP members accounted for 11.3% of world population, 38.5% of world gross domestic product (GDP) and 27% of world trade (imports and exports). The TTIP area represented 11.6% of world population, 45.8% of world GDP and 25% of world trade. Interestingly, the economic dynamics of these two areas tend to diverge. In terms of trade, EU-US trade reached 40% of world trade (excluding intra-EU trade) during 70s-90s but is decreasing since 2000. On the other hand, the flows between TPP countries have increased quickly over the last decade. These main facts are summarized in Table 1.

1.1. Which framework for which negotiations?

The discussions on the transpacific trade liberalization started in 2002 between Chile, New Zealand and Singapore. The list of participants has expanded over time with Brunei (2005), the US, Australia, Peru and Vietnam (2008), Malaysia (2010), Canada and Mexico (2012) and finally Japan (2013). A total of 12 countries are therefore currently negotiating on the mutual market access for their goods and services. Interestingly, this group includes developing, emerging and industrialized countries. This characteristic (not shared with the TTIP agreement) may of course influence the trade liberalization, pattern and speed. Current negotiations, which may be concluded in the near future, mainly deal with the dismantlement of tariff barriers. In November 2011, TPP countries announced their objective of removing all tariff barriers on trade in goods at the entry into force of the Agreement. Some adjustment periods may be negotiated for sensitive products. Nevertheless, tariffs' removal has already been engaged since each current negotiating country is involved in a free trade agreement with at least one other

Table 1 – TTIP and TPP's identity cards

	TTIP	TPP
Members		
Current	EU28, US	Australia, Brunei, Canada, Chile, Japan, Mexico, New Zealand, Malaysia, Peru, Singapore, US, Vietnam
Potential		Bangladesh, Cambodia, Colombia, India, Indonesia, Laos, Malaysia, Philippines, South Korea, Thailand (and China)
Negotiations		
Start	2013	2011
Focus	Tariffs and NTMs	Tariffs (and NTMs)
Key statistics (%, 2012)		
Share in world population	11.6	11.3
Share in world GDP	45.8	38.5
Share in world trade	25	27
Share in world agri-food trade	24	25

Note: Key statistics for TPP are computed on the sample of current members. Intra-EU trade is excluded. Statistical sources: World Development Indicators for population and GDP; CEPII-BACI database for trade flows (intra-EU trade excluded).

TPP partner. Negotiations have also been engaged on NTMs but are less likely to be achieved in a near future. Current discussions are designed to ensure that, as tariffs are reduced, they are not replaced by other forms of protection such as NTMs. TPP country coverage may be extended in the future, several countries having expressed their interest for joining the group. Potential future members involve Bangladesh, Cambodia, China, Colombia, India, Indonesia, Laos, Philippines, South Korea, and Thailand (see Figure 1). As previously mentioned, Chinese authorities increasingly perceive the potential benefit of the TPP (or say differently the cost of remaining outside of the Agreement) and China may join future negotiations. We therefore include it in the group of potential members.

The transatlantic discussions seem, at a first glance, more simple with just two partners: the US and the EU. The European Commission has received from EU members the mandate to negotiate the TTIP. Negotiations were launched in 2013 and are expected to end in 2015. The agreement aims to include not only the removal of remaining tariffs but also the harmonization and/or mutual recognition of regulations or of technical requirements (mainly SPS and TBT measures).[5] Multiple and divergent rules are of course costly, and regulatory convergence is one way to reduce such costs. However, its achievement is not always easy. Furthermore, discussions are also complex on some specific issues such as public procurement, geographical indications, genetically modified organisms (GMOs), etc. If successful, the TTIP Agreement will boost trade flows between the two main world economies. The EU-US trade relationships are naturally already strong but also increasingly challenged by other trading countries benefiting

[5] In case of harmonization, a common regulation is defined and applied by both trading partners, while mutual recognition means the reciprocal acceptance of the regulation applied in each country by its partner.

Figure 1 – Current and potential TPP members

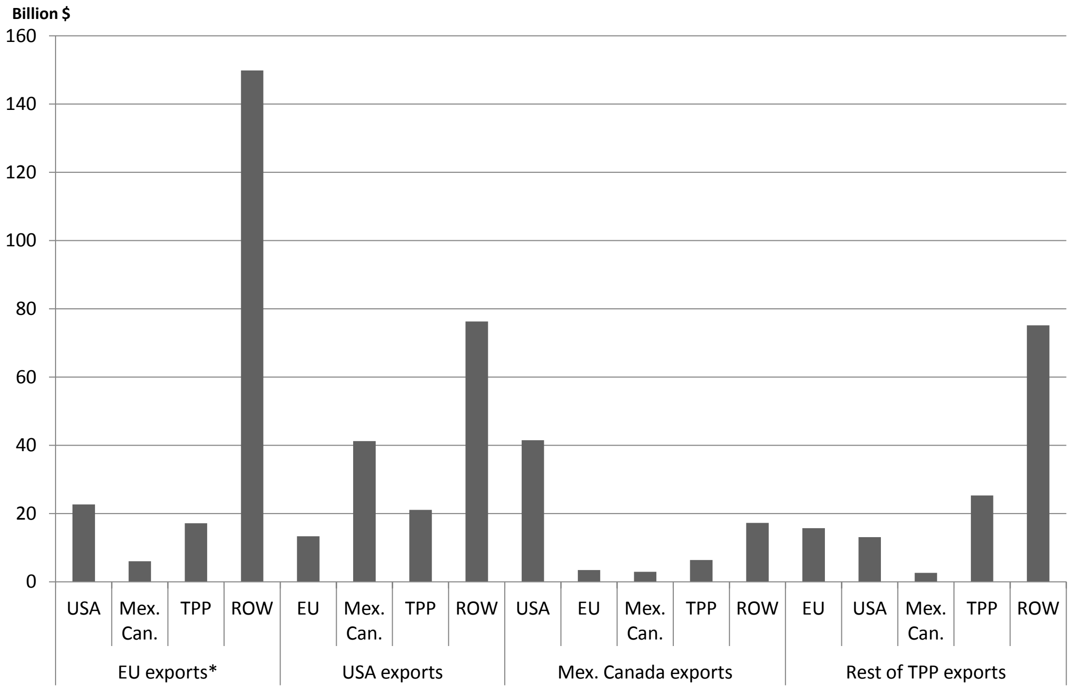
or currently negotiating a preferential access to EU and/or US markets (e.g. recently signed EU-Canada Free Trade Agreement – FTA – or EU-Japan FTA under negotiation).

1.2. Trade patterns[6]

Transatlantic trade relationships are already large. In 2013, flows between the EU and the US represented 4% of world trade. The EU market is the second biggest destination of US overall exports (after Canada) and receives 16% of total US exports (238 billion USD). On the other side, the US are the main partner of EU exporters, as 14% of EU exports are shipped to the US market (353 billion USD). In terms of imports, the EU is the second most important partner of the US (16% of total imports). For the EU, the US is the third main import partner (after China and Russia), providing 10% of total imports. Agri-food represents respectively 10% and 8% in overall exports of US and the EU. In terms of bilateral trade, 9% of US agri-food exports are sent to the EU, and the US receive 11% of EU agri-food exports (Figure 2). As shown in Figure 3, transatlantic agri-food trade is concentrated in few sectors. 57% of European exports are made in the beverage and tobacco sector (mainly wine). On the other side, beverage and tobacco products, oil seeds, and fruit and vegetables represent half of US exports to the European market.

By comparison, the TPP area is very heterogeneous. The two main features of TPP flows are the prominence of NAFTA and the role of Japan. NAFTA's countries are very integrated and intra-NAFTA flows represent 59% of the trade between TPP members (55% for agri-food). 40% of US world export flows are sent to Canada and Mexico. This share is lower in the agri-food sector (27%). The US are also the main partner of these two countries and receive

[6] All statistics are computed excluding intra-EU trade flows. These statistics are based on the BACI database, which is developed by the CEPII and uses original procedures to harmonize the United Nations COMTRADE data (evaluation of the quality of country declarations to average mirror flows, evaluation of cost, insurance and freight rates to reconcile import and export declarations, http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=1).



*Intra-EU trade excluded. By comparison, EU internal trade is equal to 341 billion USD.

Figure 2 – Agri-food exports, by origin and destination in 2013

Note: Authors' computation using BACI.

respectively 73% and 71% of their total exports (68% in agri-food). The second main pattern of TPP flows is the position of Japan, connecting the American and Asian sides of the area. Japan is the second main exporter of the TPP region behind the US. Its main partner are the US (18% of Japanese world exports), whereas the US only send 5% of their exports to Japan. Besides, Japan is an important trading partner for the several Asian countries (more than 10% of world exports of Brunei, Malaysia or Vietnam are sent to Japan), but also for Chile or New Zealand. In terms of agri-food trade, TPP countries have also various profiles. New Zealand has a strong specialization in agri-food trade (60% of its total exports). Agri-food constitutes more than 15% of Australian and Chilean exports, and around 10% of US and Peruvian exports. By contrast, agri-food products represent a very low share of the exports of Japan and Brunei (less than 1%). Meat, fruits and vegetables and cereals are the main traded products between TPP members (see Figure 4).

1.3. Tariff barriers

Tariff barriers affecting transatlantic and transpacific trade have been significantly reduced over the last few decades, but are still present, especially in agri-food sectors. Table 2 provides some figures, extracted from the MAcMap-HS6 database[7] jointly developed by the CEPII and the

[7] http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=12

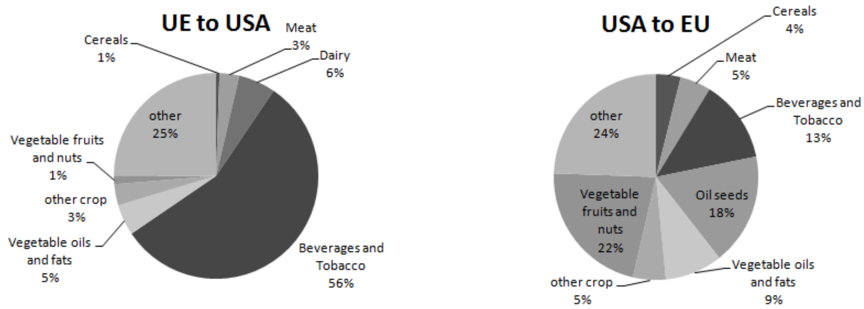


Figure 3 – Atlantic agri-food trade by sector in 2013 (%)
Note: Authors' computation using BACI.

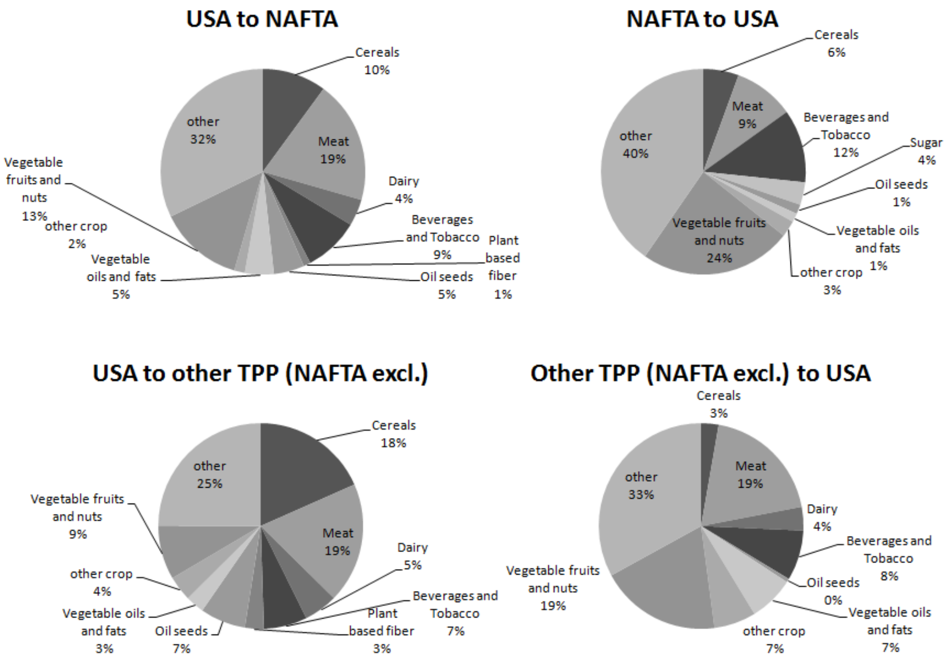


Figure 4 – Pacific agri-food trade by sector in 2013 (%)
Note: Authors' computation using BACI.

International Trade Centre (ITC). These data are based on bilateral custom tariffs and include tariff preferences, tariff rate quotas, and AVEs for non-ad valorem duties, which concern 6% of agri-food tariff lines (as compared to 0.6% in industry). AVEs are aggregated using the reference group method. This alternative weighting scheme limits the endogeneity problem compared to the classic trade weighted one (for more details, see Guimbard et al., 2012).

Four patterns characterize EU-US bilateral applied protection. First, agri-food imports are more protected than non agri-food ones both in the US and in the EU. The average duties on agri-food products reach 6.4% in the US and 12.8% in the EU. By comparison, the average applied protection on manufacturing goods is only 1.7% in the US and 2.3% in the EU. Second, EU protection on US agri-food products is on average twice higher than symmetric US protection (12.9% versus 6.4%). Third, the EU also imposes high levels of protection on a large share of agri-food products. 28.7% of these products (defined at the HS 6-digit level) imported by the EU from the US face a tariff peak (AVE above 15%). This share is only 6.5% for US agri-food imports from the EU. Finally at the sector level, four groups of US agri-food products face strong EU tariffs: red meat (bovine, goat and sheep, average of protection of 75%), dairy (38%), white meat (31%), and sugar (24%). At the opposite, oil seeds, plants fibers, oils and fats face low protection rates (less than 5%). At the US border, European sugar faces the highest rate of protection (24%), followed by dairy products (19%). Other EU agri-food sectors are much less affected by US tariffs, with a protection rate below 7%.

Within the TPP area, agri-food products are on average subject to higher tariffs than industrial ones (Table 2). However, the level of bilateral applied protection varies a lot across countries and is mainly driven by the existence of FTAs between some country-pairs (Table 3). For example, the US impose on average very low agri-food tariffs to Mexico and Canada since the implementation of the NAFTA. Tariffs are also low at the US border for agri-food products from Chile, Peru or Singapore, as the US already have FTAs with these countries. Similarly, Canadian tariffs vary according to the exporter and the presence of a FTA. Agri-food protection is on average very low for Canadian FTA-partners (Mexico: 3.6%; Peru: 0.5%), but quite high for imports from other countries (Japan: 23%, New Zealand: 40%, or Singapore: 36%) and it still reaches 10% for US products. We find the same disparity in Mexican tariffs, which are large for non-FTA partners (Australia: 31%, New Zealand: 30%, or Peru: 26%) and low for US, Chile and Canada. Among the other TPP members, Australia is characterized by very low agri-food duties whatever the partner (maximum 2%), whereas Japan, on the contrary, imposes high tariffs (except for some countries with whom it signed FTAs). At the sector level, dairy products are affected by high tariffs in several TPP countries. For example, Canada's average tariffs reach 110% on US dairy products and even 140% on dairy products from other TPP countries. Cereal flows are also rather protected. Japanese duties are above 200%, mainly because of the very high level of protection on rice. Mexican tariffs on cereals reach on average 18% for the TPP countries (10% for the US despite the presence of the NAFTA). Sugar is also strongly protected in Mexico, with an average tariff equal to 97% on the imports coming from other TPP countries (except for the US).

Table 2 – Average tariff protection on transatlantic and transpacific trade, in 2010 (%)

	Agri-food		Non agri-food	
	Applied protection (%)	Share peaks (%)	Applied protection (%)	Share peaks (%)
Transatlantic trade				
US tariffs applied to EU imports	6.4	6.5	1.7	1.9
EU tariffs applied to US imports	12.9	28.7	2.3	0.9
Transpacific trade				
US tariffs applied to TPP imports	2.7	4.8	0.7	0.9
TPP tariffs applied to US imports	7.7	9.0	1.6	7.3
TPP tariffs applied to TPP imports (excl. US)	12.5	10.6	2.1	7.8

Note: Authors' computation using MAcMap-HS6 database. Tariff peak: AVE above 15%.

Table 3 – (Trade-weighted) average applied protection in agri-food sectors between TPP countries, in 2010 (%)

Importers	Partners											
	Australia	Brunei	Canada	Chile	Japan	Malaysia	Mexico	New Zealand	Peru	Singapore	Vietnam	USA
Australia	.	1.4	1.3	1.0	2.0	0.6	1.3	0.0	1.4	0.0	0.6	0.0
Brunei	2.4	.	3.6	26.5	27.3	4.1	42.8	0.7	14.1	12.1	3.0	6.9
Canada	11.4	62.9	.	4.9	22.9	7.2	3.6	39.9	0.5	36.2	1.4	10.7
Chile	6.1	0.1	2.2	.	2.6	6.0	0.1	3.7	1.5	0.5	6.0	1.2
Japan	32.6	44.9	25.6	12.9	.	5.6	9.9	36.4	8.3	25.9	29.5	21.5
Malaysia	3.3	1.1	3.4	13.0	20.2	.	36.6	1.6	17.9	16.1	21.0	7.9
Mexico	30.7	21.1	3.2	2.6	14.1	9.9	.	29.2	25.9	23.1	10.7	1.0
New Zealand	0.0	0.0	0.2	0.0	2.8	0.9	0.9	.	0.4	0.0	0.7	1.5
Peru	6.0	6.6	2.7	0.8	4.0	2.7	4.6	2.7	.	4.0	4.5	3.4
Singapore	0.0	0.0	1.1	0.0	0.0	0.0	19.0	0.0	0.2	.	0.0	0.0
Vietnam	6.4	4.0	4.7	21.9	20.4	5.2	18.9	6.4	14.9	23.8	.	13.4
USA	5.2	9.1	1.4	1.3	6.5	3.0	0.1	6.6	0.5	3.0	2.4	.

Note: Authors' computation using MAcMap-HS6 database.

1.4. Non-tariff measures

With the reduction in tariffs under successive GATT/WTO agreements and growing consumer concerns about food safety and quality, NTMs are playing an increasing role in international trade. NTMs are defined as policy interventions other than tariffs that affect the trade of goods. Agri-food products are extensively affected by NTMs (UNCTAD, 2005).

Contrary to tariffs, the trade and welfare effects of NTMs are ambiguous. The ambiguity is twofold. Firstly, regulations are often necessary to prevent market failures and correct negative externalities, but domestic regulations may also be imposed simply to impede imports by foreign competitors (Beghin, 2008). External effects arise when consumers' utility (or producers' production) is affected by decisions taken by other agents who do not include these externalities in their decision making. For example, pesticides used in production may affect consumers' health (van Tongeren et al., 2009). Secondly, the implementation process required to comply with NTMs is costly and may exclude some producers from the market. However, NTMs can also help to improve market access by enhancing the reputation of foreign products. In such cases, NTMs may act as trade catalysts.

1.4.1. Descriptive statistics

We focus our analysis on the two main types on NTMs adopted by TTIP and TPP countries and affecting trade flows, namely the SPS and TBT measures. We use the notifications made by these countries to the World Trade Organization (WTO).[8] Each notification provides information on the notifying country (the importer), the affected product (defined at the HS 4-digit level) and the type of measure (SPS versus TBT). We cover all measures notified up to the end of 2012. Our dataset is therefore more up to date than the database developed by Kee et al. (2009) and often used in literature.[9] Unfortunately, WTO members are required to notify only new or changed measures. Furthermore, the notification requirement only covers measures which differ from international standards, guidelines or recommendations, or situations where no standards exist, and which, in addition, may have a significant impact on trade. As suggested in the literature, this affects the result of any analysis on their trade and welfare impacts.

Before presenting descriptive statistics, it should be recalled that NTMs are unilateral measures in almost all cases, i.e. they apply to a given product regardless of its origin. Furthermore, mutual recognition is applied between EU Member States. According to the mutual recognition

[8] These notifications are used by the WTO in its 2012 World Trade Report (WTO, 2012) and are available through the Integrated Trade Intelligence Portal (I-TIP) (http://www.wto.org/english/res_e/statis_e/itip_e.htm). Note that the product codes are often missing in the I-TIP database and were added at the HS 4-digit level by the Centre for WTO Studies of the Indian Institute of Foreign Trade (http://wtocentre.iift.ac.in/). The recent NTM data jointly collected by the World Bank, the UNCTAD and the African Development Bank and available on the WITS (World Bank's portal for trade data) could not be used for our research, the country coverage being limited (data are missing for 8 of the 12 TPP countries, and especially for the US).

[9] Kee et al. (2009)'s NTM data are for the year 2004 in the best case (and are likely to be older for some countries).

principle, goods and services can move freely across Member States, and national legislation does not need to be harmonized. To avoid bias, we therefore exclude intra-EU trade flows from our NTMs' analysis.

Table 4 provides some statistics on the share of agri-food and non agri-food products (defined at the 6-digit level of the HS classification) affected by at least one NTM in the US, EU and TPP countries (others than the US). These statistics are further broken down between SPS and TBT measures. A very large share of products are affected by NTMs in these markets; however, the results suggest some differences between agri-food and non agri-food products. TTIP and TPP countries notify SPS and TBT measures on almost all agri-food products. For non agri-food products, the picture is slightly different. Firstly, the US notifies fewer NTMs on non agri-food products than the EU and other TPP countries (78.6% vs. 95.8%). Secondly, NTMs on these products are mainly TBTs. The share of SPS measures notified on non agri-food products is below 20% for the US and the EU and around 50% for the TPP countries (excl. US).

Table 4 – Share of products affected by at least one NTM, in 2012 (%)

	NTM		of which SPS		of which TBT	
	Agri-food products	Non agri. products	Agri-food products	Non agri. products	Agri-food products	Non agri. products
In the US	99.2	78.6	98.0	19.7	87.5	76.2
In the EU	99.6	95.8	97.2	19.3	99.6	95.4
In TPP countries (excl. US)	100.0	95.8	98.9	52.9	98.7	93.2

Note: Authors' computation using WTO notifications. TPP countries: simple average across countries (US excluded). Agri-food products: Products included in the WTO Agreement on Agriculture plus HS Chapter 3 (fish and fish products).

All sectors are affected by NTMs, with coverage ratios (i.e. the share of HS6 lines affected by at least one SPS or TBT within a sector) well above 50%.[10] For the US, EU and TPP countries, the coverage ratio is above 95% for all agri-food sectors.

1.4.2. Computation of AVEs of NTMs

We next tackle the trade impact of NTMs notified by TTIP and TPP countries. We estimate ad valorem equivalents (AVEs), i.e. the level of ad-valorem tariffs that would have an equally trade-restricting effect as the NTMs in question. These AVEs allow comparison between the trade effects of different NTMs and will be further used in the CGE simulations (see section 2).

To compute these AVEs, we apply the method suggested by Kee et al. (2009). We first estimate the quantity impacts of NTMs on trade flows and then convert these effects into AVEs using import demand elasticities computed by Kee et al. (2008). We use the information on NTMs at the HS6 product level and perform the estimations sector by sector. We define 25 sectors (17 agri-food and 8 non agri-food sectors), which are the ones used in the CGE simulations. As

[10] Due to space constraints, results are not reported but available from the authors.

the CGE model covers the whole world economy, our sample is now extended to non agri-food activities and includes TTIP, TPP but also third countries.[11] We select all countries notifying NTMs at the WTO and collect all measures adopted up to 2012. Our final sample takes in 125 countries and covers 92.5% of world trade flows in 2012. Lastly because of the strong correlation between SPS and TBT - especially for agri-food products on which countries often notify both types of measures (see Table 4) - we estimate the global effect of NTMs and not the respective effects of SPS and TBT.

Our dependent variable, M_{rsi}, is the dollar value of imports of good i by country s from country r. We consider only trade flows that are strictly positive in 2012.[12] The estimated cross-section trade equation is as follows:

$$\ln M_{rsi} = a_0 + a_1 tariff_{rsi} + a_2 NTM_{si} + a_3 distance_{rs} + a_4 cbord_{rs} + a_5 clang_{rs} + FE_r + FE_s + FE_i + \varepsilon_{rsi} \quad (1)$$

where $tariff_{rsi}$ measures the bilateral applied protection on product i, while NTM_{si} is a dummy set to one if the importing country notifies at least one NTM (SPS and/or TBT) on the product i (0 otherwise). $dist_{rs}$ is the bilateral distance between both countries r and s; $cbord_{rs}$ and $clang_{rs}$ are dummies to control for common border and common language. FE_r, FE_s and FE_i are respectively exporter, importer, and product fixed effects. ε_{rsi} is the error term. The country fixed effects incorporate size effects but also the price and number of varieties of the exporting country, the size of demand and the price index of the importing country. They allow us to avoid the most common mis-specification found in the literature relying on the traditional simplest gravity framework, i.e. the lack of control for unobserved relative prices. Baldwin and Taglioni (2006) refer to this as 'the gold medal of classic gravity model mistakes', namely the fact that the bilateral trade costs used as regressors in the estimated equation are correlated with the omitted variable since trade costs enter into these unobserved prices.

Our tariff data come from the MAcMap-HS6 database and are for the year 2010 (2012 tariffs are not available). NTMs are extracted from the WTO I-TIP database and our trade data from the BACI database (cf. *supra*). Both sets of data are for 2012. Bilateral distance - proxy for the trade costs - stems also from the CEPII and is defined as the sum of the bilateral distances between the biggest cities of countries, weighted by the population living in those cities.[13] The two dummy variables 'Common border' and 'Common official language' are also extracted from the above-mentioned CEPII database.

[11] A service sector is also included in the CGE model and AVEs for services come from Fontagné et al. (2011).
[12] The absence of bilateral trade between some countries and for some products may result from many determinants other than tariffs and NTMs, such as endowments or absence of demand. By focusing on strictly positive flows, we do not attribute these zeros to restrictive tariffs and/or NTMs.
[13] http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=6.

Estimations run sector-by-sector provide a coefficient reflecting the trade effects of NTMs for each sector. These coefficients are then converted into importer-HS6 AVEs using the import demand elasticities (Kee et al., 2008). AVEs are, as a final step, aggregated at sector level and further used in the CGE simulations (cf. section 2).

Table 5 reports some summary statistics on these importer-HS6 AVEs for TTIP and TPP countries. First, the mean AVEs are quite high, especially compared to tariffs (Table 2). Second, the breakdown into agri-food and non agri-food products clearly shows that AVEs of NTMs are much higher in agriculture. This (expected) result holds for all countries. The mean AVEs for agri-food products are about four times larger than the mean AVEs for non agri-food ones in the US and EU and about 7 times larger in the TPP countries (excl. US). Third, mean AVEs in the EU are slightly larger than in the US and TPP countries (excl. US): 15.0% on all products for the EU versus 12.8% for the US and 10.0% for TPP countries.

Table 5 – Estimation of AVEs of NTMs: summary statistics, in 2012 (%)

	Mean		
	All products	Agri-food products	Non agri-food products
US	12.8	35.7	8.7
	(38.7)	(66.7)	(29.2)
EU	15.0	40.1	10.4
	(24.8)	(45.8)	(14.6)
TPP countries	10.0	36.7	5.1
	(23.6)	(47.1)	(10.1)

Note: Mean AVE: simple average across HS6 products. TPP countries: simple average across countries (US excluded). Agri-food products: Products included in the WTO Agreement on Agriculture plus HS Chapter 3 (fish and fish products). Standard deviation across products in parentheses.

Even though their magnitude may appear to be rather large, our AVEs on agri-food products are around 10 points lower than the ones computed by Kee et al. (2009).[14] Their mean AVEs on agri-food products are equal to 46.7% for the US, 49.8% for the EU, and 48.3% for TPP countries (other than the US). Two main facts may explain these differences: the time period covered by the data (2004 for Kee et al. (2009) and 2012 for our data) and the country and product coverages. Some products, as well as several EU and TPP countries are missing in Kee et al. (2009)'s sample.

[14]AVEs computed by Kee et al. (2009) are available on the World Bank's website. These elasticities are computed for the beginning of the 2000s, but are still the only ones that are available in the trade literature.

2. Modeling framework

Evaluating the potential impact of trade agreements on the world economy leads to many issues, from tariffs to NTMs, along with the medium-term dynamics of trade patterns. Knowing that it is impossible to carry out a detailed and accurate analysis of all these issues for each sector, we propose a consistent framework common to all sectors, in order to derive comparative conclusions about the substitutability or complementarity between the Atlantic and Pacific agreements. We encompass tariffs as well as NTMs impacting trade in goods and services, by using MIRAGE,[15] a CGE model of the world economy developed by CEPII.

While various CGE models have been used for assessing the impact of the Atlantic (Francois et al., 2013; Felbermayr et al., 2013; Bureau et al., 2014), or Pacific Agreement (Petri et al., 2012), no study currently offers both a detailed perspective on the agri-food sectors and a comparative look at the two agreements. Our paper therefore aims to fill this gap.

2.1. On general equilibrium analysis of trade agreements

CGE models are widely used to conduct ex-ante assessments of trade agreements. The framework they offer is relevant for investigating in a consistent way both the interdependencies between economies through trade and the feedbacks from income effects and factor markets. CGE models also contribute to the analysis on economies' reactions to a new environment following a policy shock. The numerical results should however be interpreted with caution. Some dimensions (for example, consequences in terms of employment) of trade agreements are not accounted for in the assessment (see Stanford (2003) on NAFTA Agreement).

The main benefit of the CGE approach lies in its consistency and exhaustiveness, all sectors and countries in the world being included in the analysis. One must however rely on a systematic methodology that requires rather strong assumptions. To deal with NTMs, we rely on their AVEs. The very objective of such measures (health and/or environment protection, etc.) can indeed not be incorporated in the model. Furthermore, some measures that are prohibitive cannot be explicitly modeled, especially when they are related to only one part of the output of a sector. For instance, we cannot distinguish hormone-fed and hormone-free beef. We however depart from existing evaluations, and contribute to the literature in two ways on the model side. First, we refine the structure of potential costs implied by NTMs, by taking advantage of the information available at the HS-6 digit level in order to build precise and consistent bilateral AVEs (cf. Section 1.4.2 for their computation). Second, we account for potential externalities in terms of rent creation by NTMs (and rent reduction due to their removal).

[15] The version used is nicknamed MIRAGE-e 1.0. A two-page summary of the model is provided in Appendix A. The full set of equations is available in the online appendix (Link to be added). Technical presentation can be found in Bchir et al. (2002), Decreux and Valin (2007) and Fontagné et al. (2013).

2.2. Which impacts for which NTMs?

As pointed out in the literature, for instance by Walkenhorst and Yasui (2005) or Fugazza and Maur (2008), NTMs can have three different types of trade effects. The first one is a direct increase in export costs, due to the necessity to comply with specific requirements and/or to obtain certification to access the destination country's market. This effect is called the "trade-cost" effect. The second corresponds to a "supply-shifting" effect: certain regulations or bans can reduce the supply in some sectors. This impact is of particular importance with genetically modified organisms, or hormone-feed beef. Finally, the third effect acts as "demand-shifting". This happens when NTMs affect consumers' behavior, such as labeling of products. The two first effects are trade-impeding, while the "demand" effect is ambiguous.

Fugazza and Maur (2008) point that the "supply-shifting" and "demand-shifting" effects are not well known empirically, and to our knowledge this still is the case. The authors acknowledge the possibility that TBT measures may change the elasticity of substitution between imported goods, as well as between domestic and foreign goods in the Armington-style demand system. They are however unable to find estimates of these potential changes. Although these effects could be large in particular in the case of TTIP – since mutual recognition could represent a signal that may shift consumer preferences – we face the same data constraints as Fugazza and Maur (2008) and are not able to integrate the "supply-shifting" and "demand-shifting" effects in our model.

By contrast, we are able to tackle the issue related to the "trade-cost" component of NTMs in our CGE simulations, using our estimations of NTMs' AVEs (see Section 1.4.2). Existing evaluations of trade agreements including NTMs, and of the TTIP and TPP agreements in particular (Francois et al., 2013; Petri et al., 2012), consider this "trade-cost" effect as a pure efficiency loss (also called "sand-in-the-wheels"). This makes sense in many cases, such as regarding the losses (especially for perishable goods) due to the time spent at the customs. This does not however cover all the potential cost effects we can expect from the implementation of a NTM. In particular, many measures are not neutral regarding income: they can imply a rent that is captured by one side of the border or the other (e.g. the necessity to fill forms at the customs implies costs, such as wages or purchase of logistic services). Furthermore, in the presence of licensing measures, the monopolistic rent can benefit the local government (if auctions are organized for licences' allocation), foreign or local firms (depending on the allocation method). As noted by Walkenhorst and Yasui (2005), these three different ways of seeing a cost effect (no rent, rent attributed to locals, rent attributed to foreigners) are respectively equivalent in our context – perfect competition and a single agent representing consumers and the government – to the implementation of an efficiency loss, an import tax equivalent or an export tax equivalent.[16]

[16] In our version of the CGE MIRAGE model, this corresponds to an iceberg cost, an additional import duty and an additional export tax. See the online appendix for details about the equations.

The distinction between these cost effects and their equivalent is of prime importance. Their potential impacts on consumers' real income are indeed different, in particular regarding the terms of trade. Andriamananjara et al. (2003) underline that the removal of a NTM modeled as an export tax would increase both the terms of trade and the allocation efficiency of the liberalizing country, and thus increasing the real income of its consumers. By contrast, the removal of a NTM modeled as an import tax equivalent or an efficiency loss would decrease the terms of trade, but increase the allocation efficiency, leading to an ambiguous effect on the real income of consumers. As above-mentioned, previous evaluations of the TTIP and TPP agreements simply assume that all NTMs represent "sand-in-the-wheels", hence orienting the results toward one single direction. Without further information on these modeling alternatives, our approach remains agnostic by dividing the trade-restrictiveness effect of NTMs into three parts and allocating one third of it to be an efficiency loss, a third to generate rent to domestic producers and the last third to foreign producers.

2.3. Data and aggregation

The CGE MIRAGE model is a flexible tool that can be tailored to the specific needs of different policy questions. In the present case, we model the agri-food sector with as much details as possible. We consider 31 distinct sectors (16 agri-food industries, 7 manufacturing sectors, 6 services sectors and 2 energy sectors) and 24 geographical areas (the US, the EU, NAFTA in 2 regions, other TPP members in 5 regions, TPP potential members in 5 regions, and 10 other regions). Detailed aggregations are provided in Table 6 for sectors and Table 7 for regions.

MIRAGE relies on the Global Trade Analysis Project (GTAP) database for social accounting matrices (version 8.1). Tariffs are taken from the MAcMap-HS6 database (Guimbard et al., 2012) for years 2007 and 2010, while AVEs for NTMs in goods are taken from our own estimations (see Section 1.4.2). AVEs for NTMs in service sector are taken from Fontagné et al. (2011).

The estimated coefficients for the trade restrictiveness of NTMs a_2 of equation (1) are specific to each HS-4 level categories, and constant worldwide. We first convert them into an importer-HS6 specific AVE, denoted by $\alpha_{s,i}$ by using import demand elasticities $\varepsilon_{s,i}$ provided by Kee et al. (2008):

$$\alpha_{s,i} = \frac{\exp(a_2) - 1}{\varepsilon_{s,i}} \tag{2}$$

Although we have information on tariffs and NTMs at the HS-6 level (respectively $\tau_{r,s,i}$ and $\alpha_{s,i}$) the CGE MIRAGE model is not defined at such detailed level, which would require too complex data, and only includes 24 regions and 31 sectors. When aggregating tariffs and AVEs from the country-HS6 level (r, s, i) to the MIRAGE aggregation level (R, S, I), we take advantage of two precious pieces of information. First regarding NTMs, we consider the contribution of an HS6 line to the aggregate AVE only if at least one NTM is actually implemented on the

Table 6 – Sector aggregation

Agri-food	**Industry**
Cereals [a]	Clothing [e]
Vegetable, fruits and nuts (v_f)	Chemical, rubber and plastic products (crp)
Oil seeds (osd)	Metal products [f]
Sugar, sugar cane and beet [b]	Transport equipment [g]
Plant-based fibers (pfb)	Electronic devices (ele)
Other crops (ocr)	Machinery and Equipment (ome)
Live animals (ctl)	Other manufacturing [h]
Red meat (cmt)	**Services**
White meat (omt)	Business Services [i]
Milk and dairy products [c]	Transport [j]
Other animal products [d]	Finance and insurance [k]
Forestry (frs)	Recreation and other services (ros)
Fishing (fsh)	Public administration (osg)
Vegetable oils and fats (vol)	Other services [l]
Beverages and tobacco products (b_t)	**Energy and other primary**
Other food products (ofd)	Energy [m]
	Other primary (omn)

Note: 'nce' means 'not classified elsewhere'

[a] Paddy rice (pdr), Wheat (wht), Cereal grains nce (gro), Processed rice (pcr).

[b] Sugar cane and sugar beet (c_b), Sugar (sgr).

[c] Raw milk (rmk), Dairy products (mil).

[d] Textiles (tex), Wearing apparel (wap), Leather products (lea).

[e] Wool, silk-worm cocoons (wol), Animal products nce (oap).

[f] Ferrous metals (i_s), Metals nce (nfm), Metal products (fmp).

[g] Motor vehicles and parts (mvh), Transport equipment nce (otn).

[h] Wood products (lum), Paper products and publishing (ppp), Minerals production nce (nmm), Manufactures nce (omf).

[i] Trade (trd), Business services nce (obs).

[j] Sea transport (wtp), Air transport (atp), Transport nce (otp).

[k] Insurance (isr), Communication (cmn), Financial services nce (ofi).

[l] Water (wtr), Construction (cns), Dwellings (dwe).

[m] Coal(coa), Oil (oil), Gas (gas), Gas manufacture and distribution (gdt), Petroleum and coal products (p_c), Electricity (ely).

Table 7 – Country aggregation

European Union (28)	**Other countries**
USA	Brazil
Other NAFTA	Argentina
Canada	European Free Trade Area
Mexico	Other Europe
TPP Members	Russian Federation
Australia and New Zealand	Turkey
Chile and Peru	Other Middle East
Singapore, Malaysia and Vietnam	North Africa [b]
Japan	Other Africa
Other ASEAN [a]	Rest of the World [c]
TPP Potential members	
China	
India	
Korea	
Other Asia	
Other Latin America	

Note: 'nce' means 'not classified elsewhere'

[a] Cambodia, Indonesia, Lao PDR, Philippines, Thailand, Rest of South-east Asia.

[b] Egypt, Morocco, Tunisia, Rest of North Africa.

[c] Rest of Oceania, Rest of North America, Rest of the World.

(r, s, i) trade flow, by using dummy variables $\delta_{r,s,i}$ built from WTO notifications. Second, the MAcMap-HS6 database provides us information on the weights $\omega_{r,s,i}$ of each disaggregated flow, which can be further used for the aggregation of tariffs and NTMs from the HS6 to the MIRAGE levels. These weights are computed using the "reference-group" method in which each country is affected to one of the 5 world regions (the reference groups) that shares similar characteristics, using hierarchical clustering analysis. The weight for each flow is ultimately the share of good i in imports of the whole reference group originating from region r, scaled by the size of country s' imports in its reference group (for more details, see Guimbard et al., 2012). The main interest of such weights, compared to a simple weighting by trade flows, is to take into account at least part of the prohibitiveness of certain transaction costs: a measure that would completely prevent trade would result in a null contribution to a trade-weighted average, whereas it would imply a positive contribution to the reference-group-weighted aggregate. Letting $G(s)$ denote the reference group of country s, and (ρ, ι) denote the same country-HS6 level as (r, i):

$$\omega_{r,s,i} = \frac{M_{r,G(s),i} \sum_{\rho,\iota} M_{\rho,s,\iota}}{\sum_{\rho,\iota} M_{\rho,G(s),\iota} - \sum_{\iota} M_{s,G(s),\iota}} \tag{3}$$

$$ave_{R,S,I} = \frac{\sum_{(r,s,i)\in(R,S,I)} \omega_{r,s,i}\delta_{r,s,i}\alpha_{s,i}}{\sum_{(r,s,i)\in(R,S,I)} \omega_{r,s,i}} \tag{4}$$

$$tariff_{R,S,I} = \frac{\sum_{(r,s,i)\in(R,S,I)} \omega_{r,s,i}\tau_{r,s,i}}{\sum_{(r,s,i)\in(R,S,I)} \omega_{r,s,i}} \tag{5}$$

3. Scenario assumptions

In this section, we present our business-as-usual scenario, as well as the scenarios we implemented to build our analysis of both the Atlantic and Pacific agreements.

3.1. Business-as-usual

Before considering counterfactual scenarios, a business-as-usual (BAU) path for the world economy, referred to as the 'baseline' simulation, is simulated up to 2025. The design for this BAU scenario is two-folds. First, in order to have consistent projections for overall total factor productivity and trajectories for production factors (labor force, education level, capital accumulation), we rely on the macro-economic projections from the EconMap database.[17] Second, we also take into account 3 foreseeable changes in order to reflect the context in which potential Atlantic and Pacific agreements would take place:

[17]For a detailed description of the MaGE model, which is used to produce the EconMap database, see Fouré et al. (2013). The version used is MaGE/EconMap 2.3.

Data update MIRAGE base data is for year 2007, whereas MAcMap tariff data are also available for year 2010. We therefore implement a global tariff update linearly between 2007 and 2010.

The EU For the same reason, we implement the completion of the EU Single Market on the tariff side (full liberalization with Romania and Bulgaria in 2008, with Croatia in 2013, and adoption of the EU external tariff by Croatia in 2013).

Known free trade agreements According to the WTO database on regional trade agreements,[18] many bilateral agreements have entered into force since 2007, or have been signed and will enter in force in the coming years. We counted 100 in-force agreements, 5 signed RTAs and 23 potential agreements currently under negotiation (apart from the TTIP and TPP). Our baseline scenario considers the first two categories ("in-force" and "signed"), and implements a simplified version of these agreements. Tariffs are reduced by 100%, linearly, but with three different paces depending on the HS-6 line considered: (i) tariffs are set to zero the year the agreement enters in force for half of the products (e.g. less sensitive products, i.e. HS-6 lines with the lowest initial tariffs); (ii) a linear liberalization in 3 years for the next quarter of products; and (iii) a linear liberalization in 5 years for the remaining quarter (e.g. most sensitive products, i.e. those with the highest initial tariffs).[19] This full liberalization happens between 2008 and 2013. While this assumption could seem very rough, our objectives were to prevent our results from attributing to the TPP agreement the outcomes of already-signed agreements, as well as including the changes in revealed comparative advantage due to such agreements (especially when the EU or the US are involved). Therefore, such basic implementation in our BAU scenario is sufficient.

The economic impacts of the Atlantic and Pacific agreements will be computed as the difference between a path incorporating their enforcement, and this baseline.

3.2. Scenarios for the Atlantic and Pacific agreements

This section reviews the potential outcomes of an Atlantic and Pacific agreements, and details the simulated scenarios. For both agreements, we implement full tariff liberalization, using the same scheme as in the BAU path: HS-6 lines are split depending on their initial tariffs, with differentiated reduction speeds (instantaneous liberalization for half of the lines (the less protected ones), 3 years for the following quarter and 5 years for the most sensitive quarter). [20]

[18]RTA-IS available at http://rtais.wto.org, consulted in June 2014.

[19]In the remainder of this paper, the term "full liberalization" will denote the same scheme.

[20]In MAcMap-HS6, the applied tariff AVE for a product under a Tariff Rate Quota (TRQ) is the relevant marginal rate of the TRQ (depending on the quota fill rate). In our scenarios, AVEs for products with TRQs are set to zero, following the same scheme as other products. This assumption may have a non-negligible impact in the European

The Atlantic agreement On the tariff side, we implement a full liberalization between 2015 and 2020. The potential outcome in terms of NTMs is less easy to forsee. The literature relies on a single evaluation by Ecorys (2009) – 25% reduction in the trade-restrictiveness of NTMs – that is not a measure of the potential outcome of negotiations but rather half the amount of reduction that European and American entrepreneurs and regulators think achievable *given that the political will exists*.[21] Although not fully satisfactory, this is the only information we have. We therefore assume as out central TTIP scenario a 25% cut in trade restrictiveness of NTMs. However, we consider that, given the current opposition to the agreement in the civil society, and the fact that the European Commission has already excluded some topics from the negotiation (e.g. cultural and audiovisual services), the *political will* may not be sufficient to achieve a 25% cut, and we test the sensitivity of our results to a 0% cut and a 10% cut in NTM trade-restrictiveness.

The Pacific agreement The Pacific agreement is more likely to include only a reduction in tariffs, that we implement as a full liberalization between 2015 and 2020 to maintain the symmetry between both the Atlantic and Pacific agreements. However, as it happened within the ASEAN+6 agreement, some NTM provisions may be included in the future TPP negotiations. Uncertainty also lies in the final list of country members associated to the Pacific agreement. Some countries have indeed expressed their interest in joining the negotiations (Colombia, Indonesia, Laos, the Philippines, South Korea and Thailand), while others are often mentioned as possible candidates (Bangladesh, Cambodia, China, and India). This extension is very likely to happen for Cambodia, which is already an ASEAN member, and for China and India which have already negotiated an FTA with ASEAN. These two options – inclusion of NTMs ("deep Pacific") and expansion of TPP country coverage ("broad Pacific") – will be handled as a sensitivity analysis in Section 5.2.

Simulated scenarios We consider seven scenarios, all implemented between 2015 and 2020. The two first scenarios ("A" and "P") only include one agreement, while the remaining five include both the Atlantic and Pacific agreements but different assumptions in terms of trade liberalization. The central scenario is "A / P" and represents a stylized version of potential agreements. "A / Broad P" and "A / Deep P" are sensitivity analysis scenarios around the Pacific agreement, encompassing respectively the extension of TPP to all potential members, and the inclusion of NTMs in the agreement. Finally, "A 10% / P" and "A Tariff / P" model two less ambitious versions of the TTIP Agreement, respectively cutting NTM AVEs by 10% and excluding NTMs from the negotiations. All scenario assumptions are summarized in Table 8.

beef sector, where TRQs are important.

[21] Ecorys (2009) defines the "Actionability" of an NTM as "the degree to which an NTM of regulatory divergence can potentially be reduced (through various methods) by 2018, given that the political will exists to address the divergence identified" and mixes business surveys, literature review, sector experts and consultations with EU and US regulators to determine it.

Table 8 – Summary of alternative scenarios

Scenario	Atlantic assumptions	Pacific assumptions
A	Full tariff liberalization ; 25% cut in costs of NTM	–
P	–	Full tariff liberalization
A / P	Full tariff liberalization ; 25% cut in costs of NTM	Full tariff liberalization
A / Broad P	Full tariff liberalization ; 25% cut in costs of NTM	Full tariff liberalization ; Potential members included
A / Deep P	Full tariff liberalization ; 25% cut in costs of NTM	Full tariff liberalization ; 25% cut in cost of NTM
A 10% / P	Full tariff liberalization ; 10% cut in costs of NTM	Full tariff liberalization
A Tariff / P	Full tariff liberalization ; 0% cut in costs of NTM	Full tariff liberalization

The next section presents the results for these scenarios, first focusing on the central assumptions ("A", "P" and "A / P"), then analyzing the sensitivity of these results to alternative specifications.

4. Quantitative results

4.1. US agri-food sectors expand at the expenses of their partners

We first identify whether (and which) countries have an interest in signing an agreement. Simulations are run separately for the Atlantic and Pacific agreements, i.e. reported results correspond to the two first scenarios "A" and "P" of Table 8. Table 9 displays total and agri-food trade variations due to both agreements, while Table 10 describes the variations in agri-food value added within countries. Our key conclusion is as follows: *When agri-food sectors are at stake, the US are the main winner in both the Atlantic and Pacific Agreements. Furthermore, the US gain at the expenses of their partners, the majority of them facing reduction in production.*

In terms of trade effects, both Agreements leads to trade creation for almost all partners. Table 9 suggests that the Atlantic and Pacific agreements impacts on overall world trade have comparable order of magnitude, especially regarding agri-food sectors. According to our results, the agreements lead to an increase in agri-food trade of 30.9 billions USD in the Atlantic case and of 34.3 billion USD in the Pacific case.

From the US point of view, the Atlantic agreement induces a higher net export growth than the Pacific one. For the Atlantic Agreement, US export growth reaches 149 billion USD (+29.9%) for all sectors, and 35 billion USD (+159.0%) for agri-food. For the Pacific Agreement, these numbers are respectively 35 billion USD (+10.5%) for all sectors, and 19 million USD (+48.6%) for the agri-food ones.

Table 9 – Variation in agri-food trade compared to BAU, billion 2007 USD and contribution of agri-food sectors to total variation in trade (pct. points), 2025

Agreement	Exporter	Importer	Agri-food	Total	Contribution of Agri-food to total (%)
Atlantic agreement	EU	USA	11.6	111.0	10.4
		EU	-10.1	-48.9	20.7
	USA	EU	34.9	149.2	23.4
	Total World		30.9	173.4	17.8
Pacific agreement	USA	Other NAFTA	9.9	3.0	331.3
		Other TPP	9.3	32.4	28.9
	Other NAFTA	USA	3.6	7.9	46.2
		Other TPP	6.2	8.1	76.9
		Other NAFTA	0.5	0.6	95.0
	Other TPP	USA	1.8	21.5	8.2
		Other NAFTA	4.3	17.7	24.0
		Other TPP	-1.2	3.0	-41.7
	Total World		30.8	82.2	37.4

Note: Authors' calculations.

Within the Atlantic agreement, the increase in US agri-food export flows (+159.0%) is much stronger than the one observed for EU countries (+55.5%). Furthermore, some trade deflection effects are at play between EU countries. The trade reduction within the EU is quite slight in percentage terms (-2.7% in agri-food) but represents more than 10 billions USD.

The Pacific agreement also leads to trade creation. In terms of percentage, the bigger trade increases are observed between Mexico, Canada and the other TPP countries: +50.6% for Mexican and Canadian exports to other TPP countries and +94.9% for the other TPP countries' exports to Mexico and Canada. However, in value terms, the strongest increase is for the US exports to Mexico, Canada and other TPP countries (+19.2 billion USD). As for the Altantic agreement, a small trade deflection is also found across TPP countries other than NAFTA ones (-1.1%).

According to Table 9, the agri-food sector is more sensitive to trade liberalization than other sectors. Agri-food flows indeed exhibit bigger percentage changes than overall flows. However, agri-food represents a limited share of total trade gains (11.7% of EU-US trade gains, 24.0% for US-EU and 20.2% for TPP-US). This only exception is for US gains in the TPP agreement, where agri-food gains represent 59.5% of total gains.

In terms of agri-food value added, both agreements show similar patterns. While the US agri-food value-added expands, almost all other countries contract their production (Table 10).

The Pacific agreement entails moderate losses, except for Canada (-2.7%), which suffers from an erosion of its existing preferential access (both due to initial preferences and the NAFTA agreement) to the US. Japanese production also registers a significant decline (-3.4%). This decline is concentrated in few sectors (fruits and vegetables, beverages and tobacco, and other

Food), where Australia, New Zealand and the US have strong comparative advantages. Due to their comparative advantages, Australia and New Zealand's agri-food value added benefits from the Pacific agreement (+2.5%). Furthermore, New Zealand also gains from the opening of the Japanese and Canadian dairy markets, which are currently very protected (tariffs are initially respectively at 99% and 142%).

The Atlantic scenario results in a decrease in European agri-food value-added (-0.9%). Thus, for the EU, the increase in trade flows is compensated by the decrease in inner trade entailed by the agreement. Finally, Table 10 shows that the Atlantic agreement does not impact much Pacific countries' value-added and vice versa.

Table 10 – Variation in agri-food value-added, percentage change, 2025

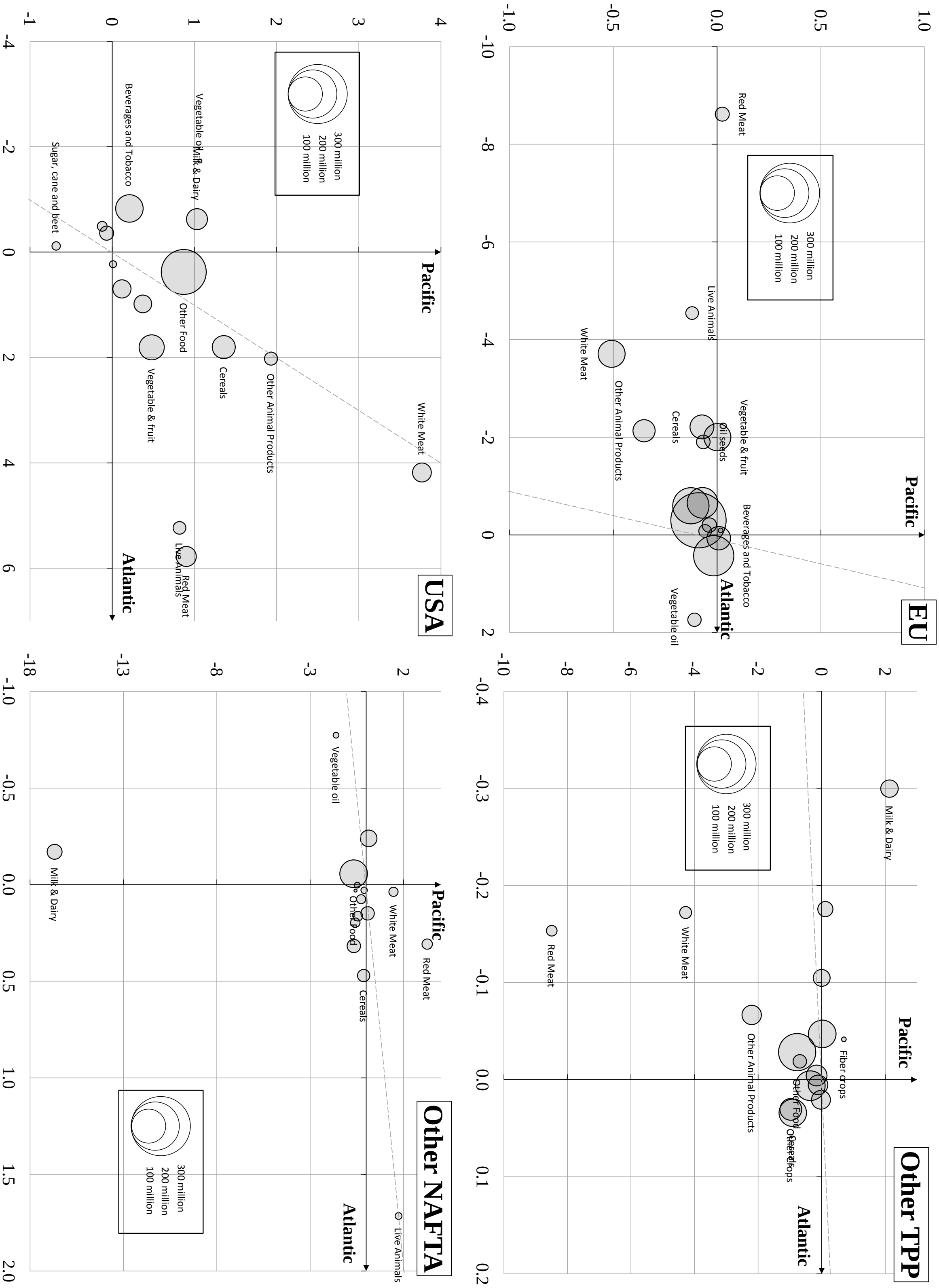
Region	Scenarios	
	Atlantic	Pacific
US	1.1	0.8
EU	-0.9	-0.1
Other NAFTA	0.0	-1.4
Canada	0.0	-2.7
Mexico	0.1	-0.6
Other TPP	0.0	-0.5
Chile, Peru	-0.1	-0.3
Singapore, Vietnam, Malaysia	0.0	-0.9
Other ASEAN	0.0	-0.3
Japan	0.0	-3.4
Australia, New Zealand	-0.1	2.5

Note: Authors' calculations.

4.2. Different sectoral issues at stake, leading to almost no competition between agreements

We now turn to the sector analysis of both agreements. The identification of sectoral critical issues is useful for drawing conclusions on the relative complementarity or substitutability between the Atlantic and Pacific agreements. Such analysis could be useful for the US (relative profitability of both agreements) and for the Atlantic and Pacific countries (cost of being excluded). We first present sectoral value-added variations, and extend our conclusions to the aggregate economy. Our results show that *offensive interests of US partners across the Atlantic and the Pacific are very different, while their defensive interests are more alike. As a consequence, losses resulting from countries being excluded from an agreement with the US are limited.*

Figure 5 – Comparative variation in agri-food value-added due to potential Pacific and Atlantic agreements (pct. variation) and initial agri-food value-added (million 2007 USD), 2025



Note: Authors' computation. Coordinates on the horizontal axis denote the variation in value-added (pct. points) due to the potential Atlantic agreement, while coordinates on the vertical axis denote the variation in value-added due to the potential Pacific agreement. The size of the bubbles denotes the size of value-added in the BAU scenario.
Scales differ from on panel to the other. Dotted lines represent the first bisector (where the impact is the same over the two agreements).

Value Added As the initial sectors' protection is not uniform (both in terms of tariffs and NTMs), the Pacific and Atlantic agreements do not have similar impacts across sectors (Figure 5). As previously mentioned, the US globally experience an increase in their agri-food value added in both agreements. At the sector level, white meat, cereals, other animal products, fruits and vegetables, and other food constitute US offensive sectors in both agreements (positive variation in value-added). By contrast, red meat and live animals represent an offensive interest only in the Atlantic scenario. The US also have some defensive sectors (negative variation in value-added): dairy, vegetable oils, beverages and tobacco in the Atlantic case, as well as sugar cane in the Pacific scenario (but this sector does not represent a big share of US agri-food production).

The Atlantic scenario negatively impacts EU value added in animal products (in particular red meat: -8.6%), while vegetable oils, and beverage and tobacco exhibit an increase in EU value added. It is worthwhile to note that the Pacific agreement alone impact European white meat value-added, due to the Australia and New Zealand competition on the US market. However, the scale of this variation is very small (-0.5%).

Within Pacific scenario, Canada and Mexico are the more affected countries. In both countries, the value added in red and white meat sectors is positively impacted, while dairy sector is negatively affected. Note however that these sectors are rather small in terms of production. A strictly opposite picture is obtained for other TPP countries, where the dairy sector represents an offensive interest (mainly for New Zealand), while white and red meat value-added is decreasing. Lastly, TPP countries' agri-food production in dairy, and white and red meat is affected by the Atlantic agreement, but the impact is rather limited (less than 0.3%).

Given the sector specializations of countries in both agreements, the competition effects between the EU and Pacific products on the US market are not likely to be important, even if both agreements are implemented simultaneously. However, since US offensive interests are the same on both TPP and TTIP markets, one may observe a saturation of the US production. In that case, trade and welfare gains will be lower than the sum of gains stemming from the Atlantic-only and Pacific-only scenarios. These issues are further analyzed in Section 5.1.

Real income Real income[22] is not much impacted by the trade liberalization within the Atlantic and Pacific areas (table 11). Both scenarios induce an increase in the real income of the agreement's members and a decrease for non-members (except for the group of other ASEAN countries, which registers losses even within the Pacific scenario).

[22] Real income is measured as the equivalent variation resulting from the implementation of the corresponding scenario. It encompasses both variations in revenue of the representative agent and changes in goods' prices. It differs from welfare because it only encompasses economic variables, and does not take into account variations in other sources of welfare (health, environment, etc.). It is worthy noting that the difference between real income and welfare may become larger when NTMs are at stake.

Table 11 – Variation in real income due to Pacific and Atlantic agreements (pct. points), 2025

Region	Atlantic	Pacific	A/P
US	0.15	0.04	0.20
EU	0.11	-0.01	0.10
Other NAFTA	-0.08	0.19	0.11
Canada	-0.08	0.32	0.24
Mexico	-0.07	0.01	-0.06
Other TPP	-0.03	0.13	0.10
Chile, Peru	-0.03	-0.02	-0.06
Singapore, Vietnam, Malaysia	-0.07	0.12	0.04
Other ASEAN	-0.04	-0.13	-0.17
Japan	-0.02	0.20	0.18
Australia, New Zealand	-0.02	0.20	0.19

Note: Authors' calculations. A/P stands for Atlantic and Pacific agreements simultaneously.

Gains and losses are however not uniformly distributed across countries. TPP countries globally loose more in the Atlantic scenario than EU countries in the Pacific one. The US see their real income increase in the two agreements, but to a larger extent in the Atlantic case. TPP agreement entails higher increase in real income for many US partners (in particular Canada, Japan, Australia and New Zealand) than for the US itself. On the other side, this scenario negatively impacts the real income of Chile and Peru. This last result can be explained by the very low tariffs these countries are already facing on other TPP markets and by their own current low tariffs. The same pattern is observed for "Other ASEAN countries", which already benefits from many agreements with other TPP countries.

4.3. Third countries may be significantly impacted by both agreements

The conclusion of any agreement could potentially be detrimental to third countries, *i.e.* countries not being part of any of the two agreements. This section examines how and why third countries could be impacted by an Atlantic or a Pacific agreement. According to our results, *some of them (Brazil, Argentina, EFTA countries) could face significant losses from being excluded from these agreements.*

We first investigate the impact of the Atlantic and Pacific agreements on third countries' overall agri-food value-added (Table 12). Potential TPP members are almost not affected at all, except the group of Other Latin American countries. Similarly, Eastern Europe, Middle-East and Africa do either not significantly suffer from an Atlantic or a Pacific agreement. By contrast, Latin America (especially Brazil and Argentina) and EFTA countries, which are historical partners of the US and the EU, face competition on their exporting market following the implementation of the TPP and TTIP agreements. The reduction in value added incurred by these countries is relatively high (respectively -0.4% for Argentina, -0.5% for Brazil, and -0.6% for EFTA countries) compared to the losses suffered by the US, the EU and TPP members when they are excluded from the agreements (less than 0.1%, see Table 10).

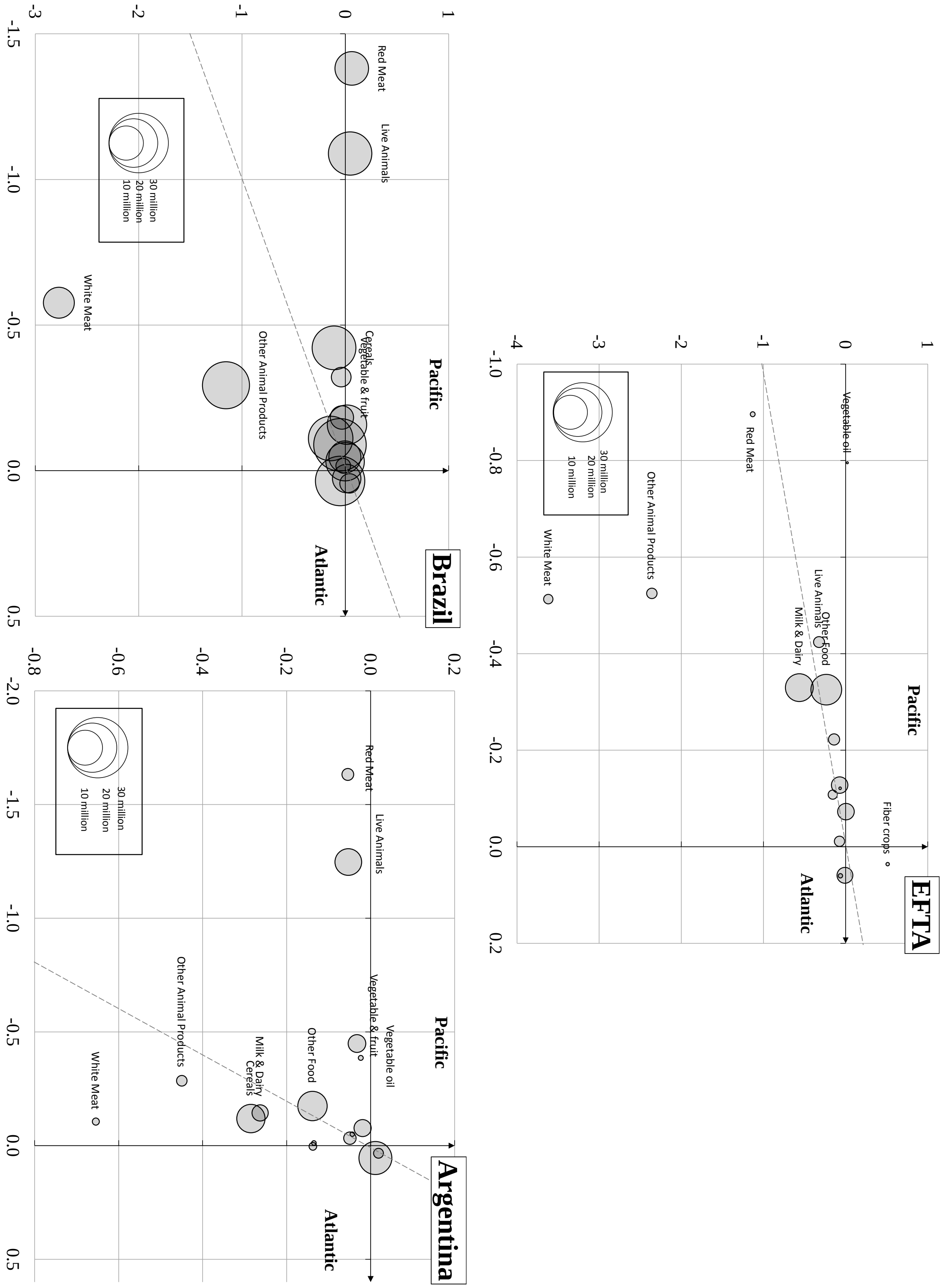
Table 12 – Variation in third countries' agri-food value-added, percentage change, 2025

Region	Atlantic	Pacific	A/P
Potential TPP members	0.0	0.0	-0.1
China	0.0	0.0	0.0
India	0.0	0.0	-0.1
Korea	0.1	0.0	0.1
Other Asia	0.0	0.0	-0.1
Other Latin America	-0.2	-0.1	-0.3
Third countries	-0.1	-0.1	-0.2
Argentina	-0.3	-0.1	-0.4
Brazil	-0.3	-0.2	-0.5
EFTA	-0.2	-0.4	-0.6
Russia	0.0	-0.1	-0.1
Other Europe	-0.1	0.0	-0.1
Turkey	0.0	0.0	0.0
Other Middle East	-0.1	0.0	-0.1
North Africa	-0.1	0.0	-0.1
Sub-saharan Africa	0.0	0.0	-0.1

Note: A/P stands for Atlantic and Pacific agreements simultaneously.
Source: authors' calculations.

Figure 6 details the impact of both agreements on Argentina, Brazil and EFTA countries' value-added at the sector level. For a majority of sectors in these three countries, the variation in value-added is small (around 0.1 %). Therefore, the losses in total agri-food value-added previously underlined are in fact driven by a few sectors. In Brazil, the sectors of white meat and other animal products are sensitive to both agreements. In addition, an Atlantic agreement also entails some risks for the sectors of cereals, red meat and live animals (as a consequence of the decrease in meat production). The profile of Argentina is similar to the Brazilian one in terms of sectors at risk: red meat and live animals in case of an Atlantic agreement, white meat and other animal products in case of a Pacific agreement. This reflects a comparable sector specialization in these two countries. However, the Pacific agreement affects less Argentina than Brazil, because TPP countries represent a smaller share of its exports (US and other TPP countries represent respectively 21% and 12% of Brazilian exports whereas they only account for 8% and 6% of Argentina's exports). EFTA agri-food sector is impacted by both agreements, but quite surprisingly to a higher extend by the Pacific one. Although EU is the main partner of EFTA countries, products exported by EFTA to the EU (other food products, fishing) are not products that will face important increases in the case of an Atlantic agreement. Hence, the Atlantic scenario has moderate impact of EFTA countries. On the other side, the US are the second market (after EU) for EFTA's milk and dairy exports, and the third market for other Food (after EU and Russia). Thus, EFTA access to the US market will be impacted in the case of a Pacific agreement, leading to a value-added reduction.

Figure 6 – Comparative variation in agri-food value-added due to potential Pacific and Atlantic agreements (pct. variation) and initial agri-food value-added (million 2007 USD), 2025



Note: Authors' computation. Coordinates on the horizontal axis denote the variation in value-added (pct. points) due to the potential Atlantic agreement, while coordinates on the vertical axis denote the variation in value-added due to the potential Pacific agreement. The size of the bubbles denotes the size of value-added in the BAU scenario.
Scales differ from on panel to the other. Dotted lines represent the first bisector (where the impact is the same over the two agreements).

5. Sensitivity analysis

5.1. No significant cross-agreement interactions when both are implemented

The Atlantic and Pacific agreements are likely to happen simultaneously, potentially leading to general equilibrium effects that could shade previous results. We show that *given the complementarity of issues at stake in both agreements, no significant interactions are likely to happen.*

Table 13 reports the variation in agri-food trade by importer and exporter in the Atlantic only scenario (A), in the Pacific only scenario (P), and in the simultaneous agreements scenario (A/P) (i.e. the three first scenarios described in Table 8). The comparison of trade variations across scenarios suggests few interactions between agreements and thus only slight general equilibrium effects. If both the Atlantic and Pacific agreements are implemented simultaneously, the competition between EU and TPP exporters on the US market reduces the gains of trade for the two groups of countries, as compared to the scenarios with single agreements. On the US side – as the US are exporting quite similar products to the EU and to TPP countries –, the "A/P" scenario results in a saturation of production in the US. Hence, the US have lower capacity to export and export less with each partner than in the Atlantic or Pacific only scenarios. This leaves more room for intra-regional trade, which appears to be indeed higher in the simultaneous scenario than in the scenarios with single agreement. As a consequence, the intra-EU trade deflection is smaller if both agreements are signed simultaneously, and the trade integration within the TPP (US excepted) stronger. At the national level, there is no significant interaction, since the variation in real income for every region in the world stemming from both agreements simply cumulate when the agreements are implemented simultaneously (Table 11).

Table 13 – Variation in agri-food trade, deviation from BAU, 2025

		Pct. points			Volume (billion 2007 USD)		
Exporter	Importer	Atlantic	Pacific	A/P	Atlantic	Pacific	A/P
EU	EU	-2.7	-0.1	-2.7	-10.1	-0.2	-10.3
	US	55.5	-0.8	53.8	11.6	-0.2	11.2
	Other NAFTA	0.7	-8.4	-7.8	0.0	-0.4	-0.4
	Other TPP	0.8	-6.5	-5.9	0.1	-1.2	-1.1
USA	EU	159.0	-0.7	157.0	34.9	-0.2	34.4
	Other NAFTA	-1.2	21.9	20.5	-0.6	9.9	9.2
	Other TPP	-1.8	26.7	24.4	-0.6	9.3	8.5
Other NAFTA	EU	-2.1	2.1	-0.1	-0.2	0.2	0.0
	US	-0.1	8.7	8.4	0.0	3.6	3.5
	Other NAFTA	0.7	20.7	21.4	0.0	0.5	0.5
	Other TPP	0.0	50.6	50.7	0.0	6.2	6.2
Other TPP	EU	-2.4	-0.2	-2.6	-0.7	-0.1	-0.7
	US	-1.2	10.3	8.4	-0.2	1.8	1.4
	Other NAFTA	0.4	94.9	95.2	0.0	4.3	4.3
	Other TPP	0.0	-1.1	-1.1	0.0	-1.2	-1.2

Note: Authors' calculations. A/P stands for Atlantic and Pacific agreements simultaneously.

In terms of overall performance, the outcomes of the two agreements for the US are more additive than competing. According to Table 13, US exports in the “A/P” scenario are almost equat to the sum of the Atlantic-only and Pacific-only trade expansion (though always slightly lower). Two mechanisms may explain this result. First, supply in sectors that are key to both the Atlantic and Pacific markets proves to be relatively elastic. For instance, the Pacific-only scenario has its highest diversion impact on US exports to the EU in ’Cereals’, ’Other Crops’, and ’Vegetables, fruits and nuts’, while these sectors are also among the biggest potential markets in the Atlantic-only scenario. Second, US main offensive interest on its Atlantic side (red meat) is subject to very limited deviation in case of a Pacific-only agreement.[23] Table 11 confirms these results at the national scale.

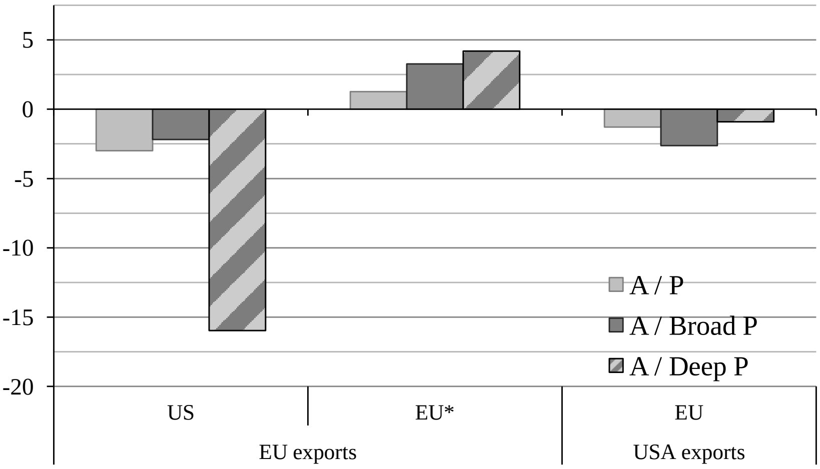
As emphasized in Section 3, a lot of uncertainty remains around what would be the real content of the Atlantic and Pacific agreements at the end of the negotiations. In the two following subsections, we test the sensitivity of our results to different negotiations’ outcomes. *The amount of cuts in NTM trade-cost effect appears to be a key element of cross-agreement interactions, while a broader geographic coverage for the Pacific agreement with additional Members (such as China, India, or South Korea) would not have significant consequences on Atlantic trade.*

5.2. A deeper Pacific agreement (with NTMs’ removal) may impact EU exports. A broader one (additional members) will have almost no impact on EU exports

We previously highlighted that transatlantic trade is little impacted in the case of a Pacific scenario (Table 13). We check the robustness of this result to a deeper (removal of NTMs) and broader (larger geographic coverage) Pacific agreement (scenarios 4 and 5 of Table 8). Figure 7 takes the trade variations induced by an Atlantic only scenario (A) as a reference and examines how these variations are affected by a Pacific agreement under different assumptions: the central (tariff-only) Pacific scenario (A/P), a broader Pacific agreement including potential partners like China or India (A/Broad P) and a deeper Pacific integration with 25% cuts in NTMs’ AVEs (A/Deep P). Transatlantic trade appears to be more sensitive to the depth of the Pacific agreement than to its geographic coverage: a broader Pacific agreement would reduce transatlantic trade gains by around 2.5% whereas a deeper integration in a narrow Pacific agreement would reduce EU export gains to the US by more than 15%. In both cases, EU exports to the US are more sensitive than US exports to the EU, the latter being relatively equally impacted by a broader or deeper Pacific integration (between 1% and 2.5%).

[23] Although not depicted in this paper, these sector results are available from the authors.

Figure 7 – Sensitivity of Atlantic agri-food trade variations to TPP alternative assumptions (pct. change in trade variations compared to an Atlantic-only scenario), 2025



Note: Authors' calculations. The graph should read "The implementation of both agreements at the same time reduces EU exports to the US by 3% compared to an Atlantic agreement only. The inclusion of NTMs in a Pacific agreement would imply a reduction by 14.5% compared to an Atlantic agreement only."
A * denotes that the initial variation due to an Atlantic agreement was negative. In this case, a positive variation therefore means a decrease in trade.

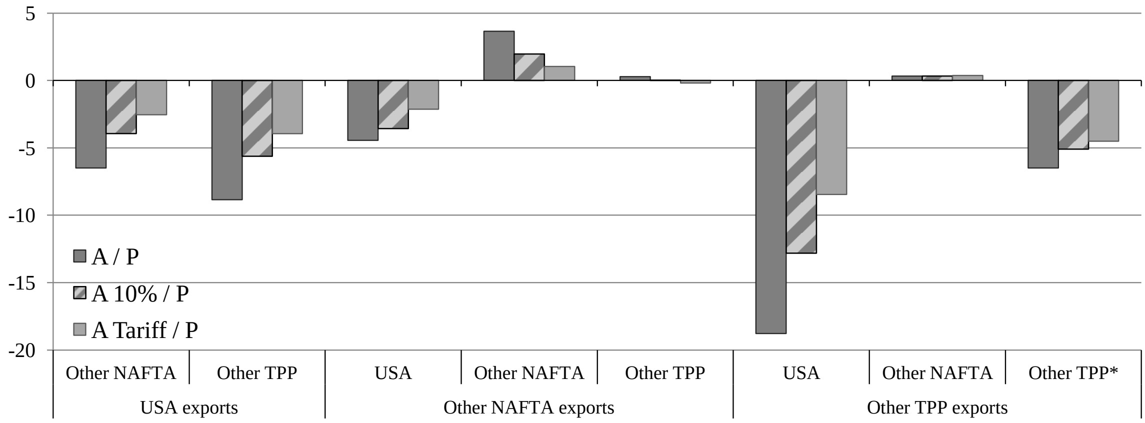
5.3. The depth of the Atlantic agreement (magnitude of NTMs' harmonization) may impact Pacific countries' access to the US market

We finally test the sensitivity of our results to the size of the Atlantic integration. More specifically, we study the impact of NTMs' harmonization between the EU and the US on Pacific countries' exports to the US (scenarios 6 and 7 of Table 8).

Figure 8 takes the trade variations induced by a Pacific only scenario (P) as a reference and compares them with the variations resulting from simultaneous Atlantic and Pacific agreements, with different levels of NTM cuts within the Atlantic scenario: 25% (i.e. same cut as in the main scenario), 10% and 0% (the Atlantic agreement being simply a tariff liberalization in that case). The diversion effects induced by the Atlantic agreement on the transpacific trade (especially on the exports of TPP countries other than Canada and Mexico to the US) decrease with the magnitude of NTMs' cuts in the Atlantic agreement. The case of Canada and Mexico (i.e. other NAFTA countries) is particular. The Atlantic liberalization, in addition to the Pacific one, increases trade between the two countries, as it reduces their mutual trade with the US (due to the competition of the EU on US market). Lower cuts in NTMs within the Atlantic agreement therefore reduce this effect. Overall, the inclusion of NTMs in the Atlantic agreement has a lower impact on Pacific trade than the impact on Atlantic trade resulting from the inclusion of

NTMs in the Pacific agreement.

Figure 8 – Sensitivity of Pacific agri-food trade variations to TTIP alternative assumptions (pct. change in trade variations compared to a Pacific-only scenario), 2025



Note: Authors' calculations. The graph should read "The implementation of both agreements at the same time reduces US exports to other NAFTA countries by 6.5% compared to a Pacific agreement only. The exclusion of NTMs in an Atlantic agreement would imply a reduction by 2.5% compared to a Pacific agreement only."
A * denotes that the initial variation due to a Pacific agreement was negative. In this case, a positive variation therefore means a decrease in trade.

6. Concluding remarks

We analyzed two mega-trade deals (the TTIP and the TPP Agreements). Although trade patterns and trade barriers are heterogenous between them, the potential effects of both agreements on agri-food sectors – measured through a CGE analysis – are comparable in overall magnitude, but not in profile. Offensive interests of the EU and TPP countries are very different, while their defensive interests are alike. As a consequence, the two agreements in their most likely form are not competing one against the other. In any case the US agri-food sectors are better off, at the expense of both its partners' and third countries'.

We investigated the sensitivity of our results to several assumptions on the content of the agreements, coming to the conclusion that only the inclusion of NTM issues in a Pacific agreement and the exclusion of NTMs in the Atlantic agreement could significantly alter our results: in that case, a Pacific agreement could lower EU-US trade gains coming from the TTIP, and reciprocally.

Our focus in this paper was on the agri-food sectors. However, both mega deals will cover the whole economy and some of the losses observed for the European and TPP (other than the US) countries in the agri-food sectors may be compensated by gains in the industry and services.

References

Andriamananjara, S., Ferrantino, M. J., and Tsigas, M. E. (2003). Alternative approaches in estimating the economic effects of non-tariff measures: results from newly quantified measures. *U.S. International Trade Commission*, 2003-12-C.

Armington, P. S. (1969). A theory of demand for products distinguished by place of production. *Staff Papers - International Monetary Fund*, 16(1):159–178.

Baldwin, R. and Taglioni, D. (2006). Gravity for dummies and dummies for gravity equations. *NBER Working Paper*, 12516.

Bchir, H., Decreux, Y., Guérin, J., and Jean, S. (2002). Mirage, a computable general equilibrium model for trade policy analysis. *CEPII Working Paper*, 2002-17.

Beghin, J. (2008). Nontariff barriers. *The New Palgrave Dictionary of Economics*, in S. Darlauf and L. Blume (eds):126–129.

Bureau, J.-C., Disdier, A.-C., Emlinger, C., Felbermayr, G., Fontagné, L., Fouré, J., and Jean, S. (2014). Risks and opportunities for the eu agri-food sector in a possible eu-us trade agreement. *Study for the European Parliament's Committee on Agriculture and Rural Development*, IP/B/AGRI/IC/2013-129.

Cernat, L. (2013). Tpp, ttip and multilateralism: stepping stones or oceans apart? *Vox Column*.

Decreux, Y. and Valin, H. (2007). Mirage, updated version of the model for trade policy analysis: Focus on agriculture and dynamics. *CEPII Working Paper*, 2007-15.

Ecorys (2009). Non-tariff measures in eu-us trade and investment – an economic analysis. *Study for the European Commission, DG Trade*.

Erixon, F. (2013). The transatlantic trade and investment partnership and the shifting structure of global trade policy. *CESifo Forum*, 14(4):18–22.

Felbermayr, G., Larch, M., Krüger, F., Flach, L., Yalcin, E., and Benz, S. (2013). Dimensionen und auswirkungen eines freihandelsabkommen zwischen der eu und den usa. *Ifo Forschungsbericht*, 62.

Fontagné, L., Fouré, J., and Ramos, M. P. (2013). Mirage-e: A general equilibrium long-term path of the world economy. *CEPII Working Paper*, 2013-39.

Fontagné, L., Guillin, A., and Mitaritonna, C. (2011). Estimations of tariff equivalents for the services sectors. *CEPII Working Paper*, 2011-24.

Fouré, J., Bénassy-Quéré, A., and Fontagné, L. (2013). Modelling the world economy at the 2050 horizon. *Economics of Transition*, 21(4):617–654.

Francois, J. (2014). After bali: Mulitlaterism and mega-regionals. *CESifo Forum*, 15(4):14–19.

Francois, J., Manchin, M., Norberg, H., Pindyuk, O., , and Tomberger, P. (2013). Reducing transatlantic barriers to trade and investment. *Centre for Economic Policy Research*.

Fugazza, M. and Maur, J.-C. (2008). Non-tariff barriers in cge models: How useful for policy? *Journal of Policy Modeling*, 30(3):475–490.

Guimbard, H., Jean, S., Mimouni, M., and Pichot, X. (2012). Macmap-hs6 2007, an exhaustive and consistent measure of applied protection in 2007. *International Economics*, Q2:99–122.

Hertel, T., Hummels, D., Ivanic, M., and Keeney, R. (2007). How confident can we be of CGE-based assessments of Free Trade Agreements? *Economic Modelling*, 24(4):611–635.

Kee, H. L., Nicita, A., and Olarreaga, M. (2008). Import demand elasticities and trade distortions. *The Review of Economics and Statistics*, 90(4):666–682.

Kee, H. L., Nicita, A., and Olarreaga, M. (2009). Estimating trade restrictiveness indices. *The Economics Journal*, 119:172–199.

Petri, P. A., Plummer, M. G., and Zhai, F. (2012). The trans-pacific partnership and asia-pacific integration: A quantitative assessment. 98.

Stanford, J. (2003). Economic models and economic reality: North american free trade and the predictions of economists. *International Journal of Political Economy*, 33(3):28–49.

UNCTAD (2005). Methodologies, classifications, quantification and development impacts of non-tariff barriers. TD/B/COM.1/EM.27/2.

van der Mensbrugghe, D. (2005). *LINKAGE Technical Reference Document*. World Bank.

van Tongeren, F., John, B., and Marette, S. (2009). A cost-benefit framework for the assessment of non-tariff measures in agro-food trade. *OECD Food, Agriculture and Fisheries Working Papers*, 21.

Walkenhorst, P. and Yasui, T. (2005). Benefits of trade facilitation: a quantitative assessment. quantitative methods for assessing the effects of non-tariff measures and trade facilitation. In Dee, P. and Ferrantino, M., editors, *Quantitative Methods for Assessing the Effects of Non-tariff Measures and Trade Facilitation*, pages 161–192. APEC Secretariat and World Scientific, Singapore.

WTO (2011). World trade report 2011 - the wto and preferential trade agreements: From co-existence to coherence.

WTO (2012). World trade report 2012 -trade and public policies: A closer look at nontariff measures in the 21st century.

Appendix

A. Detailed description of the MIRAGE model

As a complement to the short description given in the main text, the key elements of the MIRAGE model's structure are sketched below. The model's equations are presented in the online appendix. The latest version of the MIRAGE model, used here, is documented in Fontagné et al. (2013), the original model being fully described in Bchir et al. (2002) and Decreux and Valin (2007).

Supply Side On the supply side, each sector in MIRAGE is modeled as a representative firm, which combines value-added and intermediate consumption in fixed shares. Value-added is a CES bundle of imperfectly substitutable primary factors (capital, skilled and unskilled labor, land and natural resources). Firm's demand for production factors is organized as a CES aggregation of land, natural resources, unskilled labor, and a bundle of the remaining factors. This bundle is a nested CES aggregate of skilled labor and capital (that are considered as relatively more complementary).

MIRAGE assumes full employment of primary factors. Population, participation in the labor market and human capital evolve in each country (or region of the world economy) according to the demographics embedded in the macro projections. This determines the labor force as well as its skill composition (skilled/unskilled). Skilled and unskilled labor is perfectly mobile across sectors, but immobile between countries. Natural resources are sector specific, while land is mobile between agricultural sectors. Natural resources and total land for agricultural sectors are set at their 2007 levels: prices adjust demand to this fixed supply.

Installed capital is assumed to be immobile (sector-specific), while investments are allocated across sectors according to their rates of return. The overall stock of capital evolves by combining capital formation and a constant depreciation rate of capital of 6% that is the same as in the long-term growth models. Gross investment is determined by the combination of saving (the saving rate from the growth model, applied to the national income) and the current account. Finally, while total investment is saving-driven, its allocation is determined by the rate of return on investment in the various activities. For simplicity, and because we lack reliable data on foreign direct investment at country of origin, host and sectoral levels, international capital flows only appear through the current account imbalances, and are not explicitly modeled.

Demand side On the demand side, a representative consumer from each country/region maximizes instantaneous utility under a budget constraint and saves a part of its income, determined by saving rates projected in the long-term growth model. Expenditure is allocated to commodities and services according to a LES-CES (Linear Expenditure System – Constant Elasticity of Substitution) function. This implies that, above a minimum consumption of goods produced by each sector, consumption choices among goods produced by different sectors are made according to a CES function. This representation of preferences is well suited to our purpose as it is flexible enough to deal with countries at different levels of development.

Within each sector, goods are differentiated by their origin. A nested CES function allows for a particular status for domestic products according to the usual Armington hypothesis (Armington, 1969): consumer's and firm's choices are biased towards domestic production, and therefore domestic and foreign goods are imperfectly substitutable, using a CES specification. We use Armington elasticities provided by the GTAP database and estimated by Hertel et al. (2007). Total demand is built from final consumption, intermediate consumption and investment in capital goods.

Dynamics Dynamics in MIRAGE are of two kinds: the total factor productivity is calibrated in a baseline exercise, while production factors dynamics are set exogenously. Both are built in MIRAGE using macroeconomic projections from the MaGE model documented in Fouré et al. (2013).

Total factor productivity is based on the combination of three mechanisms. First, agricultural productivity is projected separately, as detailed in Fontagné et al. (2013). Second, a 2 percentage point growth difference between TFP in manufactures and services is assumed (as in van der Mensbrugghe (2005)). Third, the aggregate country-level TFP is calibrated in the baseline exercise in order to match both production factors and GDP projections resulting from the aggregate growth model, given the exogenous agricultural productivity and the productivity gap between manufacturing and services.

Dynamics in MIRAGE is implemented in a sequentially recursive way. That is, the equilibrium can be solved successively for each period, given the exogenous trajectory for sector-specific TFP calibrated as described above, the accumulation of production factors – savings, current accounts, active population and skill level – coming from the growth model. Simulations extend up to 2025. Finally, MIRAGE is calibrated on the GTAP dataset version 8.1, with 2007 as a base year.