Quantifying the EU-Japan Economic Partnership Agreement*

Gabriel Felbermayr†, Fukunari Kimura‡, Toshihiro Okubo§ and Marina Steininger¶

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Abstract

This paper provides a quantitative analysis of the new EU-Japan free trade agreement (FTA), the biggest bilateral deal that both the EU and Japan have concluded so far. It employs a generalized variant of the Eaton-Kortum (2002) model, featuring multiple sectors, input-output linkages, services trade, and non-tariff barriers (NTBs). It uses the results of an econometric ex post analysis of a related existing FTA, the one between the EU and Korea, to approximate the expected reductions in the costs of NTBs. This approach yields welfare effects for Japan of about 15 bn. USD per year (0.32% of GDP) after eight years. The EU can expect gains worth about 19 bn. USD per year. Long run gains are likely to be 50% larger. Trade diversion effects are small on average but pronounced for Japanese sourcing in the Asia-Pacific region. Sectoral value added impacts are very heterogeneous, even within the agri-food or manufacturing sectors.

JEL Classification: F15, F17, N74
Keywords: Free Trade Agreements, General Equilibrium, Quantitative Trade Models, Japan

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†ifo Institute, LMU, CESifo & GEP, Poschingerstr. 5, 81679 Munich, Germany; felbermayr@ifo.de
‡Keio University & ERIA
§Keio University & CESifo
¶ifo Institute, Poschingerstr. 5, 81679 Munich, Germany; steininger@ifo.de

1 Introduction

In this paper, we provide a quantitative analysis of the trade and welfare effects of the forthcoming EU-Japan Economic partnership Agreement (EU-Japan EPA. This free trade agreement (FTA) is the largest agreement that both the EU and Japan have concluded so far, and it is likely to be of systemic relevance. Its conclusion is of strategic importance for both the EU and Japan in times of growing protectionism and unilateralism.

To this end, we employ a quantitative trade theory model of the type proposed by Eaton and Kortum (2002) and extended by Caliendo and Parro (2015). A key innovation of our proposed approach is to use the recently implemented EU-Korea agreement (entry into force in July 2011) as a benchmark and to use the most recent available data (from 2014) for the implementation of the simulation model.[1] This makes sure that our assumptions on trade cost savings meet a feasibility checks. The negotiations between the EU and Japan did not materialize out of thin air. To facilitate the trade relationships between the EU and Japan, a number of informal bilateral dialogues have been established: A Cooperation Framework aimed at promoting two-way investment via concrete actions exists since 2004. The EU-Japan Business Round Table - established in 1999 - allows for a dialogue and an exchange of views between EU and Japanese businesses. Since 1979 the European Commission has been encouraging European enterprises to enter the Japanese market and has given them concrete assistance through promotion programs such as the Executive Training Program and the EU Gateway Program.

At the EU-Japan Summit of 28 May 2011, the EU and Japan agreed to work towards a new framework for their bilateral relations and to explore on the desirability to pursue a Free Trade Agreement. In line with the Summit conclusions, a joint scoping exercise was conducted to determine the scope and the level of ambition of a future Free Trade Agreement. The exercise defined a number of non-tariff barriers to trade that are considered by the EU as obstacles in accessing the Japanese market. Following the successful completion of the scoping exercise, in July 2012 the Commission recommended the Council to launch negotiations for a Free Trade Agreement between the EU and Japan. In November 2012 the Council authorized the Commission to start the negotiations. The first round of negotiations took place in Brussels in April 2013. In December 2017, negotiations were concluded, and the ratification process of the FTA is expected to begin soon.

[1] Drawing on existing analysis, the Commission had ordered a Trade Sustainability Impact Assessment for the FTA between the EU and the Republic of Japan (European Commission, 2016). The simulation results in that analysis are, therefore, also based on 2007 baseline data. Moreover, there is no member state level analysis available anywhere so far.

The text of the EU-Japan agreement is available. However, translating the provisions of the FTA into an appropriate scenario for modeling the economic effects of the FTA is not trivial. The parties have gradually agreed to phase out all tariffs, often over rather long transition periods, and to increase certain quotas in the area of agriculture. In the area of industrial tariffs, Japan has low or zero most-favored-nations (MFN) tariffs before the agreement; the EU's tariffs on cars or motor cycles are more substantial. In contrast, Japan has stronger tariff protection in the agri-food sectors. Modelling the tariff reductions is straight-forward, even if the high level of aggregation needed in a quantitative model hides some interesting product-level variation.

However, much of the text of the FTA deals with non-tariff barriers (NTBs) to trade. These concern wide-ranging issues such as the protection of Geographical Indicators, public procurement (both offensive interest of the EU), auto standards, general regulatory cooperation, and many areas more. Generally, the assessment is that the EU-Japan agreement falls short from the level of ambition adopted in the EU-Canada agreement (CETA); see Dreyer (2018). Rather, there are important parallels between the EU-Japan agreement and the FTA which the EU has negotiated with Korea and which is in force since 2011.

Much of the literature on ex ante assessment of FTAs uses relatively strong assumptions on how the costs of NTBs fall across trade partners and products. Usually, symmetry is assumed. We take a different approach. We start with a comprehensive econometric ex post evaluation of the existing EU-Korea trade agreement and use the trade cost savings found there as proxies for what one expect for the EU-Japan agreement as well. This is clearly an audacious assumption. One advantage is that it is data-driven rather than driven by expert judgement. Being based on an ex post analysis, the scenario should also survive any feasibility check. We view it as complementing other approaches.

Several quantitative impact assessments with respect to the EU-Japan free trade agreement have been presented over the past years with differing main focus. The EU's Directorate General for Trade has published a quantitative study in 2010 conducted by Sunesen et al. (2010) that assesses the impact of bilateral barriers to trade and investment between the EU and Japan. This first study accounts for both a reduction in tariffs and non-tariff measures with two possible extreme scenarios, a minimum and maximum NTB reduction that constitute the possible range of achievable trade liberalization. Based on a CGE model a liberalization of trade is predicted to result in an increase in EU exports to Japan by 23% or 14 bn. Euro if tariffs were abolished, including tariffs in agriculture. The largest gains from tariff dismantling would occur in agricultural and processed foods exports. In case of a maximum liberalization scenario EU exports could increase by almost 50% or 29 bn. Euro if the cost of NTBs in Japan were reduced to the defined possible extent. The largest trade expansions are expected to arise in in the chemicals (incl. pharmaceuticals) industry, followed by motor vehicles and medical equipment. A less ambitious only on tariff reduction based agreement could increase Japanese exports to the EU by around 30% which amounts to 25 bn. Euro. The biggest growth in exports is expected to appear in the motor vehicles industry (16 bn. Euro). A comprehensive trade liberalization that includes an ambitious elimination on non-tariff barriers would result in additional exports by 28 bn. Euro. As in the less ambitious scenario again the motor vehicles industry, followed by the chemicals and electronics industry are the biggest gainers. The study concludes that a combination of both bilateral elimination of tariffs and the reduction of non-tariff measures would be beneficial to firms and consumers in both economies and economic welfare will increase by 33 bn. Euro in the EU and 18 bn. Euro in Japan. A third of the benefits for the EU originate from tariff dismantling, the rest are expected from NTB reduction. For Japan, the vast majority of benefits result from NTB reduction.

A second analysis of an EU-Japan free trade agreement is presented by Benz and Yalcin (2015). While the study also employs a CGE model to assess potential gains from bilateral trade liberalization it is the first analysis to quantify economic effects between Japan and the EU accounting for the importance of intra-industry trade and taking appropriate consideration of NTBs. In contrast to related studies the simulations build on a monopolistic competition model extended by a search-matching framework of the labor markets. Clearly, there are differences not only in bilateral trade barriers but also in how efficient the EU and Japanese labor markets work. The new and important aspect of this study is the modelling of the different labor markets in the considered economies. The simulations of the specific model predict that tariff elimination will result in a 0.07% increase of Japanese GDP while the EU's GDP is expected to grow by an additional 0.02 per cent. Growth effects are substantially larger in a comprehensive liberalization including NTB reductions, with Japanese GDP increasing by 0.86 per cent, whereas GDP in the EU will rise by 0.2%. The expected amount of additional employment created from the trade agreement is relatively low. Instead, however, the model predicts strong firm entry and exit dynamics in both Japan and the EU, meaning that less productive firms are forced out of the market and more productive firms expand. Aggregating these effects, Japan and the EU experience a significant increase in productivity in the tariff plus NTB reduction scenario, around 0.5 per cent for Japan and 0.1 per cent in the EU. Consequently, most of the benefits from an EU-Japan FTA do not come from additional employment but from a higher average firm productivity. This is a core and new result of the Benz and Yalcin analysis.

A third report has been recently published by the EU's DG Trade and authored by European Commission (2016). Their EU-Japan Trade Sustainability Impact Assessment (Trade SIA) was conducted in support of the negotiations of a comprehensive trade and investment agreement between the EU and Japan. The study defines two major aims: 1) to integrate sustainability into trade policy by informing negotiators of the possible social, environmental and economic consequences of a trade agreement; 2) to make information on the potential impact available to all actors. The study expects long-term GDP growth after an EU-Japan FTA amounting to 0.76% for the EU and 0.3% for Japan if symmetric liberalization policy is applied. Moreover, bilateral exports are estimated to increase by 34% for the EU and by 29% for Japan, while the total export increase is at around 4% for the EU and 6% for Japan. The authors emphasize three important channels through which expected growth in both regions are realized: The first effect originates from lower trading costs and the resulting higher bilateral exports. Along this adjustments export driven growth is particularly important in food and feed, where bilateral exports from the EU could increase by 294%. Motor vehicles, medical devices, pharmaceuticals/chemicals are also expected to grow above average. The second adjustment channel stems from decreasing prices due to import driven competition which enhances consumer welfare, while the third channel originates from new investments measured in terms of FDI inflows.

The fourth study is a set of CGE analysis on the impact on the Japanese economy. Using the GTAP ver.9, Kawasaki (2017) measures the impact under the assumption that tariff rates go to zero immediately and non-tariff barriers (NTBs) are reduced by 50%. He finds that Japan's real GDP increases by 0.99%, compared to the case of non-EU-Japan FTA. In detail, GDP increases by 0.26% in tariff reduction and 0.73% in NTBs reduction. Furthermore, if Brexit impact is taken into account, GDP is increased by 0.94% in total. He concludes that NTB reduction is a bigger impact than tariff reduction. Cabinet Office of Japan (2017) estimates the impact of EU-Japan FTA. Their CGE model takes into account TFP increased by trade liberalization, labor supply in response to real wage and capital accumulation by investment. As a result, they find that the real GDP increases around by 1%, although it is smaller than the impact of TPP11 (1.5%).

The remainder of the paper is organized as follows. Section 2 presents the methodological framework. Section 3 discusses the main data sources. Section 4 explains the empirical estimation method and discusses the gravity results. Based on the defined EU-Japan scenarios, we examine general equilibrium consistent results on trade and welfare in section 5. The final chapter concludes.

2 Model

The model is described in detail in Aichele et al. (2016) who extend the model of Caliendo and Parro (2015). The framework is a multi-sector version of the Eaton and Kortum (2002) model, a multi-country Ricardian general equilibrium model extended to incorporate rich value chain interactions, and non-tariff trade costs. The general class of models is described in detail by Costinot and Rodriguez-Clare (2014).

2.1 Consumption and production

The model has N countries, which are indexed by i, n and the J sectors by j, k. The representative consumer utility over final goods consumption is indexed by C_n^j and follows Cobb-Douglas preferences. α_n^j denotes the sectoral expenditure shares

$$u(C_n) = \prod_{j=1}^{J} {C_n^j}^{\alpha_n^j}, \tag{1}$$

with $\sum_j \alpha_n^j = 1$ and a country's labor force L_n is mobile across sectors (e.g. $L_n = \sum_{j=1}^{J} L_n^j$), but not across countries.

A continuum of goods ω^j is produced with labor $l_n^j(\omega^j)$ in each sector j and with a composite intermediate input $m_n^{k,j}(\omega^j)$ of each source sector k. This gives us the following production function:

$$q_n^j(\omega^j) = x_n^j(\omega^j)^{-\theta^j} \left[l_n^j(\omega^j)\right]^{\beta_n^j} \left[\prod_{k=1}^{J} m_n^{k,j}(\omega^j)^{\gamma_n^{k,j}}\right]^{(1-\beta_n^j)}, \tag{2}$$

very sector j of each country n has a value added share, $\beta_n^j \geq 0$ and the cost share of source sector k in sector j's intermediate costs$\gamma_n^{k,j}$, with $\sum_{k=1}^{J} \gamma_n^{k,j} = 1$, which indicates that sectors are interrelated because sector j uses sector k's output as intermediate input and vice versa. The inverse efficiency of good ω^j in sector j and country n is the $x_n^j(\omega^j)$, while θ^j is the dispersion of efficiencies in a sector j. The lower θ^j the lower is the dispersion of productivity across the goods ω^j.

An input bundle's dual cost c_n^j depends on the wage rate w_n and the price of the composite intermediate goods k of country n.

$$c_n^j = \Upsilon_n^j \, {w_n}^{\beta_n^j} \left[\prod_{k=1}^{J} {p_n^k}^{\gamma_n^{k,j}}\right]^{(1-\beta_n^j)}, \tag{3}$$

The only difference between the sectoral goods ω^j is their efficiency $x_n^j(\omega^j)$, thus the goods can be depicted as x_n^j. Υ_n^j is a constant.

κ_{in}^j depicts the trade costs of delivering sector j goods from country i to country n. They consist of ad-valorem tariffs $\tau_{in}^j \geq 0$ and iceberg trade costs $d_{in}^j \geq 1$. So,$\kappa_{in}^j = (1 + \tau_{in}^j) d_{in}^j$. Similar to other gravity applications of the literature, the iceberg trade costs are modelled as a function of bilateral distance, regional trade agreements and observable trade cost proxies as $d_{in}^j = {D_{in}}^{\rho^j} e^{\delta^j \mathbf{Z}_{in}}$. D_{in} is the measure for bilateral distance, while $\mathbf{Z}_{in}$ is a trade cost shifting vector (e.g. RTAs or other trade policies). Firms will charge the following unit costs:

$$p_{in}^j(x_i^j) = \kappa_{in}^j \left[x_i^j\right]^{\theta^j} c_i^j. \tag{4}$$

The simplification is possible because of perfect competition and constant returns to scale. Intermediate goods are depicted as a vector of efficiencies $x^j = (x_1^j, \ldots, x_N^j)$ and country n searches across all trading partners for the cheapest supplier. Good x^j is bought for price

$$p_n^j(x^j) = \min_i \left\{p_{in}^j(x_i^j); i = 1, \ldots, N\right\}. \tag{5}$$

Countries differ in their productivity across sectors, which introduces for comparative advantage. A country's produced set of goods follows an exponential cumulative distribution function and the productivity distribution is assumed to be independent across countries, sectors, and goods. The joint density of x^j is

$$\phi^j(x^j) = \left(\prod_{n=1}^{N} \lambda_n^j\right) \exp\left\{-\sum_{n=1}^{N} \lambda_n^j x_n^j\right\}, \tag{6}$$

where λ_n^j shifts the location of the distribution, and measures the absolute advantage. In contrast, $\theta^j > 0$ indexes productivity dispersion, thus, comparative advantage.

Each sector j's composite intermediate good q_n^j is produced with a Dixit-Stiglitz CES technology and η^j denotes the elasticity of substitution. $r_n^j(x^j)$ depicts the demand for intermediate good x^j, with sum of costs for all the intermediate goods x^j being minimized, subject to

$$\left[\int r_n^j(x^j)^{\frac{\eta^j-1}{\eta^j}} \phi^j(x^j) dx^j\right]^{\frac{\eta^j}{\eta^j-1}} \geq q_n^j. \tag{7}$$

The demand for x^j is dependent on the variety's price relative to the sectoral price index $p_n^j = \left[\int p_n^j(x^j)^{(1-\eta^j)} \phi^j(x^j) dx^j\right]^{\frac{1}{1-\eta^j}}$:

$$r_n^j(x^j) = \left(\frac{p_n^j(x^j)}{p_n^j}\right)^{-\eta^j} q_n^j. \tag{8}$$

The composite intermediate good q_n^j can then be used for the production of intermediate inputs of each sector k, for the production of final consumption goods.

2.2 Exports

Once one solves for the price distribution and integrates over the sets of goods where each country i is the lowest cost supplier to country n, the composite intermediate goods price is given by

$$p_n^j = A^j \left(\sum_{i=1}^{N} \lambda_i^j \left(c_i^j \kappa_{in}^j \right)^{\frac{-1}{\theta^j}} \right)^{-\theta^j}, \tag{9}$$

where $A^j = \Gamma \left[1 + \theta(1 - \eta^j) \right]^{\frac{1}{1-\eta^j}}$ is a constant. The prices are correlated across all sectors (via c_i^j) and the strength of the correlation depends on the input-output table coefficients $\gamma_n^{k,j}$.

The expenditure share π_{in}^j for source country i's goods in sector j of country n follows the common gravity equation, can be applied to gross exports:

$$\pi_{in}^j = \frac{\lambda_i^j \left[c_i^j \kappa_{in}^j \right]^{\frac{-1}{\theta^j}}}{\sum_{i=1}^{N} \lambda_i^j \left[c_i^j \kappa_{in}^j \right]^{\frac{-1}{\theta^j}}}. \tag{10}$$

2.3 General equilibrium

Y_n^j denotes the gross production's value of varieties in sector j. Sector j, Y_n^j has to be equal to the value of demand for sectoral varieties from all countries $i = 1, \ldots, N$.[2] The goods market clearing condition is given by

$$Y_n^j = \sum_{i=1}^{N} \frac{\pi_{ni}^j}{(1 + \tau_{ni}^j)} X_i^j \qquad \text{with} \qquad X_i^j = \sum_{k=1}^{J} \gamma_i^{j,k} (1 - \beta_i^k) Y_i^k + \alpha_i^j I_i, \tag{11}$$

where national income consists of labor income, tariff rebates R_i and the (exogenous) trade surplus S_i, i.e. $I_i = w_i L_i + R_i - S_i$ and X_i^j is country i's expenditure on sector j goods. The first term on the right hand side gives demand of sectors k in all countries i for intermediate usage of sector j varieties produced in n, the second term denotes final demand. Tariff

[2]Our exposition differs from Caliendo and Parro (2015) in that they use total expenditure on composite goods instead of total production of varieties as endogenous variable. So in Caliendo and Parro (2015) the value of gross production comprises all foreign varieties that are bundled into the composite good without generation of value added.

rebates are $R_i = \sum_{j=1}^{J} X_i^j \left(1 - \sum_{n=1}^{N} \frac{\pi_{ni}^j}{(1+\tau_{ni}^j)}\right)$.[3]

The model is closed with an income-equals-expenditure condition, which takes into trade imbalances for each country n into account. The value of total imports, domestic demand and the trade surplus has to equal the value of total exports including domestic sales, which is equivalent to total output Y_n:

$$\sum_{j=1}^{J}\sum_{i=1}^{N} \frac{\pi_{in}^j}{(1+\tau_{in}^j)} X_n^j + S_n = \sum_{j=1}^{J}\sum_{i=1}^{N} \frac{\pi_{ni}^j}{(1+\tau_{ni}^j)} X_i^j = \sum_{j=1}^{J} Y_n^j \equiv Y_n \tag{12}$$

2.4 Comparative Statics in General Equilibrium

Adjustments of trade flows, sectoral value added changes, production, and tariff income can be simulated with comparative statics with respect to trade cost shocks. The input-output structure of the data and the accompanying trade along the value chain imply that changes in a country pairs' bilateral trade costs affect all producer's effective production cost. Moreover, it implies that trade creation effects spill over to third countries not only through changes in consumer demand, but also through changes in demand for intermediate goods.

In accordance with Dekle et al. (2008), the relative, global change in a variable from its initial level z to counterfactual z' is denoted by $\hat{z} \equiv z'/z$. $\hat{\kappa}_{in}^j = \frac{1+\tau_{in}^{j'}}{1+\tau_{in}^j}(e^{\delta^j(Z_{in}^{'} - Z_{in})})$ denotes the change in trade cost due to the implementation of trade integration agreements. The counterfactual changes in all variables of interest can be solved by using the following system of equations:[4]

[3] Instead of the goods market clearing condition, one can also use the expenditure equation $X_i^j = \left(\sum_{k=1}^{J} \gamma_i^{j,k}(1-\beta_i^k)(F_i^k X_i^k + S_i^k) + \alpha_i^j I_i\right)$ as in Caliendo and Parro (2015).

[4] See also Caliendo and Parro (2015). The feature of solving in counterfactual changes rather than levels reduces the set of parameters and moments that have to be estimated or calibrated. In particular, no information on price levels, iceberg trade costs, or productivity levels is needed.

$$\hat{c}_n^j = \hat{w}_n^{\beta_n^j} \left(\prod_{i=1}^{N} [\hat{p}_n^j]^{\gamma_n^{k,j}} \right)^{1-\beta_n^j}, \tag{13}$$

$$\hat{p}_n^j = \left(\sum_{i=1}^{N} \pi_{in}^j [\hat{\kappa}_{in}^j \hat{c}_i^j]^{-1/\theta^j} \right)^{-\theta^j}, \tag{14}$$

$$\hat{\pi}_{in}^j = \left(\frac{\hat{c}_i^j}{\hat{p}_n^j} \hat{\kappa}_{in}^j \right)^{-1/\theta^j}, \tag{15}$$

$$X_n^{j'} = \sum_{j=1}^{J} \gamma_n^{j,k} (1 - \beta_n^k) \left(\sum_{i=1}^{N} \frac{\pi_{ni}^{k'}}{1 + \tau_{ni}^{k'}} X_i^{k'} \right) + \alpha_n^j I_n', \tag{16}$$

$$\frac{1}{B} \sum_{j=1}^{J} F_n^{j'} X_n^{j'} + s_n = \frac{1}{B} \sum_{j=1}^{J} \sum_{i=1}^{N} \frac{\pi_{ni}^{j'}}{1 + \tau_{ni}^{j'}} X_i^{j'}, \tag{17}$$

where $\hat{w}_n$ are wage changes, X_n^j are sectoral expenditure levels, $F_n^j \equiv \sum_{i=1}^{N} \frac{\pi_j^{in}}{(1+\tau_{in}^j)}$, $I_n' = \hat{w}_n w_n L_n + \sum_{j=1}^{J} X_n^{j'} (1 - F_n^{j'}) - S_n$, L_n denotes country n's labor force, and S_n is the (exogenously given) trade surplus. We fix $s_n \equiv S_n/B$, where $B \equiv \sum_n w_n L_n$ is global labor income, to make sure that the system is homogenous of degree zero in prices.

Equation 13 shows the shift in unit costs occurring due to changes in input prices (i.e., wage and intermediate price changes). The trade cost changes directly affect the sectoral price index p_n^j, and the changes in unit costs have an indirect effect (see equation (14)).

Once the trade costs, unit costs and prices change, the trade shares will change in response. The intensity of this reaction is driven by the productivity dispersion θ^j. A higher θ^j implies bigger trade changes.

Equation (16) ensures goods market clearing in the new equilibrium and the counterfactual income-equals-expenditure or balanced trade condition is given by equation (17). We calculate welfare change $\hat{W}_n$ as real income change,

$$\hat{W}_n = \frac{\hat{I}_n}{\prod_{j=1}^{J} (\hat{p}_n^j)^{\alpha_n^j}}. \tag{18}$$

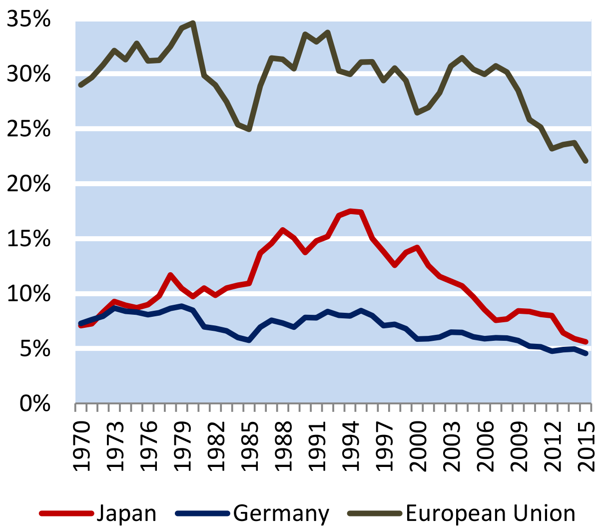
To solve the system of equations for multiple sectors, we again relate to Caliendo and Parro (2015), who extend the single-sector solution algorithm proposed by Alvarez and Lucas (2007). We start with an initial guess about a vector of wage changes. Using (13) and (14), it computes changes in prices, trade shares, expenditure levels, evaluates the trade balance condition (17), and updates the change in wages based on deviations in the trade balance.

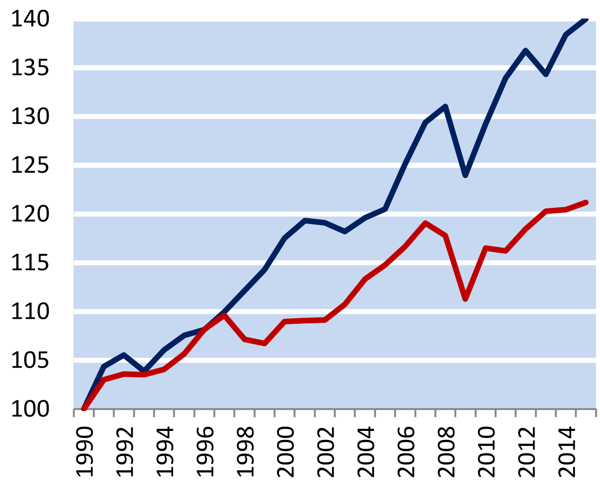
The model provides static level effects on real income and trade. As dynamic effects of trade disintegration are not taken into account, it provides a lower bound for the potential effects. Contrary to trade agreements, where effects occur after a phase-in[5], disintegration effects would potentially occur immediately.

3 Descriptive Statistics

Measured at current market prices, Japan is the third biggest economy of the world (USD 4,120 bn. as of 2015), after the US and China, and about 25% greater than Germany. Its economy has been growing only sluggishly after the burst of a real estate bubble in 1992; indeed, since 1990, real per capita income measured in purchasing power parities has grown by only about 0.77% per year (Germany: 1.35% p.a.); see Figure 1. As a consequence, Japan's share in the value of world output (and demand, both measured in USD) collapsed from about 15% in 1990s to the value of 5.6% observed today (Germany: 4.6%). Nonetheless, together the EU and Japan account for more than a third of the world's GDP.

Figure 1: Shares in world GDP, current USD (1970-2015) and evolution of real GDP per capita in purchasing power parities, 1990=100, 1990-2015





Source: World Development Indicators, World Bank..

Interestingly, Figure 1 qualifies the widely held view that Japan's growth performance after

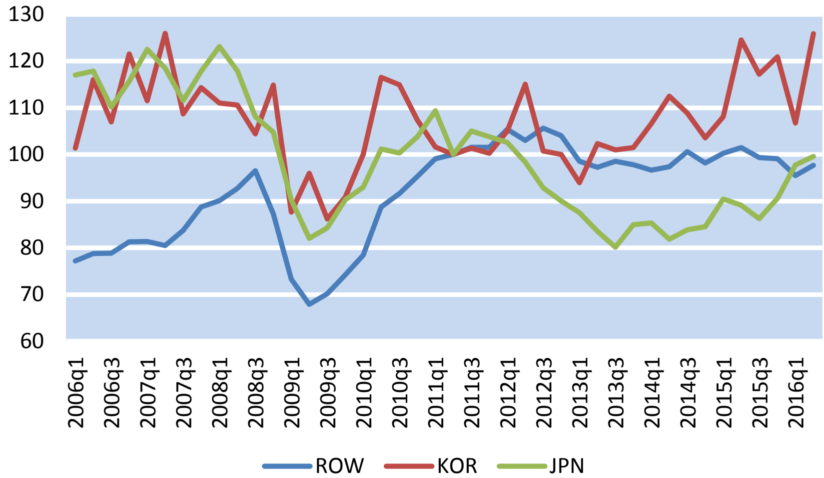
[5]This is particularly relevant for non-tariff trade costs. Evidence from existing FTAs shows that this phasing-in process usually takes between 10 and 12 years (see, e.g., Jung, 2012).

the burst of the real estate bubble in 1990 was a disaster. To obtain a realistic view of economic development in Japan, one has to take into account that the size of the population has slightly shrunk since then, so that per capita GDP has grown faster. Moreover, it is also important to account for different local price levels in making cross-country comparisons. However, these qualifications notwithstanding, the recent growth history of Japan is clearly disappointing. Nonetheless, Japan is an extremely interesting but ambivalent market: it is technologically very advanced as a main innovator of automated and robotized manufacturing. It has one of the world's best internet infrastructures. On the other hand, its economy is dominated by small and medium (SME) companies, and technology adoption in businesses is often small. And the country is still relatively protectionist, in particular when looking at non-tariff barriers; see EU Commission (2016). Moreover, even if China may have surpassed Japan in terms of real GDP in 2012, Japan remains almost equal to the size of the Chinese market measured in consumption, given China's structurally low rates. As investors, Japan and China are also of equal importance, at 8.4 and 8.6% respectively of global FDI outflows. Compared to other OECD countries, Japan is a relatively closed economy. In 2011, only about 13.5% of its final demand is spent on foreign value added. For example, in Germany, the share is about 25%; in the USA it is about 15%. Clearly, larger economies tend to serve a larger fraction of domestic demand with domestic production. Opening the market through the EU-Japan Economic Partnership Agreement might yield positive effects on Japan's economy and also for the EU members.

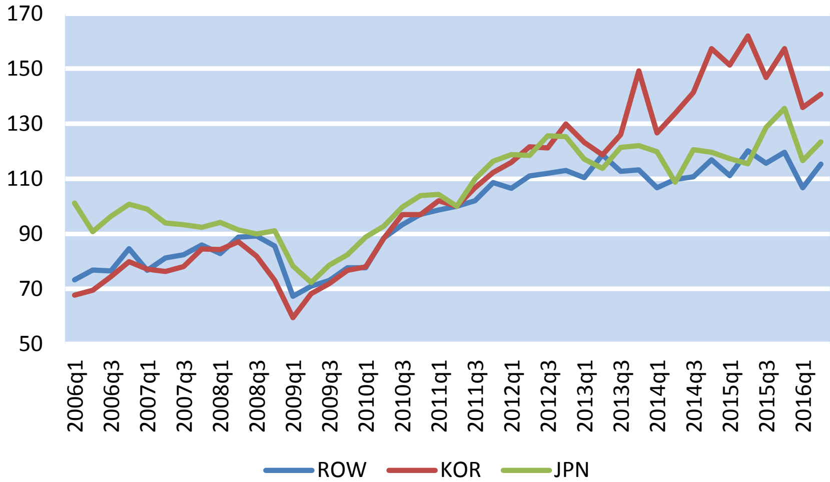
The next two figures study the evolution of EU-Japan trade over the last decade. Using quarterly data, the figures compare the dynamics of trade with Japan to Korea an the Rest of the World. Normalizing all series to the value of 100 in the first quarter of 2011, Figure 2a looks at imports while Figure 2b looks at exports. Including Korea is interesting, because the EU concluded a free trade agreement with this country which went into effect in July 2011. The pictures do suggest that after 2011 trade with Korea developed more dynamically than trade with Japan. Without providing a formal proof, the illustrations highlight the possibility that the divergence is due to the FTA. It also visualizes the hope that a trade agreement with Japan could trigger a similar development.

Figure 2: Evolution of EU Bilateral Trade with Japan, Korea and the rest of the world

(a) EU bilateral imports



(b) EU bilateral exports



Source: COMEXT (2017), own calculations.

Table 1 illustrates the initial bilateral trade relationship between the EU and Japan. The first column shows the different sectors. Column two depicts the volume of the initial EU exports to Japan in bn USD. The third column shows how much the EU exported in total to the entire world, per sector. The fourth column then shows the share of EU exports in each of the sectors that goes to Japan. The remaining columns show the same patterns for Japan as exporter and EU as importer. If one looks at the shares of exports it becomes obvious that only a relatively small proportion of EU's exports go to Japan. It is striking that although Japan is one of the largest countries in economic terms, the European export shares to Japan are small and do not go beyond 2.3%. There is still potential to increase this rate. The shares are especially small for EU's competitive manufacturing sectors, such as the machinery, automotive, or electronic equipment sectors. This looks different in Japan: Compared to Japan's total exports per sector, the share that goes to the EU is larger. This is especially evident in the services sectors.

Table 1: Initial sectoral bilateral trade between EU and Japan

	EU Exports to Japan in bn USD	EU Total Exports in bn USD	Share of Exports to Japan in %	Japanese Exports to EU in bn USD	Japanese Total Exports in bn USD	Share of Japanese Exports to EU in %
Agri- and Food Products	7	538	1.3	7	538	1.3
Automotive	10	679	1.4	19	163	11.5
Chemicals	22	1067	2.1	15	124	11.8
Electronic equipment	2	241	0.8	11	89	11.8
Energy	0	32	0.1	0	0	0.7
Financial and Insurance, Business Services	17	722	2.3	9	30	30.8
Machinery and equipment	16	1234	1.3	40	294	13.5
Manufacturing	2	93	1.7	2	10	16.4
Metals	4	537	0.7	7	91	8.0
Natural Resources and raw materials	5	585	0.8	3	39	8.5
Other services	7	341	2.0	6	21	25.8
Textile	4	226	1.7	1	11	9.4
Trade and Transport	15	515	2.9	13	39	31.9

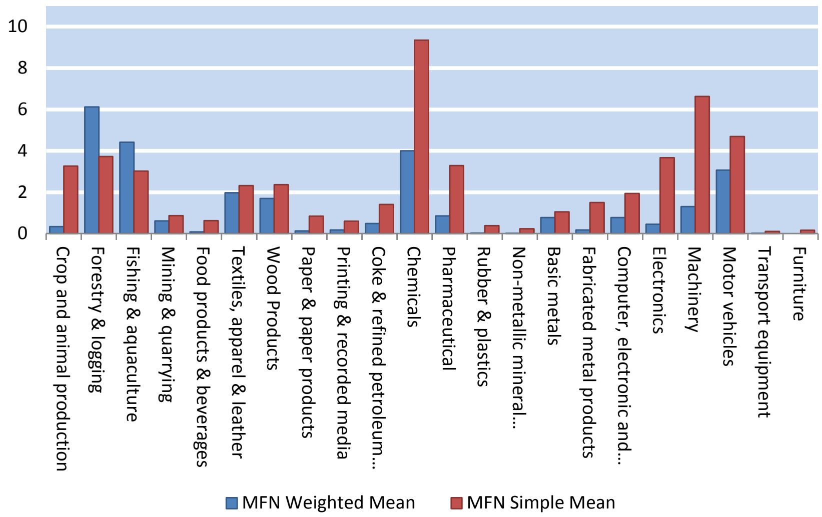
Note: World Input Output Database, 2014; Own illustration. The shares are based on total EU exports and imports including intra-EU trade.

A large share of these traded products between Japan and the EU is subject to tariffs which comply with the World Trade Organization's (WTO) regulations. At the same time, in both regions around one quarter of products are not subject to such import duties. Across all goods that are protected by tariffs around 85% of the bound duties turn out to be below 10%-points. Except for a handful of traded goods with tariff peaks, the remaining product lines reach import duties of around 30 per cent in the EU and 35 per cent in Japan. Peak tariff rates reach 60 per cent in Japan and 75 per cent in the EU. Figure 3 summarizes the prevailing applied tariff rates for EU industries for which trade data is available. The weighted average tariffs differ across agricultural and non-agricultural sectors and also significantly within the goods sectors. Weighted tariffs reach on average 10% (e.g. chemical products).[6] The traditional export oriented industries machinery, electronics, and

[6]The weighted average tariffs are weighted by trade volume of the HS6 products, which belong to the

non-metallic mineral products apply average tariff rates of 8 percentage points. This implies a relative large range for potential costs savings by tariff elimination. Further, the figure illustrates the simple average tariffs, which sometimes substantially differ from the weighted ones. Two sources can drive these statistical patterns. Either some products are protected with very high prohibitive tariffs resulting in no trade and hence weighted tariffs are biased downwards, or some goods with low tariffs are strongly traded resulting in lower weighted tariffs.

Figure 3: EU import tariffs (%)



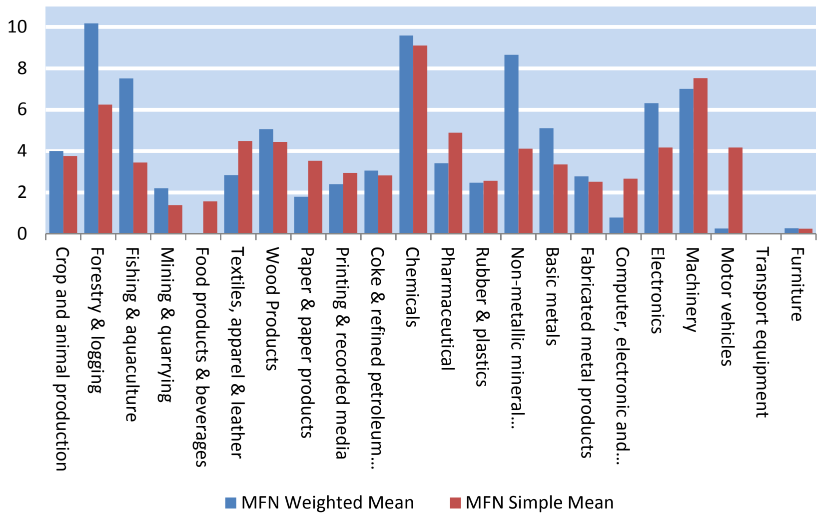
Source: WTO Tariff Profiles; own illustration.

Figure 4 illustrates the equivalent Japanese tariff distribution across the same industries as depicted for the EU. While Japan also shows a strong tariff variation across the listed industries, interestingly tariff rates in most of the industries turn out to be on average lower than in the respective European industry. Particularly, the difference between weighted applied MFN tariffs between the EU and Japan turn out to be substantially different. Tariffs for machinery products e.g. are on average at around 7.5% in the EU and 6.6% in Japan. However, if one accounts for the trade volumes for each tariff line in the sector, weighted average tariffs in the EU remain at around 7%, while in Japan the respective tariffs drop down to below 2%. Hence, for a large share of EU exports to Japan with relative high tariffs rates, we don't observe large export volumes. One reason for this structural difference in the weighted applied tariffs between the EU and Japan could rest in the mentioned business model of Japanese affiliates enterprises located in the EU. It is possible for Japan to circum-

same average product group.

vent relative high tariffs e.g. in the machinery sector because a certain share of Japanese products are produced within the EU, while at the same time European companies serve the Japanese market with the full range of products in the machinery industry predominantly via trade. One expectation resulting from this tariff pattern is that reciprocal tariff liberalization between the EU and Japan will most likely be relatively more beneficial for EU exporters if compared with expected Japanese exports.

Figure 4: Japanese import tariffs (%)



Source: WTO Tariff Profiles; own illustration.

These simple statistics demonstrate that for a critical number of traded products tariffs still represent a sizeable barrier and their elimination is relevant for additional welfare gains. At the same time it is worth to emphasize, that in comparison to other countries the average tariff rates between the EU and Japan are on average relative low (e.g., China has a simple average MFN-bound rate of 10 per cent). It is therefore unlikely that elimination only of these relatively low tariffs will lead to strong trade and output effects in the aggregate.

4 Model Calibration and Scenario Definition

4.1 Data

We use two main data bases. First, to inform our scenarios, we estimate the sector-level trade cost effects of the EU-Korea agreement. For this purpose we use the World Input-Output Database (WIOD) for the period 2000 to 2014. These are the adequate data for our purposes because we require both a panel dimension and information on intra-national trade to properly identify our estimates. The trade elasticities for the manufacturing sectors stem from (Aichele et al., 2016) .The conducted trade cost elasticities can be found in the appendix in table 9.

Second, we use the data from the Global Trade Analysis Project (GTAP) 9.1 database to calibrate our general equilibrium model. The GTAP data provides us with a comprehensive set of input-output tables, sectoral value added information and production values, bilateral final and intermediate goods trade in both producer and consumer prices. The database was chosen because of its rich country detail of 140 regions (see table 11 in the appendix). Compared to other input-output databases GTAP has a rich country detail for the ASEAN region, which is interesting in the light of an analysis of Japan and its trading partners. Further, it can distinguish 56 sectors with 15 of these representing services, while the rest shows agri-food and manufacturing sectors. In short, the GTAP data provide us information on expenditure shares α, cost shares β and γ, bilateral trade shares π, countries' total value added $w_n Ln$, and trade surpluses S. The GTAP data has no panel dimension, and it does not provide information on intra-national trade. It is available for the year of 2011. Hence, in what follows, our assumption is that the structure of the world has remained approximately constant since 2011.[7] We do adjust our baseline for observed trade policy changes (new FTAs concluded, changes in tariffs) that occurred between 2011 and 2018.

We take information on bilateral preferential and MFN tariffs stem from Felbermayr et al. (2018).

4.2 Learning from EU-Korea for EU-Japan

The tariff changes agreed upon in the FTA can be simply taken from the published text. What the numerous vertical and horizontal provisions on NTBs mean for the size of trade costs is however much harder to predict. In this paper, we prefer a data-driven approach

[7] One could, of course, produce out-of-sample projections on the GTAP data, but we refrain from doing so since this would entail additional measurement error.

over the more conventional strategy to use export judgement. More specifically, we use an econometric ex-post estimation of the trade cost effects of the EU-Korea trade agreement in force since 2011 to approximate the trade cost savings expected from the EU-Japan free trade agreement. This allows us to incorporate sectoral heterogeneity, asymmetry between trade partners, and it also ensures that the scenarios are feasible (European Commission, 2017)). The EU-Korea agreement is a modern agreement, which, however, falls short from the most ambitious pacts that the EU (EU-Canada) and Japan (TPP-11) have concluded so far. According to Dreyer (2018), the EU-Japan FTA is more similar to the EU-Korea one in terms of structure, coverage, and depth. Moreover, Korea is more similar to Japan in its economic structure than any other large economy with which the EU has an FTA, i.e., it is a resources importing country, has significant machinery and automotive sectors, and operates production networks in Asia. Also, Korea and Japan have similar bureaucratic systems and heavy government regulations. Thus, it is plausible that NTBs share similar characteristics. Finally, geographical distance from the EU is similar to Korea and Japan. Likewise, cultural distance (language, business culture) are also comparable. Clearly, our assumption is bold. We view it as complementary to other papers that base scenario definitions on expert judgement.

We use a gravity model consistent with our theoretical framework to estimate the effects of the EU-Korea FTA. The econometric technique isolates the causal effects of the trade agreement from other determinants of bilateral trade such as price levels, the development of the GDP, other trade policy initiatives, or changes in the structure of comparative advantage. Recent developments in the empirical gravity literature as summarized byYotov et al. (2016) are taken into account. The specification uses econometric panel data methods on bilateral sector-level trade flows for the period 2000-2014, which stems from the latest version of the WIOD data. The sample for the main estimation includes all 56 sectors and the estimation is based on more than 1.5 million observations. The use of panel data is necessary because it ensures to comprehensively treat time-invariant trade costs. Second, following Baier and Bergstrand (2007), we are able to treat potential endogeneity of the policy variables of interest. We follow gravity theory to properly define the set of fixed effects that are needed for the estimations. Informed by the sectoral and by the panel gravity literature, the main specification is estimated with exporter-sector-time and importer-sector-time fixed effects in order to account for the unobservable multilateral resistance terms highlighted by Anderson and Van Wincoop (2003). These fixed effects also absorb all other observable and unobservable characteristics on the importer and on the exporter side. Following the recommendations of Santos Silva and Tenreyro (2006) to account for heteroskedasticity and to take into account the information that is contained in the zero trade flows, we use the PPML estimator in order to obtain our main estimates. In the sensitivity analysis we also obtain OLS estimates.

In order to take advantage of all the information contained in the data, we estimate the main specification with data for all years in the sample. This is important because we only have four post-agreement years in the data, namely 2011 until 2014.[8] Bergstrand et al. (2015) argue that the RTA estimates from panel gravity specifications may be biased upward because they may capture general effects of globalisation. In order to address this issue, our main specification follows Bergstrand et al. (2015) and introduces yearly dummy variables for international borders for each year in our sample.[9]

Baier, Yotov, and Zylkin (2016) further show that the effects of FTAs might be asymmetric. Following Baier, Yotov, and Zylkin (2016), we allow for the effects of the EU-Korea FTA to be different for EU exports to Korea and for Korean exports to the European Union. In addition, we also allow the pair fixed effects to be directional. Finally, in addition to accounting for the specific effects of the EU-Korea FTA, which are of primary interest here, the main estimate also controls for the presence of any other regional trade agreement that may have impacted trade between the countries in our sample during the period of investigation. In the robustness checks, we allow for differential effects of the RTAs depending on their type.

This is our main estimating equation:

$$X_{ij,t}^{k} = \exp\left[\frac{\delta_1^j}{\theta^j} EUKOR_{ij,t} + \frac{\delta_2^j}{\theta^j} KOREU_{ij,t} + \frac{\delta_3^j}{\theta^j} RTAij,t + \pi_{ij,t}^{k} + \chi_{ij,t}^{k} + \mu_{ij,t}^{k}\right] + \varepsilon_{ij,t}^{k}. \tag{19}$$

$X_{ij,t}^{k}$ denotes the nominal bilateral trade flows from exporter i to importer j in sector k at time t, which also include intra-national trade flows. $EUKOR_{ij,t}^{k}$ is an indicator variable that is equal to one for exports from EU to Korea for the years after 2010, and it is equal to zero otherwise. Similarly, $KOREU_{ij,t}$ is a dummy variable that takes a value of one for Korea's exports to EU after 2010, and it is equal to zero otherwise. $RTAij,t^{k}$ is an indicator for the presence of any other regional trade agreement. Finally, $\pi_{ij,t}^{k}$, $\chi_{ij,t}^{k}$ and $\mu_{ij,t}^{k}$ are exporter-sector-time, importer-sector-time, and directional sector-pair fixed effects,

[8] An important feature of the WIOD dataset is that it includes intra-national trade flows. GTAP does not include it, which is why we have to estimate the structural gravity with WIOD instead of GTAP, which is later used for the computable general equilibrium analysis. This enables us to follow Anderson and Yotov (2016) and to include intra-national trade flows when estimating structural gravity models. As discussed and demonstrated in Dai et al. (2014), the inclusion of intra-national trade flows enables us to member countries at the expense of domestic sales.

[9] Perfect collinearity requires one of the border dummies to be dropped. Our choice is the border dummy for 2000, which is the first year in the sample. Thus, all other border estimates should be interpreted as relative to the border impact in 2000.

respectively. The two first ones control perfectly for the theoretical multilateral resistances and for all other observable and unobservable variables at the exporter-sector-time and the importer-sector-time dimensions. The latter one absorbs all time-invariant trade costs by allowing them to vary by sector and in each direction of trade. In addition it is equivalent to implementing the average treatment effect methods to account for endogeneity of regional trade agreements following Baier and Bergstrand (2007).

Results based on aggregate trade data. The next table shows the aggregate results in terms of additional trade created by the EU-Korea FTA for the main estimation, specification (1), which is estimated with a Maximum Likelihood (PPML) estimator and several robustness checks. The EU-Korea FTA seemingly promoted trade between the EU and Korea, which is supported by the positive and significant estimates of the coefficients on each of the two indicator variables (EU exports to Korea and vice versa). The agreement increased EU exports to Korea on average by 52% and Korean exports to the EU by 14%.[10] Note that as of 2014, the last year in our sample, the agreement is not fully phased in and the economic effects have certainly not fully ramped up either. Hence, the estimated effects can be understood as lower bounds of the long-run effects. Another interesting result is the, on average, significantly asymmetric effect across the members. The effect on EU exports to Korea was significantly larger compared to the corresponding effects on Korean exports to the European Union, which might indicate the fact that it took longer for the Korean side to fully take advantage of the large and sophisticated EU market.[11]

The robustness checks show quite similar results compared to the main estimation, specification (1). In column (2) an OLS estimator is used instead of PPML estimator. The main difference between the OLS and the PPML estimates is that the OLS estimator delivers a significant estimate of the effects of the other Regional Trade Agreements in our sample. More important for our purposes, comparisons between the estimates of the effects of the EU-Korea FTA from columns (1) and (2) suggest that they are not statistically different from each other, even though the OLS estimates of the effects on the Korean exports to the EU are a bit larger as compared to their counterparts from column (1).

Column (3) drops the observations for RoW completely from the sample, which is a potentially important check since countries may trade a lot with the RoW region and trade with this region may be important in defining the reference group for the identification of the agreement effects in our analysis. The estimates from column (3) are qualitatively iden-

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[10]The trade creation effects are computed from the estimated effects by applying the formulas $100\% * \exp 0.42 - 1 = 52\%$. All other point estimates presented in the table can be interpreted similarly.

[11]Note that the effect is not due to the strong depreciation of the euro vis-à-vis the won, because currency effects have been controlled for in the empirical analysis.

tical and, even though they are a bit smaller, they are not statistically different from the corresponding estimates from column (1). In sum, this experiment and the previous one demonstrate that the treatment of RoW does not affect our findings.

Column (4) of the table above allows for the effects of all other RTAs that entered into force during the period of investigation to vary by type of agreement. The estimates for three of the four types of agreements are positive and significant, as expected. The negative estimate on FTA is likely to be of small relevance because there are very few new FTAs in the sample, and it is the creation of agreements rather than their sheer existence which drives the estimates. Second and more important the estimates of the effects of the EU-Korea FTA are virtually unchanged in each direction as compared to the main estimates from column (1). Column (5) does not control for the presence of any other RTAs. The new estimates of the effects of the EU-Korea FTA in each direction are identical to the corresponding results from the main specification in column (1). Given the purpose of this evaluation, this result is even more important than our previous experiment of allowing for heterogeneous RTA estimates.

Table 2: Broad estimates of the aggregate trade effects of the EU-Korea FTA

	(1)	(2)	(3)	(4)	(5)
				Treatment of RTAs	
	Main	OLS	RoW excluded	Type of agreement	no RTA
EU → KOR	0.42	0.42	0.36	0.43	0.42
	(0.04)**	(0.03)**	(0.04)**	(0.04)**	(0.04)**
KOR → EU	0.13	0.17	0.12	0.14	0.13
	(0.04)**	(0.02)**	(0.04)**	(0.04)**	(0.04)**
Other Regional Trade Agreements	0.02	0.2	-0.01		
	-0.02	(0.01)**	-0.02		
Economic Integration Agreements				0.07	
				(0.02)**	
Free Trade Agreements				-0.07	
				(0.02)**	
Customs Unions				0.28	
				(0.02)**	
GSP-type Agreements				0.22	
				(0.05)**	

Note: Own estimation, based on WIOD (2017) data. Note: Standard errors in parentheses, + $p < 0.10$, * $p < .05$, ** $p < .01$. Number of observations: 1,515,818. All regressions include a full set of yearly dummy variables for international borders for each year in our sample. All regressions use PPML estimates, except (2).

Results based on sectoral trade data. The above evaluation of aggregate data illustrates general patterns. However, for our multi-sector trade model, we require sectoral estimates. Consistent with our theoretical model, we specify sector-level gravity regressions that are similar to the aggregate one used above. Results are shown in Table 3.[12]

[12] The sector classification is based on the WIOD data. We map the WIOD sectors into GTAP sectors using an appropriate concordance table.

One has to be aware of the fact that the estimates presented here are to be understood as partial equilibrium effects, and that additional trade effects from higher incomes as well as trade diversion effects are not accounted for. These will be dealt with in the subsequent GE analysis. However, the estimates presented can be interpreted as causal effects of the EU-Korea FTA, because other determinants of trade have been controlled for so that the effects reported indeed represent the additional trade due to the agreement.

The table reveals several interesting results. First, it is consistent with the findings of the table 2. On average the effects of the EU-KOR FTA for EU exports to Korea is stronger than vice versa. Although, there is substantial heterogeneity across the sectors and the available time span is relatively short, 92% of the effects of EU-Korea FTA on EU exports to Korea are positive, with 84% being statistically significant and vice versa 73% of the estimates of the EU-Korea FTA's effects on Korean exports to the EU are positive, with more than half of them being statistically significant. Another interesting pattern is the fact that the effects are on average stronger for the goods than for services.

The results suggest a relatively symmetric trade-creating effect ranging between 28% (EU exports) and 34% (Korean exports) for the crop and animal production. This result can be translated to the EU and Japan case, because both regions have relatively restrictive barriers for the agricultural sectors and once these decrease, we can expect equal trade creation effects in both regions. In fishing and aquaculture, the trade creating effects amount to 102% for the EU, while we have no evidence for higher exports from Korea to the EU. This result is also plausible for the EU-Japan example, because Japan's non-tariff barriers seem to be stricter compared to international standards in the fishery sector. Satisfying the required quality and safety standards can be costly. A trade liberalization with accompanying decreases of strict non-tariff barriers will lead to higher trade creation effects for the respective trading partners (here: the EU). In the area of processed food, beverages, and tobacco, the situation is relatively balanced with positive effects of 29% on EU exports and of 18% on Korean exports. Trade in textiles, apparel, and leather was stimulated as well, but the effects do not come out as statistically significant. This is different for the manufacture of wood and cork, where, albeit from low initial levels, exports went up by 41% and 36%, respectively.

Substantial trade creation effects are reported in the manufacturing sectors. The effects tend to be stronger for the EU than for Korea. The automotive sector (ID 20) plays an especially important role. While Korean exports have grown by 47%, the EU exports increased by some 41%. In contrast, EU exports in the transport equipment sector expanded by almost 80% and is thus a much more asymmetric development. The effect is mainly driven by the aircraft sector. Korean exports, on the other hand, did not grow.

The point estimates of the petroleum sector (ID 10) is 1.867 for EU exports and suggests

Table 3: Sectoral trade creation effects (%) of the EU-Korea FTA

GTAP ID	Sector Description	EU (%)	p-value	KOR (%)	p-value
1	Crop and animal production	28.0**	0.002	33.8**	0.001
2	Forestry and logging	88.5**	0	55.0**	0.009
3	Fishing and aquaculture	102.4**	0	-6.3	0.718
4	Mining and quarrying	76.3**	0	44.8**	0.001
5	Manufacture of food beverages, tobacco	29.3*	0.04	18.4+	0.088
6	Manufacture of textiles, apparel, leather	8	0.643	16.8	0.109
7	Manufacture of wood and cork;	40.9*	0.02	35.7*	0.022
8	Manufacture of paper and paper products	9.3	0.299	31.1**	0.007
9	Printing and reproduction of recorded media	23.0*	0.022	26.0*	0.028
10	Manufacture of coke and refined petroleum	547**	0	130**	0
11	Manufacture of chemicals and chemical products	21.2+	0.074	39.4**	0
12	Manufacture of basic pharmaceutical products	73.8**	0	0.3	0.975
13	Manufacture of rubber and plastic products	23.7*	0.022	37.4**	0
14	Manufacture of other non-metallic minerals	53.6**	0.003	30.6*	0.021
15	Manufacture of basic metals	19.2+	0.054	32.4+	0.053
16	Manufacture of fabricated metal products	31.0**	0.001	24.2*	0.014
17	Manufacture of computer, electronic and optical	81.1**	0	-1.5	0.922
18	Manufacture of electrical equipment	60.5**	0	15.4	0.17
19	Manufacture of machinery and equipment nec.	50.4**	0	0.8	0.942
20	Manufacture of motor vehicles, trailers and semi-trailers	41.2**	0	47.0*	0.04
21	Manufacture of other transport equipment	79.3**	0	2.2	0.823
22	Manufacture of furniture; other manufacturing	10.3	0.265	-12.9	0.144
23	Repair and installation of machinery and equipment	-	-	-10	0.251
24	Electricity, gas, steam and air conditioning supply	238**	0.001	32.6*	0.035
25	Water collection, treatment and supply	385**	0.001	-54.5*	0.027
26	Sewerage; waste collection, disposal;	48.6**	0	3	0.882
27	Construction	39.4**	0	26.1**	0.002
28	Wholesale, repair of vehicles and motorcycles	72.5**	0	25.1	0.252
29	Wholesale trade, except of vehicles and motorcycles	59.5**	0	20.9+	0.092
30	Retail trade, except of motor vehicles and motorcycles	53.6**	0.001	26.7*	0.056
31	Land transport and transport via pipelines	73.0**	0	15.4	0.458
32	Water transport	22.5	0.261	28	0.112
33	Air transport	84.2*	0.033	32.6+	0.079
34	Warehousing and support activities for transportation	45.6**	0.001	1.9	0.862
35	Postal and courier activities	10.6	0.452	-5.2	0.835
36	Accommodation and food service activities	26.2*	0.013	17.9+	0.081
37	Publishing activities	31.4*	0.029	-9.3	0.646
38	Motion picture, video and television, sound	15.7	0.342	-17.6	0.295
39	Telecommunications	78.6**	0	-17.9	0.331
40	Computer programming, consultancy; information	74.9**	0.001	-5.2	0.841
41	Financial services, except insurance and pension	55.9+	0.082	10.4	0.537
42	Insurance, reinsurance and pension funding	106.3**	0	30.2+	0.083
43	Auxiliary to financial and insurance activities	13.2	0.744	-8.2	0.727
44	Real estate activities	-15.5	0.523	40.4*	0.032
45	Legal and accounting, management, consultancy	-27.7*	0.044	26.9*	0.022
46	Architectural, engineering, technical testing	53.3**	0.01	8.4	0.662
47	Scientific research and development	26.0*	0.029	5.2	0.594
48	Advertising and market research	-47.7+	0.061	-18.9	0.214
49	Other professional, scientific, veterinary activities	49.6**	0.024	9.2	0.271
50	Administrative and support service activities	30.9*	0.035	15.6	0.217
51	Public administration and defence	-0.2	0.988	-14.4+	0.054
52	Education	10.4	0.363	-3.3	0.772
53	Human health and social work activities	117**	0	6	0.658
54	Other service activities	42**	0.001	4.9	0.66
55	Undifferentiated goods- and services activities				0
56	Activities of extraterritorial organisations				

Note: Own estimates, based on WIOD (2014) data. The coefficients are translated into percentage trade creation effects. P-values below 0.10 denote statistical significance at least at the 10 percent level. If cell is blank it means that no sectoral estimate could be provided due to the lack of sufficient transactions in this area. + $p < 0.10$, * $p < .05$, ** $p < .01$.

that trade has multiplied by a factor of 5. This is a somewhat surprising result, but has also been noticed by Forizs et al. (2016). Accordingly, the EU mineral product exports increased substantially in 2012 and tapered off in the subsequent years. Supposedly the main drivers were increased EU oil exports, liquefied natural gas and oil preparations. This can also be translated to the EU Japan case.

Further, the econometric analysis shows strong heterogeneity across the services sectors. But although some effects are very large numerically, one has to be aware that they are mostly not statistically significant, because the level of trade was almost zero in the initial situation.

The analysis reveals rather symmetric trade creation effects for the construction industry (ID 27). While, the EU exports increased by 39%, the Korean exports expanded by 26%. Retail trade is confronted with positive effects of 54% and of 27% for Korea.

The air transport services expanded substantially (In the EU by 84% and 33% in Korea). The effects on trade in postal services (ID 35) or in audiovisual media (ID 38) are not statistically significant. The publishing and telecommunication services exports from Korea to the EU could not benefit, while the effect is positive for the vice versa case.

Large trade creation effects are evident in both financial services sectors, but the EU benefits more than Korea. This can also be seen in other services sectors. Exports in the EU's insurance sector (ID 42) more than doubled while Korean exports grew by only 30%. The advertising sector (ID 48), public administration and defence do not experience trade creation effects. Opposed to that, EU exports to Korea increase by 117% in the health care sector. Korean exports to the EU in this sector increased as well, but only by 6%.

Japan has some peculiar features. Thus once we apply this to Japan, some sectors might see much bigger or smaller magnitude particularly in EU exports. For example, EU imposes import restriction on some agricultural and fishery products from Japan after the Great East Earthquake of 2011. Thus the impact on Japanese exports to EU could be smaller. On the other hand, Japan faces drastic decreasing birthrate and aging of the population. Thus, positive impact of finance, insurance and health care sector in EU export will be much bigger.

4.3 Counterfactual Scenarios

The EU-Japan free trade agreement is the largest and most comprehensive trade agreement for the European Union, so far. But the world is changing fast and due to the ongoing uncertainties, such as the rising protectionism of the current US-administration or the Brexit negotiations, scenario uncertainty exists. We still do not know how the world and the existing trade patterns will look in the future. Thus, we simulate the consequences of the EU-Japan FTA based on different benchmark scenarios. The first scenario assumes a world as of today (status quo July 2018), thus with neither the exit of the United Kingdom from the EU (Brexit) implemented, nor any trade agreement that has been negotiated but that is not applied yet. The second benchmark scenario additionally takes Brexit into account, while the third scenario includes the Transpacific Partnership (TPP) agreement instead of Brexit.[13] In our scenarios, we reduce sectoral non-tariff barriers by the ex-post estimated trade cost reductions net of tariff changes, which are identified through the gravity analysis for the EU-Korea FTA, and reduce tariffs as specified in the FTA (i.e., bringing them to zero in the long-run).

There are several reasons why our results show a lower bound of the potential outcomes: First, Japan is a larger economy than Korea. Evidence from the literature shows that larger countries have more bargaining power in trade negotiations, which might lead to higher benefits for the ones estimated for Korea. Second, the data available for the structural gravity estimation to identify the causal effects for the NTBs goes from 2011 to 2014. Thus, the effects stemming from the EU-Korea FTA might not fully be observed in the data, because FTAs take longer time to fully unfold. The more general reason for the relatively low welfare gains lies in the calibration used using in this project. Due to a very conservative parameterization, welfare gains are low. Moreover, the model features only static gains; the dynamic gains from trade are not modeled. They can be very substantial; see Felbermayr and Gröschl (2013) for empirical evidence. Moreover, Japan has a different way of serving foreign markets compared to most EU countries. Rather than to produce at home and to export, its firms serve foreign markets via local production. Through this strategy, Japanese firms have insulated themselves from trade costs; however, as a consequence, lowering trade costs is of relatively little advantage to them. So, Japanese exports do not rise too much in absolute and in percentage terms. Imports, bound by the model to exports in order to keep trade surpluses constant at their 2014 level, and cannot increase very strongly, neither. This also keeps welfare gains down. Since Jung (2012) finds that FTAs take between 8 and 12 years to fully unfold, we square the trade cost savings factors, such that we effectively

[13] We do not implement the recent tariff policy of the US administration.

estimate the general equilibrium effects after an implementation period of 8 years. Given the findings of Jung (2012), we may underestimate the true effects by as much as 50%.

S1: The first counterfactual scenario replicates a deep and comprehensive free trade agreement with complete tariff elimination in all sectors. Further, the non-tariff measures modelled to the example of the EU-Korea agreement of 2011 are reduced at the respective amount. As described above, the baseline assumes the world existing as of January 1st 2018.

S2: Additionally, we compute a scenario that accounts for the exit of the UK from the EU. We therefore construct a baseline, which assumes a Brexit. The applied Brexit assumptions stem from Felbermayr et al. (2018). We then simulate the identical counterfactual scenario as in S1 on this new baseline. We believe that this scenario might be interesting to see, because UK makes up a large share of EU's economy. Japan will have access a smaller market via the FTA. Great Britain is bound to leave the EU following the negative referendum on June 23rd 2016. After triggering Art. 50 of the Treaty on the European Union (TEU), which defines the modality of exiting the Union, the UK and the remaining European countries (EU27) have two years to negotiate both the separation of the two entities from each other and a new free trade agreement. In a white paper, the British Prime Minister Theresa May has made it very clear that the UK is set to leave the European customs union and the single market. The UK wants to pursue its own external trade policy, it wants to free itself from the jurisdiction of the European Court of Justice, and it wants to regain control on the flow of immigrants from the EU. These objectives mean that the future relationship of the EU with the UK will be very different to the present one. For example, the trade agreements negotiated by the EU with third countries cannot apply to the UK anymore if the UK is no longer in the customs union. Also, withdrawing from the Single Market means that new trade barriers will emerge, for instance, as the mutual recognition of market access permits of financial products expires. A model often cited is the EU-Canada Deep and Comprehensive Free Trade Agreement (DCFTA), CETA, or an older agreement the EU has with South Korea (EU-Korea). At this stage, it is unclear what shape the future relationship between the UK and EU27 will take, but the probability that, two years after triggering Article 50, only a transitory arrangement can be agreed upon, is high. In this section, we model a tough Brexit; i.e., the EU and the UK reintroduce tariff barriers, and non-tariff barriers reemerge to the level observed with other WTO members. The Brexit would also imply that a future agreement between the EU and Japan would not apply to Britain.

S3: The third scenario assumes a baseline, identical to scenario one, but additionally includes a TPP without the USA. The counterfactual scenario is then again identical to S1.

5 General Equilibrium Results

Our CGE analysis captures all general equilibrium feedbacks, e.g. those through trade diversion effects or changes in aggregate income. In contrast, the gravity estimates presented in the previous section refer to partial equilibrium effects of the agreement, because incomes and aggregate prices are taken as given. The advantage of our approach is that no direct measures of observed reductions in non-tariff trade costs are needed, and the simulation exercise is cleanly tied to the gravity estimation. The model framework allows for drawing conclusions about the EU-Japan FTA on the structure of bilateral trade flows at the GTAP 9.1. level of aggregation, aggregate trade (volumes and openness measures), levels of value added, employment, emissions, and price levels, both at the sectoral and on the aggregate levels, wages and overall price levels, measures of real per capita GDP and of welfare (compensating variation measures). Simulating the effects of the EU-Japan FTA in the frame of the model, two vectors will change compared to the status quo: first, the vector that reflects tariffs between the EU and Japan and second, the vector that reflects non-tariff measures. While the former is directly observable, the latter one is indirectly estimated by the partial equilibrium analysis.

We report effects on marco- and microeconomic outcomes, such as the real income changes, or sectoral value added and trade changes. In our Ricardian trade model, lowering trade costs allows countries to specialize more strongly in sectors in which the comparative advantage is the strongest. But such a trade liberalization does not necessarily lead to an overall welfare gain. Consumers benefit from lower prices, but they may source from more inefficient countries. At the same time, governments lose tariff income. Moreover, the preferential nature of trade liberalization gives rise to the Viner-ambiguity. The FTA may affect world market prices such that some partner countries could be hurt. Further, the European Union and Japan are both advanced economies with quite similar patterns of their comparative advantage in the manufacturing industry. Once countries have similar technological structures with similar domestic prices, a removal of trade barriers incites small trade flow changes and relatively small welfare gains, respectively. This makes the analysis of the EU-Japan trade agreement especially interesting. The next part will now present the results of the simulations and gives insights about the loser and winners in respect to the trade agreement members, other regions (e.g. Taiwan, ASEAN, etc.) and sectors within these regions.

5.1 Changes in Real Income

This section depicts the real income changes for certain countries and regions (also see equation 18). Table 4 shows the respective real income changes occurring because of an FTA between the EU and Japan under the three different baseline scenarios. The changes are sorted by the magnitude of effects of S1. The aggregation of the regions can be found in the Appendix 11.

In general, we see a positive change in real income for Japan and the EU across all scenarios. The potential for growth is evident. Japan's economy has been growing slowly after the burst of a real estate bubble in 1992. Measured in purchasing power parities the real per capita income has grown by only about 0.77% per year, while Germany's real per capita income increased by 1.35% per year. This resulted in a strong collapse of Japan's share in the value of world output (and demand, both measured in USD) from about 15% in 1990s to the value of 5.6% observed today (Germany: 4.6%). Nonetheless, together the EU and Japan account for more than a third of the world's GDP. Indeed, Japan is the third biggest economy of the world (USD 4,120 bn. as of 2015, measured in current prices), after the US and China, and about 25% greater than Germany. An impulse in the form of a free trade agreement can therefore lead to relatively high changes of Japan's and EU's real income.

The effects for Japan are positive in all depicted scenarios, with the largest effects being evident in S1 and S3. When Japan ratifies the TPP (with Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, and Vietnam) the changes in real income increase slightly (S3) compared to the S1, because Japan's economy is stronger under the existence of TPP and can therefore trade even more with European Union compared to the first scenario. The positive change on Japan's real income shrinks, once the baseline takes account of Brexit. Not only will a Brexit lead to UK leaving the European Union, but this also connotes that the UK dissolves from existing trade agreements. Japan will then have access to a smaller market with less consumers and potential buyers of Japanese products, which explains the somewhat smaller positive real income effects of Japan in S2. Japan is one of Europe's most important trading partners, which explains the relatively large results for the European countries. All EU countries are expected to benefit. For Germany, the fourth largest economy in the world (measured in current market prices), the effect of the FTA is the largest under Brexit, because Germany will be able to substitute large parts of UK's initial trade with Japan. The ratification of a TPP leads to slightly smaller positive changes than under S1. Interestingly the UK profits more from a Brexit than without.

But as the scenarios show, the remaining countries and regions will most likely loose slightly because of this agreement. The largest losses can be expected in Taiwan and South Korea,

Table 4: Real Income Changes of all Regions, in %

	Real Income Changes in %				Real Income Changes in %		
	S1	S2	S3		S1	S2	S3
Japan	0.32	0.26	0.31	Rest of World	0.01	0.01	0.01
Italy	0.23	0.06	0.07	India	0.00	0.00	0.00
United Kingdom	0.11	0.12	0.11	China	0.00	0.00	-0.00
Rest of EU	0.10	0.10	0.10	USA a. Canada	-0.00	0.00	-0.00
Germany	0.08	0.10	0.08	Latin America	-0.00	0.00	0.00
France	0.07	0.06	0.07	Africa	-0.00	-0.00	-0.00
Vietnam	0.03	0.02	0.00	Singapore	-0.00	-0.01	-0.01
Philippines	0.01	0.00	0.00	Middle East	-0.00	-0.00	-0.00
Malaysia	0.01	0.00	-0.01	Rest of Europe	-0.00	0.00	0.00
Indonesia	0.01	0.00	0.00	Thailand	-0.01	0.00	-0.02
Oceania	0.01	0.01	0.00	Taiwan	-0.01	-0.01	-0.03
Rest of ASEAN	0.01	0.01	-0.01	South Korea	-0.01	-0.00	-0.01
World	**0.05**	**0.05**	**0.05**				

Note: S1 simulates the EU-JPN FTA based on the baseline that assumes the world existing as of January 1st 2018. S2 simulates the EU-JPN FTA under a hard Brexit. S3 simulates the EU-JPN FTA based on a world with a ratified TPP11.

which are quite dependent from Japan. With the new FTA, there will be trade creation to some extent, but also trade diversion that will substitute existing trade relationships with new ones. A more profound explanation can be found in chapter 5.3. Interestingly, Vietnam will be able to generate income gains as soon as Japan ratifies the agreement. The gains will even be larger without the TPP 11 than with its existence (compare S1, S2 with S3).

To summarize, Japan will have the largest gains in all three scenarios. Countries of the European Union are also able to generate real income increases. Italy, Germany, UK and France will benefit the most, while smaller EU economies will profit less. The remaining countries will be confronted with small losses. Only Vietnam is able to generate substantial income gains without even being member of the new trade agreement. Other close trading partner of Japan, such as South Korea and Taiwan will be confronted with somewhat stronger losses in terms of real income. These effects can also be decomposed into its components. Table 5 shows the decomposition of scenario 1. This decomposition provides a profound indication to what extent the different trade costs are responsible for the total real income change, seen in table 4.

Figure 5 shows the main trade cost drivers of scenario 1. The real income changes are sorted by the absolute magnitude per region. The separate sub-scenarios are shown as stacked bars. Scenario one includes all of these separate effects, which cannot be simply added up. Rather, they also generate some complementary effects when enforced together. A reduction of tariffs might for example have spillover effects for non-tariff barriers, such as a simplification of other bureaucratic measures, which are obsolete when there are no tariffs.

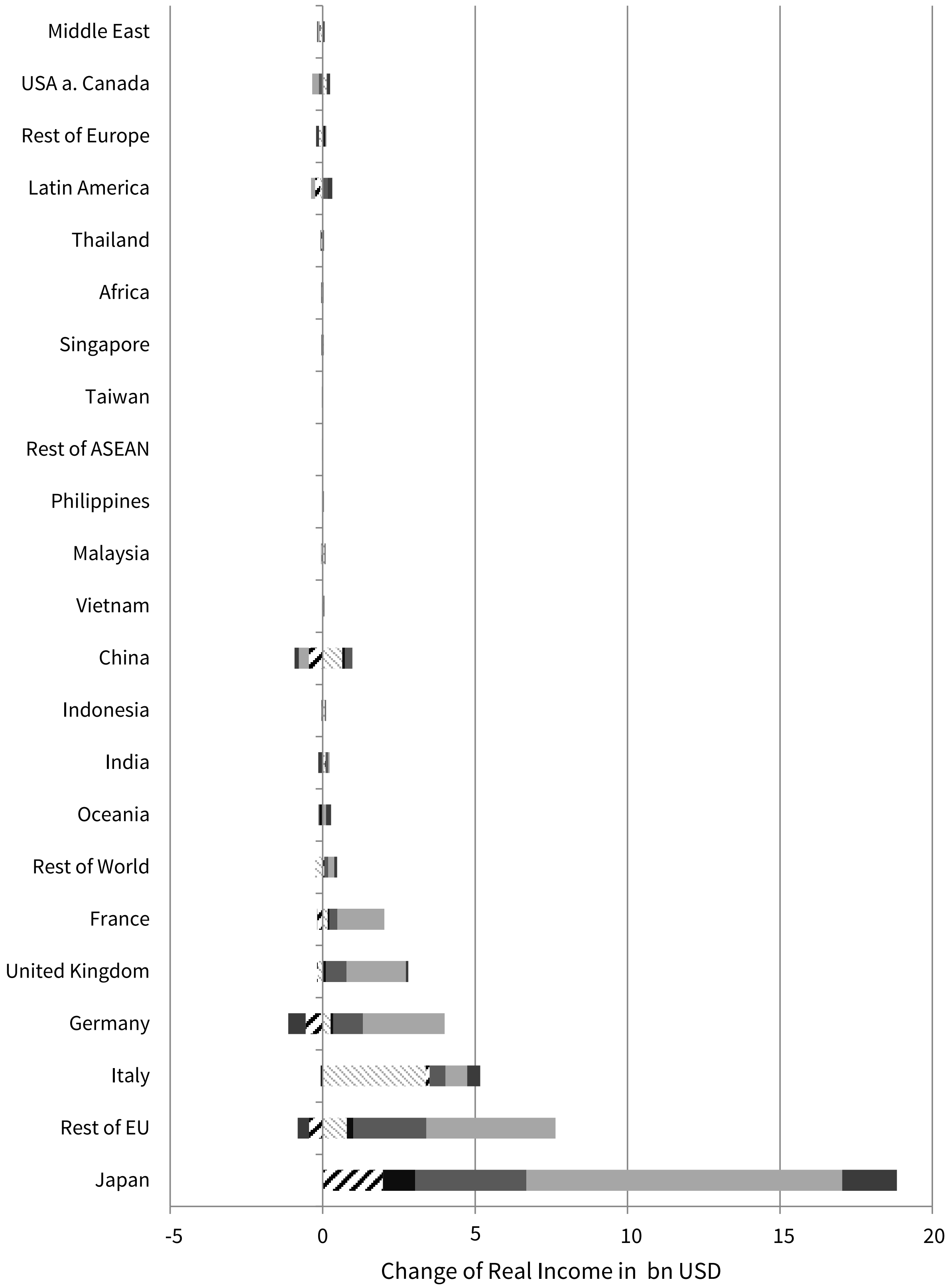
Table 5: Sub-Scenarios of S1

	Reduction of tariffs		Reduction of non-tariff barriers		
	Agrifood	Manufacturing	Agrifood	Manufacturing	Services
a	✓				
b		✓			
c			✓		
d				✓	
e					✓
Scenario 1	✓	✓	✓	✓	✓

The FTA would increase Japan's real income by 18.8 bn USD. The reduction of non-tariff barriers in the service industries is the key driver of this positive outcome; it is responsible for 10.4 bn USD of Japan's real income increase (scenario e), while the reduction of non-tariff barriers in the manufacturing sector is responsible for another positive real income change worth 3.7 bn USD (scenario d), while the reduction in the agri-food sector generates additional income of 1.1 bn USD (scenario c). The tariff cuts in the agri-food and manufacturing sector are not able to influence the Japanese real income as the non-tariff barrier reduction does (scenarios a and b). In total these cuts would increase Japan's real income by only 2 bn USD, which is not surprising if one looks at the tariff schedule between Japan and the EU. One quarter of products is already exempt from tariffs between the two trade partners, Japan and the EU. Although a large array of products between both regions is subject to tariffs, and 85% of the bound tariffs are below 10 percentage points. So a tariff cut as simulated in scenario a and b cannot lead to substantial gains, because there is simply not much to liberalize. Only a few traded goods reach tariff peaks of 75% in the EU and 60% in Japan.

As the figure shows, the positive gain for Japan is by far the largest ones. In total, the EU members will be able to gain 19.3 bn USD. The reduction of non-tariff barriers in the service industry generates is responsible for most of the gains in the European Union. The effect of the remaining countries is also mainly driven by the reduction of non-tariff measures in the service sectors.

Figure 5: Welfare Decomposition for Regions, in bn USD



5.2 Changes in sectoral value added

The next part looks at the sectoral value added effects of the EU and Japan. For this purpose, we concentrate on scenario one. Table 6 shows the initial value added and the respective change in each of the depicted sectors for the EU and Japan. The detailed sector list can retrieved from the Appendix, table 10. The value added is an important indicator for the determination of threats and opportunities for workers and firms. The lower the sectoral value added the higher is the pressure on wages and employment.

A free trade agreement between Japan and the EU liberalizes two extremely developed and specified markets. Japan is a high-tech market and is one of the main innovators of automated and robotized manufacturing; with one of the world's best internet infrastructures and small and medium enterprises dominate the market. Further, the country is still quite protectionist, in particular when looking at non-tariff barriers (see EU Commission (2016)). Both, the EU and Japan are fairly advanced economies with similar patterns of comparative advantage; in particular, they are manufacturing hot-spots. However, this has direct implications for the gains from trade integration: countries with similar technological structures would have similar domestic prices in the presence of trade barriers so that their removal incites only relatively small trade flows and corresponding welfare gains. A trade liberalization between those regions has the potential to further increase the specialization of the sectors with a high comparative advantage. This would lead to an increase in sectoral value added in the most competitive industries. It will be interesting to see which sectors can assert them and which sectors are not able to take advantage of this trade liberalization.

The changes of value added in the manufacturing industry are quite heterogeneous across sectors and the two trading regions. Large changes can be expected in the automotive and electronic equipment industry. While the Japanese automotive industry would be able to increase its value added by 7.9% (7.3 bn USD), the one of the EU is confronted with losses of 1.7%, which equals a decrease of 5 bn USD. EU's electronic equipment industry will be able to generate value added gains of 1%, which equals 1.3 bn USD. The Japanese electronic equipment industry will increase its value added by 0.5% (0.5 bn USD).

The FTA would lead to benefits for the Japanese chemical industry (also including pharmaceuticals). Its value added increases by 4.7%, thus 6.1 bn USD. This result is in line with a report of the European Commission (2016), which counts the chemical sector to the ones profiting the most from an EU-Japan agreement. Japan owns an advantage in the pharmaceutical industry with an export volume of 5 billion Euro in 2014 while the EU exported products worth 350 million to Japan. With the existence of the EU-Japan FTA, Japan seems to be able to expand its exports in the chemicals industry. The EU, on the other hand, would be confronted with losses of 0.8%, which is equivalent to a lower value added of 4.9 bn USD. Up until today, EU's weighted average tariffs of the chemical industry lies at 10%, which is higher than in other manufacturing sectors. Seemingly, the reduction of tariffs puts pressure on the European industry, because Japan is able to expand its business in this sector. The specific trade relation is explained in the next sub-chapter. Further, Japan would be able to increase the value added by 1.4% (2.6 bn USD) in the machinery and equipment sector. The EU would increase its respective value added 0.1%, which equals an increase of 0.8 bn USD. The disruptions in the remaining production sectors are rather small. The manufacturing industries of the EU would also be confronted with minor losses of 164 mn USD (-0.1%), while Japan can again increase the value added by 256 mn USD (0.9%). Similar patterns are evident in the textile and metals sectors: Europe is confronted with slightly higher pressure and losses between 2.5 bn USD and 102 mn USD, while Japan can increase the sectoral value added between 4.1 bn USD and 348 mn USD. On the other hand, but Japan and the EU can increase their value added in the natural resources and raw material sectors by 1.6% and 0.1%.

The tariff reduction and liberalization seems to put some pressure on the Japanese agri-food sectors, because the sectoral value added would decrease by 9.9%. Although, many Japanese agricultural products depend on foreign imports, the tariff liberalization, and the following lower prices, seems not necessarily to have positive effects as theory would predict. The discussion about the agricultural sectors in the FTA negotiations is especially sensitive, and the pressure of increasingly cheaper imports from abroad is evident. In contrast, the European Union would increase its value added of agri-food products by 2.3%.

The value added in the service industries increases for both regions. EU's sectoral value added in the trade and transport sector increases by 4.1 bn USD and Japan's by 0.7 bn USD. Only the financial, insurance and business services of the EU are confronted with a decrease in value added of 0.1% (1.8 bn USD), while the respective Japanese counterpart will increase its value added by 0.7% (6.1 bn USD).

5.3 Changes in trade

Outcomes of the two trading regions look quite complementary in the agri-food and goods sector. All the sectors that can generate gains in terms of value added are losing in the other region and vice versa. The only exception is the electronic equipment and machinery sector. The services sectors behave similarly and are confronted with positive value added effects in both regions. The EU-Japan trade agreement would seemingly lead to diversion effects in the agri-food and goods sectors and to output creation in the service industry. The next part

Table 6: Change in sectoral value added, EU28 and Japan

	EU28 Sectoral Value Added Initital in bn USD	EU28 Sectoral Value Added Change in %	Japan Sectoral Value Added Initital in bn USD	Japan Sectoral Value Added Change in %
Agri- and Food Products	848	2.32	206	-9.98
Automotive	289	-1.73	93	7.86
Chemicals	602	-0.83	134	4.70
Electronic equipment	143	0.93	98	0.51
Energy	82	-2.13	0	9.67
Financial and Insurance, Business Services	3148	-0.06	925	0.66
Machinery and equipment	808	0.10	193	1.36
Manufacturing	133	-0.12	29	0.88
Metals	463	-0.54	146	2.81
Natural Resources and raw materials	856	0.11	191	1.57
Other services	6817	0.10	2478	0.37
Textile	230	-0.04	21	1.68
Trade and Transport	1751	0.23	1139	0.06
Total	16172	0.10	5654	0.69

Note: The list depicts the aggregated sector categories. A detailled sector list can be found in the Appendix, table 10.

will now look into the changes of the trade patterns between Japan and its trade partners on an aggregate and sectoral level. Table 7 shows the change of Japanese exports, while table8 shows the respective imports. Both tables are identical in their structure. The first column depicts the sectors, which were already shown in the table 6. The remaining columns show the changes of Japanese exports/imports with the EU28, China, ASEAN, Rest of the World and USA/Canada as relative and absolutes changes (in mn USD). The last line shows the aggregate, bilateral trade change per bilateral partner. Let's first concentrate on the Japanese export structure.

Overall, Japan is able to increase its exports towards all countries and regions. Not surprisingly, Japan's exports to the EU increase to the largest extent, by 84 bn USD, which is equivalent to a 68% increase in Japanese exports towards the EU. The export increases towards the remaining countries and regions cannot be neglected either. Chinese imports of Japanese products increases by 1.9% (4 bn USD), ASEAN by 1.8% (2.1 bn USD), USA/Canada by 2.3% (3.5 bn USD) and imports of the rest of the world from Japan by 2% (6.1 bn USD). Japanese imports from the EU increase by 94%, which is equal to an increase of 105 bn USD. Other than on the export side, Japanese imports from the remaining world decreases by 17 bn USD. Trade diversion away from third countries and towards the EU is evident on the import side.

The largest export increase towards the EU can be expected in the automotive machinery and electronics sector (32.7 bn USD). Further, Japanese exports towards the EU increase in the chemical industry (15.6 bn USD). The same is true for the agri-food industry that exports additional products worth 432 Million USD more towards the EU. The increase of exports in the Japanese service industry is not negligible either. While the EU is already successfully active in Japan in some service sectors, such as in the construction, health and machinery services, with an export volume of around 2.5 billion, 760 million, and 670 million Euros in 2014, Japanese exports in these sectors turn out to be negligible so far, while in other industries a reversed pattern is prevailing. E.g. in the whole sale services, water transport, and technical activities Japan achieves trade volumes between 2.3 billion and 1 billion Euros while EU exports in the same industries remain on a relative low level. Implicitly, the new trade agreement somewhat balances the observed asymmetries across the different service sectors while at the same time there are several service industries in which both Japan and the EU can increase bilateral trade by eliminating non-tariff barriers and market access regulations, which are the only trade restricting measures in services compared to the primary and secondary industries.

Table 7: Change of Japanese bilateral Exports, in % and mn USD

	Change of Japanese Exports to									
	EU28		China		ASEAN		RoW		USA a. Canada	
	in %	in bn USD	in %	in bn USD	in %	in bn USD	in %	in bn USD	in %	in bn USD
Agri- and Food Products	129.27	0.43	3.73	0.04	3.70	0.03	2.31	0.06	3.86	0.04
Automotive, Machinery and Electronics	47.33	32.71	1.99	2.58	1.83	1.23	2.10	3.55	2.31	2.60
Chemicals	107.46	15.64	1.99	0.62	1.97	0.30	1.94	0.91	2.15	0.34
Energy	122.38	0.00	3.41	0.00	7.72	0.00	8.42	0.00	3.54	0.00
Financial and Insurance, Business Services	83.56	7.70	2.07	0.03	2.50	0.08	2.61	0.22	2.28	0.17
Manufacturing	8.32	0.13	1.46	0.03	1.47	0.01	1.50	0.05	1.55	0.03
Metals	78.14	5.68	1.17	0.25	1.05	0.22	1.12	0.38	1.14	0.08
Natural Resources and raw materials	327.84	10.91	1.67	0.16	1.69	0.08	1.58	0.28	1.75	0.05
Other services	46.80	2.60	2.14	0.05	2.34	0.03	2.57	0.21	2.23	0.10
Textile	95.60	1.00	2.39	0.12	2.40	0.05	2.98	0.07	2.48	0.02
Trade and Transport	59.39	7.45	2.62	0.15	2.75	0.14	3.03	0.36	3.10	0.12
Total	67.63	84.24	1.93	4.01	1.79	2.18	2.00	6.10	2.25	3.54

Note: The list shows the aggregated sector categories. A detailed sector list can be found in the Appendix, table 10.

Table 8: Change of Japanese bilateral Imports, in % and mn USD

	Change of Japanese Imports from									
	EU28		China		ASEAN		RoW		USA a. Canada	
	in %	in bn USD	in %	in bn USD	in %	in bn USD	in %	in bn USD	in %	in bn USD
Agri- and Food Products	422.71	38.07	-16.64	-2.05	-17.03	-2.15	-17.35	-8.48	-23.70	-6.88
Automotive, Machinery and Electronics	75.65	21.20	-2.69	-1.99	-2.56	-0.86	-2.51	-0.87	-4.33	-1.28
Chemicals	15.21	3.40	-0.40	-0.07	-0.38	-0.05	-1.64	-0.29	-1.60	-0.28
Energy	15.54	0.00	1.61	0.01	1.28	0.33	1.36	2.38	1.24	0.03
Financial and Insurance, Business Services	38.35	6.49	-1.84	-0.06	-2.00	-0.06	-2.18	-0.24	-2.15	-0.45
Manufacturing	9.18	0.15	-1.21	-0.08	-1.06	-0.01	-1.89	-0.03	-3.33	-0.03
Metals	29.42	1.11	0.17	0.02	1.02	0.07	0.74	0.19	-0.01	-0.00
Natural Resources and raw materials	212.98	10.20	-2.91	-0.37	-2.68	-0.32	-0.44	-0.41	-1.56	-0.16
Other services	94.84	6.59	-1.83	-0.04	-2.22	-0.03	-2.31	-0.18	-1.94	-0.23
Textile	46.35	2.06	-11.52	-4.42	-4.42	-0.26	-8.28	-0.32	-13.93	-0.13
Trade and Transport	109.59	16.40	-5.56	-0.75	-7.71	-0.39	-8.39	-1.30	-11.46	-1.02
Total	93.63	105.68	-2.72	-5.17	-2.22	-2.70	-0.71	-3.08	-4.50	-6.10

Note: The list shows the aggregated sector categories. A detailed sector list can be found in the Appendix, table 10.

6 Conclusions

This paper provides a quantitative analysis of the trade and welfare effects of the forthcoming EU-Japan Economic partnership Agreement, the so far largest agreement that both the EU and Japan have concluded as of today. Its conclusion is of strategic importance for both the EU and Japan in times of growing protectionism and unilateralism. Further, this study shows that it also bears positive effects for both trade partners. By approximating the expected trade cost savings using estimates for the EU-Korea agreement, this quantitative analysis reveals welfare effects for Japan within eight years at about 15 bn. Euro. This is equivalent to an increase of 0.32% of GDP in 2016. The EU members can expect total income gains of around 19 bn. Euro per year. The largest gains can be expected in Italy (5.1 bn), Germany (2.9 bn.), UK (2.6 bn.), and France (1.9 bn.).

A decomposition exercise reveals that especially the reduction of non-tariff barriers is the key driver of the welfare increase throughout the EU and Japan. China, Korea, and Taiwan are expected to suffer from the EU-Japan trade agreement due to trade diversion effects. However, the damage is relatively minor. Interestingly, Japan increases its exports to the EU by 68%, thus worth 83 bn USD. But Japan is also able to increase its exports towards third countries, such as China and the ASEAN countries. Opposed to that results, the share of Japanese imports from the EU relative to the remaining import origins seems to increase. Sectoral value added impacts are very heterogeneous, even within the agri-food or manufacturing sectors. Substantial changes can be expected in the automotive and electronic equipment industry. The Japanese automotive industry would be able to increase its value added by 7.3 bn USD and the EU would be confronted with a decrease of 5 bn USD. Opposed to that, EU's electronic equipment industry will be able to generate value added gains of 1.3 bn USD. Here, the Japanese electronic equipment industry will increase its value added by 0.5 bn USD. Other important Japanese sectors, such as the chemical industry (also including pharmaceuticals) also increases the value added (by 6.1 bn USD). The value added in the service industries increases for both regions.

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7 Appendix

Table 9: Trade Cost Elasticities

GTAP ID	Description	Trade Elasticities
1	Paddy rice	-5.8230
2	Wheat	-1.3217
3	Cereal grains nec	-1.2893
4	Vegetables, fruit, nuts	-1.4956
5	Oil seeds	-1.3217
6	Sugar cane, sugar beet	-1.3217
7	Plant-based fibers	-14.4952
8	Crops nec	-1.8446
9	Cattle, sheep, goats, horses	-2.5031
10	Animal products nec	-3.5222
11	Raw milk	-2.5486
12	Wool, silk-worm cocoons	-2.5486
13	Forestry	-3.7834
14	Fishing	-3.6693
15	Coal	-10.3915
16	Oil	-26.6757
17	Gas	-26.6757
18	Minerals nec	-4.1475
19	Meat: cattle, sheep, goats, horses	-2.5486
20	Meat products nec	-2.5486
21	Vegetable oils and fats	-3.7847
22	Dairy products	-2.8907
23	Processed rice	-9.8984
24	Sugar	-2.5073
25	Food products nec	-3.2790
26	Beverages and tobacco products	-1.3169
27	Textiles	-5.2618
28	Wearing apparel	-2.1010
29	Leather products	-3.7073
30	Wood products	-3.3775
31	Paper products, publishing	-4.6448
32	Petroleum, coal products	-8.6460
33	Chemical, rubber, plastic prods	-4.4832
34	Mineral products nec	-3.3516
35	Ferrous metals	-1.5660
36	Metals nec	-4.8543
37	Metal products	-2.5564
38	Motor vehicles and parts	-4.0680
39	Transport equipment nec	-4.0118
40	Electronic equipment	-2.0006
41	Machinery and equipment nec	-3.3853
42	Manufactures nec	-2.5133
43-57	All Services	-5.9591

Note: The trade cost elasticities for the goods stem from (Aichele et al., 2016). The trade cost elasticities for services stem from (Egger et al., 2015).

Table 10: List of GTAP Sectors

GTAP sector ID	GTAP Sector	GTAP sector ID	GTAP Sector
	Agri- and Food Products		**Energy**
1	Paddy rice	15	Coal
2	Wheat	16	Oil
3	Cereal grains nec	17	Gas
4	Vegetables, fruit, nuts		
5	Oil seeds		**Metals**
6	Sugar cane, sugar beet	35	Ferrous metals
7	Plant-based fibers	36	Metals nec
8	Crops nec	37	Metal products
9	Cattle, sheep, goats, horses		
10	Animal products nec		**Natural Resources and raw materials**
11	Raw milk	13	Forestry
14	Fishing	18	Minerals nec
19	Meat: cattle, sheep, goats, horses	30	Wood products
20	Meat products nec	31	Paper products, publishing
21	Vegetable oils and fats	32	Petroleum, coal products
22	Dairy products	34	Mineral products nec
23	Processed rice		
24	Sugar		**Other services**
25	Food products nec	43	Electricity
26	Beverages and tobacco products	44	Gas manufacture, distribution
		45	Water
38	**Automotive**	46	Construction
		51	Communication
33	**Chemicals**	55	Recreation and other services
		56	PubAdmin/Defence/Health/Education
40	**Electronic equipment**	57	Dwellings
	Financial and Insurance, Business Services		**Textile**
52	Financial services nec	12	Wool, silk-worm cocoons
53	Insurance	27	Textiles
54	Business services nec	28	Wearing apparel
		29	Leather products
	Machinery and equipment		
39	Transport equipment nec		**Trade and Transport**
41	Machinery and equipment nec	47	Trade
		48	Transport nec
42	**Manufacturing**	49	Sea transport
		50	Air transport

Note: The list depicts all sector,s available in the GTAP 9.0 data. The aggregated sectors used in the above analyses are underlined and bold. Individual underlined and bold sectors, such as the automotive industry are separately illustrated, which is why they are not categorized into another sector.

Table 11: List of GTAP Regions and Countries

Africa	**Japan**	Israel	Ukraine
Ghana			Rest of EFTA
Mozambique	**Latin America**	**Oceania**	Croatia
Kenya	Brazil	New Zealand	Albania
Cameroon	Argentina	Australia	Norway
Uganda	Uruguay	Rest of Oceania	Switzerland
Rest of Eastern Africa	Puerto Rico		Turkey
South Central Africa	Rest of South America	**Philippines**	Rest of Europe
Namibia	Colombia		
Burkina Faso	Dominican Republic	**Rest of ASEAN**	**Rest of World**
Rest of South African Customs Union	El Salvador	Rest of Southeast Asia	Kazakhstan
Nigeria	Chile	Brunei Darussalam	Belarus
South Africa	Panama	Cambodia	Sri Lanka
Benin	Trinidad and Tobago	Lao PDR	Rest of South Asia
Mauritius	Guatemala		Nepal
Ethiopia	Nicaragua	**Rest of European Union**	Rest of former Soviet Union
Zambia	Paraguay	Hungary	Mongolia
Zimbabwe	Venezuela, RB	Spain	Pakistan
Rwanda	Costa Rica	Sweden	Rest of East Asia
Senegal	Honduras	Lithuania	Bangladesh
Côte d'Ivoire	Ecuador	Slovak Republic	Georgia
Malawi	Mexico	Luxembourg	Azerbaijan
Central Africa	Peru	Finland	Armenia
Togo	Jamaica	Malta	Rest of World
Botswana	Belize	Netherlands	Russian Federation
Guinea	Bolivia	Belgium	Kyrgyz Republic
Rest of Western Africa		Latvia	
Tanzania	**Malaysia**	Poland	**Singapore**
Madagascar		Greece	
	Middle East	Cyprus	**South Korea**
China	Rest of North Africa	Austria	
Hong Kong SAR, China	Bahrain	Portugal	**Taiwan**
China	Qatar	Czech Republic	
	United Arab Emirates	Bulgaria	**Thailand**
France	Jordan	Denmark	
	Oman	Ireland	**USA a. Canada**
Germany	Saudi Arabia	Romania	Rest of North America
	Morocco	Slovenia	Canada
India	Rest of Western Asia	Estonia	United States
	Tunisia		
Indonesia	Kuwait	**Rest of Europe**	**United Kingdom**
	Iran, Islamic Rep.		
Italy	Egypt, Arab Rep.	Moldova	**Vietnam**

Note: The list depicts all countries available in the GTAP 9.0 data. The aggregated regions used in the above analyses are underlined and bold. Individual underlined and bold countries, such as Japan are separately illustrated, which is why they are not categorized into another region.