Reducing Transatlantic Barriers to Trade and Investment

An Economic Assessment

Final Project Report

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Prepared under implementing Framework Contract TRADE10/A2/A16

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Colophon

Reducing Trans-Atlantic Barriers to Trade and Investment

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Key Findings

- An ambitious and comprehensive transatlantic trade and investment agreement could bring significant economic gains as a whole for the EU (€119 billion a year) and US (€95 billion a year). This translates to an extra €545 in disposable income each year for a family of 4 in the EU, on average, and €655 per family in the US.
- The benefits for the EU and US would not be at the expense of the rest of the world. On the contrary, liberalising trade between the EU and the US would have a positive impact on worldwide trade and incomes, increasing global income by almost €100 billion.
- Income gains are a result of increased trade. EU exports to the US would go up by 28%, equivalent to an additional €187 billion worth of exports of EU goods and services. Overall, total exports would increase 6% in the EU and 8% in the US.
- Reducing non-tariff barriers will be a key part of transatlantic liberalisation. As much as 80% of the total potential gains come from cutting costs imposed by bureaucracy and regulations, as well as from liberalising trade in services and public procurement.
- The increased level of economic activity and productivity gains created by the agreement will benefit the EU and US labour markets, both in terms of overall wages and new job opportunities for high and low skilled workers. Labour displacement will be well within normal labour market movements and economic trends. This means a relatively small number of people would have to change jobs and move from one sector to another (0.2 to 0.5 per cent of the EU labour force.)
- The agreement would have negligible effects on CO2 emissions and on the sustainable use of natural resources.

Executive Summary

The economies of the European Union and the United States are very important trading partners for each other. Although average tariff levels are relatively low already, various non-tariff barriers or NTBs (often in the form of domestic regulations) on both sides of the Atlantic constitute important impediments to deepening transatlantic trade and investment linkages. This study examines the impact of the reduction of such barriers. Even where they might not be directly targeting cross-border activities, domestic rules and regulations nevertheless can place a cost on trade and investment. However, unlike tariffs, it should also be stressed that many regulations cannot simply be removed when they serve legitimate domestic purposes. Yet in such cases the costs involved may still be mitigated or reduced through partial regulatory convergence and cross-recognition of standards. While this is likely to be a difficult process, the potential benefits in terms of productivity and incomes are substantial.

This study reviews the importance of the bilateral economic relationship and provides computable general equilibrium (CGE)-based estimates for the economy-wide impact of reducing both tariff and non-tariff barriers (NTBs). Estimates are provided with regards to expected changes in GDP, sector output, aggregate and bilateral trade flows, wages, and labour displacement, among other issues. The analysis uses the GTAP8 database (projected to 2027), in conjunction with NTB estimates reported in the Ecorys (2009) study. The study investigates different policy options for the deepening of the bilateral trade and investment relationship between the EU and US. These range from partial agreements that are limited in the scope of barriers they would address (tariffs only, or services only, or procurement only) to a full-fledged free trade agreement

(FTA) with a comprehensive liberalisation agenda covering simultaneously tariffs, procurement, NTBs for goods, and NTBs for services. The comprehensive option includes two scenarios: a less ambitious agreement that includes a 10 per cent reduction in trade costs from NTBs and nearly full tariff removal (98 per cent of tariffs) and an ambitious scenario that includes the elimination of 25 per cent of NTB related costs and 100 per cent of tariffs. In both scenarios more ambition is imposed on the lowering of procurement-related NTBs than for other NTBs affecting goods and services. It is assumed that NTBs linked to procurement are reduced by 25 per cent or 50 per cent, in the "less ambitious" and in the "ambitious" scenarios respectively. The impact of partial alignment of global rules and standards with a new set of EU-US standards and cross-recognition agreements is also included in the assessment.

The results indicate positive and significant gains for both economies. Under a comprehensive agreement, GDP is estimated to increase by between 68.2 and 119.2 billion euros for the EU and between 49.5 and 94.9 billion euros for the US (under the less ambitious and more ambitious scenarios). However, if the FTA would be limited to tariff liberalisation only, or services or procurement liberalisation only, the estimated gains would be significantly lower. For example, an FTA limited to tariff liberalisation would lead to a lower (23.7 billion euro) increase in GDP for the EU and a 9.4 billion euros increase for the US. The study also quantifies potential benefits from NTB reduction affecting FDI. The overall message is that negotiating an agreement that would be of a comprehensive nature would bring significantly greater benefits to both economies.

Another core message that follows from our results is that focusing efforts on reducing NTBs is critical to the logic of transatlantic trade liberalization. Different approaches to the same regulatory challenges have the unintended consequence of increasing costs for firms, which have to comply with two regulatory environments, dragging down labour productivity. Negotiation on NTBs provides the opportunity to pursue a mix of cross-recognition and regulatory convergence to reduce these barriers. Compared to a focus on NTBS, just limiting the exercise to tariffs would lead to much more limited,

though positive effects. Furthermore, the gains to the transatlantic economies from NTB reduction are not projected to be at the expense of the rest of the world, though the rest-of-world impact hinges critically on the potential for global convergence toward EU-US standards, which could then become de facto global standards and have a knock-on effect lowering NTBs multilaterally. Such a process implies improvement of market access for third countries, helping to offset trade diversion.

Finally, this study also reports estimates on sustainability impacts -- changes in emissions and in natural resource utilization. Elimination of NTBs implies improved productivity (i.e. less primary inputs are required for current activity). The results point to negligible effects on the rate of CO2 emissions and utilisation of natural resources.

Summary of Macroeconomic Effect

	Limited agreement: tariffs only	Limited agreement: services only	Limited agreement: procurement only	Comprehensive agreement: less ambitious	Comprehensive agreement: ambitious
Change in GDP					
EU, million euros	23,753	5,298	6,367	68,274	119,212
US, million euros	9,447	7,356	1,875	49,543	94,904
Bilateral exports f.o.b.					
EU to US, million euros	43,840	4,591	6,997	107,811	186,965
US to EU, million euros	53,777	2,859	3,411	100,909	159,098
Total exports f.o.b.					
extra-EU, million euros	43,740	5,777	7,136	125,232	219,970
US, million euros	57,330	5,488	5,942	142,071	239,543

Note: estimates to be interpreted as changes relative to a projected 2027 global economy.

1. Introduction

The transatlantic trade relationship is a deep one, rooted in centuries of shared economic history. In the post-war period, this fact has been reflected not only in early shared steps leading ultimately to the modern multilateral trading system, but also periodic initiatives to form a regional trade agreement. [1] With the rising importance of global and regional production chains and international firms, the logic for a regional, transatlantic agreement seems compelling. Together, the two economies account for roughly half of world output and world trade. They are, mutually, each other's most important investment partners as well.

In 2012, a comprehensive dialogue was initiated between the European Union and United States, regarding possibilities for deepening of transatlantic trade and investment relations. The discussions regarding the possible deepening of these links are on-going. This report offers quantification of the effects of a trade and investment agreement under a range of possible policy options. Both the EU and the US have relatively low MFN tariffs. But, given the magnitude of both trade and investment flows between the EU and the US, removing even relatively minor impediments to these flows will have a significant impact, with potential substantive benefits for both economies. In addition, since the existing non-tariff barriers also act as impediments to trade and investment, there are good reasons to believe that there are significant untapped gains from a deeper trade and investment relationship.

1 Past initiatives have included both the NAFTA (North Atlantic Free Trade Area) and the TAFTA (Transatlantic Free Trade Area). See Baldwin and Francois (1997a, 1997, 1999) for background on earlier initiatives. See Baldwin (2012) and Francois, Manchin, and Tomberger (2012) on the rise in value chains and global production.

This report builds on an important previous study benchmarking the current level of transatlantic NTBs. That report found that the potential gains for the EU and US were substantial (Ecorys, 2009). Since the Ecorys study was published, economic conditions have changed, while the likely focus of a possible agreement is now better defined. Working with new data (including the GTAP8 database, more recent trade and tariff information and new investment income data from Eurostat), the present report provides an updated and more accurate set of estimates. We provide new CGE-based estimates for the economy-wide impact of removing not only NTBs (quantified on the basis of the estimates in Ecorys (2009),[2] but also tariffs affecting transatlantic trade flows. In addition, we have expanded the analysis by providing an assessment of the impact of removing barriers to foreign direct investment (FDI) on the activity of multi-national enterprises (MNEs) across the transatlantic marketplace. Both the CGE and investment assessments build on the survey and econometric work of the original Ecorys study. The report is structured as follows. Chapter 2 provides the background for the economic assessment. This includes current trade and FDI flows, as well as a technical discussion, providing an overview of how NTBs have been identified and measured, based on the 2009 Ecorys report. In Chapters 3-5 we set out and employ a CGE model to examine both economic and socio-economic (sustainability) impacts of trade-related measures. Chapter 6 focuses on foreign investment. In Chapter 7 we offer some concluding comments.

2 In Ecorys (2009) study, non-tariff barriers are defined as "all non-price and non-quantity restrictions on trade in goods, services and investment, at federal and state level. This includes border measures (customs procedures, etc.) as well as behind-the border measures flowing from domestic laws, regulations and practices".

2. Economic and Policy Background

We start this chapter with an overview of current trade and FDI relationships between the EU and US, as well as tariffs and NTBs that are currently in place. In doing so, we define the context in which we estimate the effects of liberalising trade and investment between the two economies.

The EU and the US are relatively open towards each other in terms of investment and trade, as reflected in relatively low levels for tariffs. However, various NTBs (often in the form of domestic regulations) on both sides of the Atlantic constitute important impediments to transatlantic trade and investment flows. Even though they might not be directly targeting cross-border activities they nevertheless do bear a cost on trade and investment. The reduction of such barriers could potentially benefit both the EU and the US. However, unlike tariffs, many regulations cannot simply be removed, as they often serve important and legitimate domestic objectives like product safety and environmental protection. Yet such costs may be reduced through partial regulatory convergence and cross-recognition of standards. Still, some amount of regulatory divergence is inevitable and will remain, as regulations reflect differences in geography, language, preferences, culture, and history. Thus, in a realistic analytical exercise, while it can be assumed that some NTBs can be eliminated by mutual agreement and effort, their 100 per cent elimination should not be considered as a realistic outcome.[3]

3 At the same time, as both regions are high income with high standards for domestic objectives, neither should regulatory convergence be seen as a process for bilateral lowering of standards, but rather as a mechanism for reinforcement of comparable objectives otherwise reached through different regulatory means.

2.1. Current trade flows and FDI

2.1.1. Trade

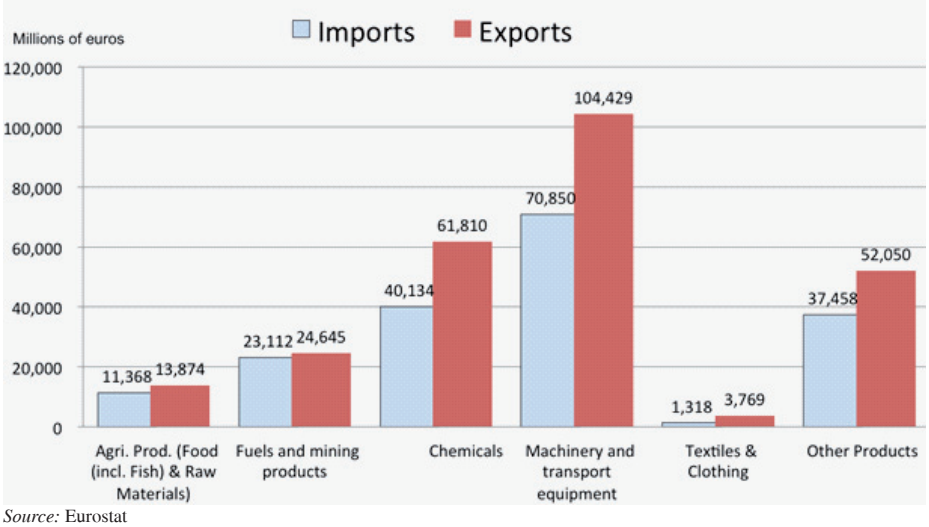
The US is the most important trade partner for the EU as measured by exports. In 2011, around 17 per cent of total EU exports were destined to the US market. The US is also an important source of EU imports. It is the third most important (11 per cent of total imports) after China and Russia[4]. For the US, the EU is also a key bilateral trade partner. The EU was the second most important destination for US exports (after Canada), representing 19 per cent of total exports. It is also the second most important import partner (after China), supplying 17 per cent of total US imports.[5]

The magnitude of the trade relationship between the EU and the US, and the importance of the two economies as bilateral partners, suggests that an FTA that would reduce obstacles and costs to trade between the two could have significant impacts on trade and on their economic performance.

Figure 1 shows EU merchandise trade with the US divided by main sectors for the year 2011. Most imports and exports take place in the machinery and transport equipment sector. This amounted to 70,850 million euros of EU imports from the US, and 104,429 million euros worth of EU sales to the US. The second most important sector for goods trade between the EU and the US is chemicals. Also in this sector the EU exports more than it imports (around 50 per cent more).

4 Source: Eurostat.
5 Source: Eurostat.

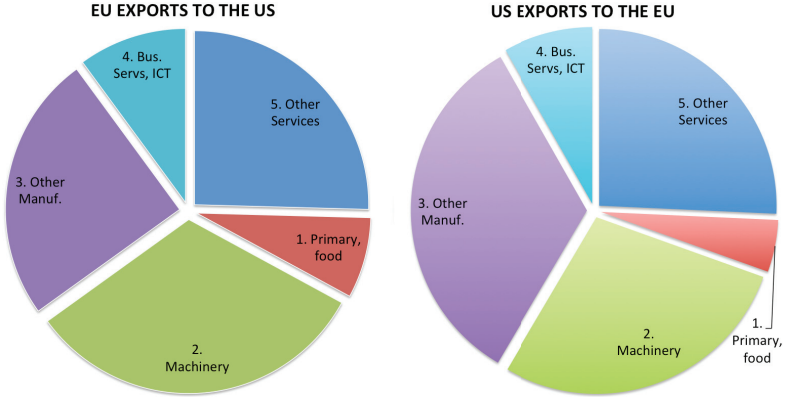
Figure 1 EU trade in goods with the US by sector (in million euros), 2011



Source: Eurostat

Given that goods trade accounts for roughly 65 per cent of total bilateral trade, (see Figure 2), liberalisation efforts (if the same across the board) are likely to lead to a more pronounced impact in terms of exchanges of goods rather than services between the US and EU.

Figure 2 The bilateral composition of trade in projected benchmark (2027)

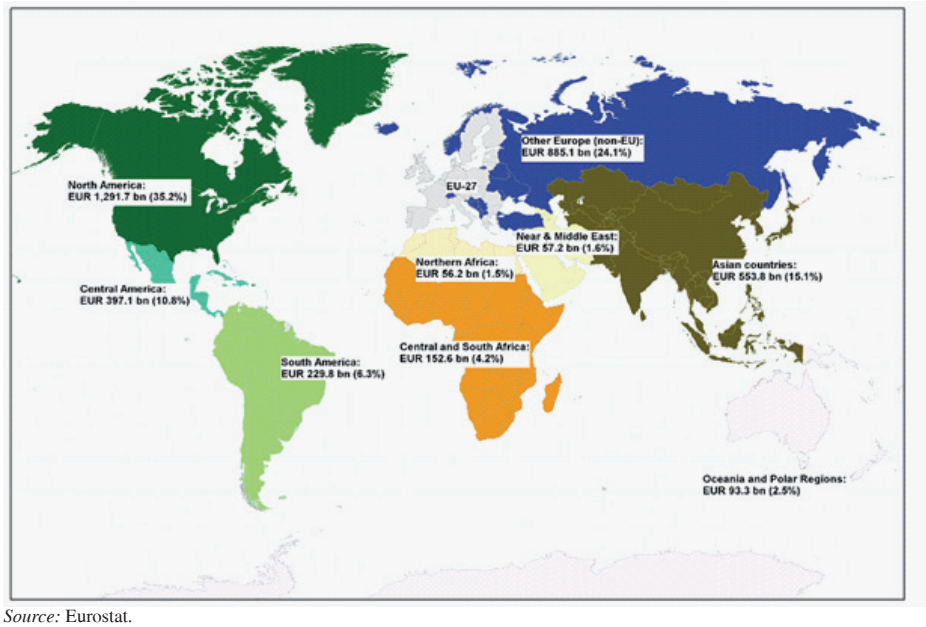


Source: model benchmark database.

2.1.2. FDI

North America is the most important destination for EU outward FDI, as can be seen in Figure 3. The region hosts about one-third of total EU outward FDI stocks. The second most important region for EU's outward FDI stock is the so-called non-EU Europe region that includes the former Soviet Union countries, Switzerland, Norway and Turkey. These economies hold about one-fourth of EU FDI stocks. The third most important region for EU's FDI is Asia, which accounts for 14 per cent of total FDI outward stocks.

Figure 3 EU27 outward stocks of FDI, 2010

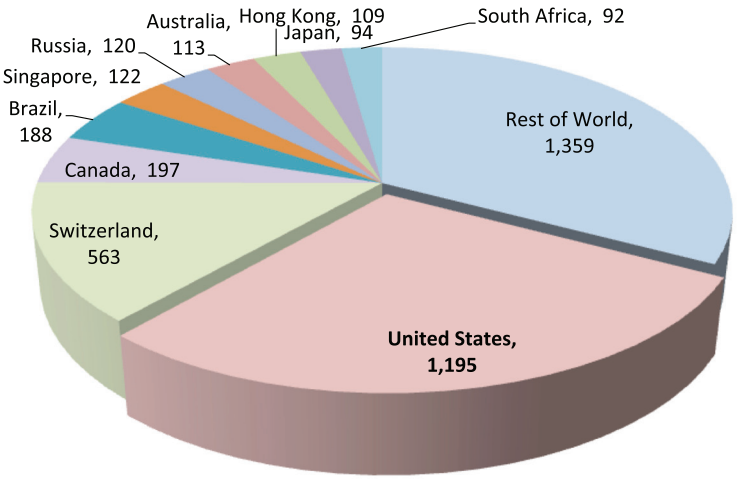


Source: Eurostat.

While in Figure 3 we focused on regions, Figure 4 and Figure 5 (below) show the breakdown of EU FDI partners by major country (instead of regions). Again, this confirms the importance of the US. On a country basis, the US stands out even more as the most important bilateral investment partner for the EU. EU outward FDI stocks in the US are more than twice as large as to the second most important host country for EU FDI, which is Switzerland. The relative importance of the US as source of FDI in

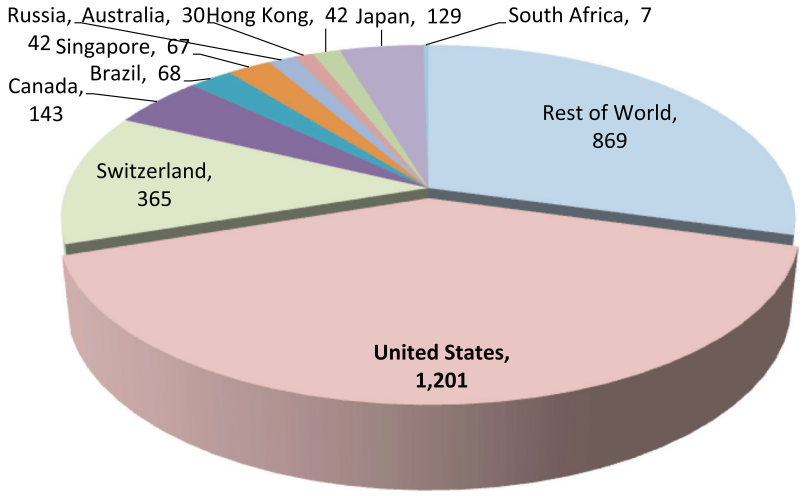
the EU is even more pronounced when viewed on a country basis, with the US owning almost four times more of EU inward stocks of FDI than the second most important partner country, Switzerland. Given the magnitudes of the FDI between the EU and the US any policy influencing the further flows could have a significant impact on these economies.

Figure 4 Top ten hosts of EU outward FDI stocks, 2010 (in 1000 million euros)



Source: Eurostat

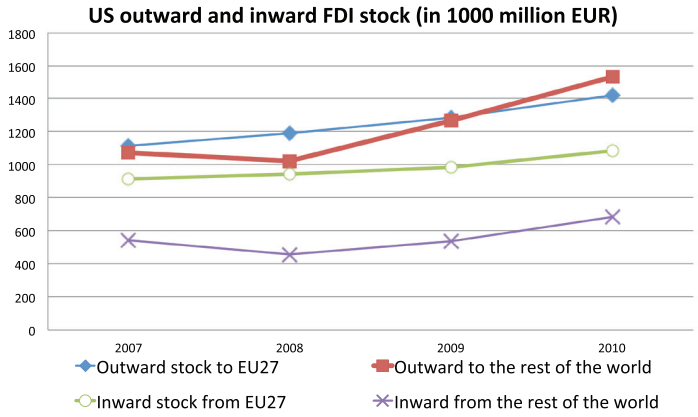
Figure 5 Top ten sources of EU inward FDI stocks, 2010 (in 1000 million euros)



Source: Eurostat

Figure 6 depicts the evolution of outward and inward FDI to and from the US. For the US, the EU is also the most important FDI partner. The stock of inward FDI from the EU exceeds that from the rest of the world. However, the stock of US outward FDI to the EU represents an even higher amount than inward stock from the EU.

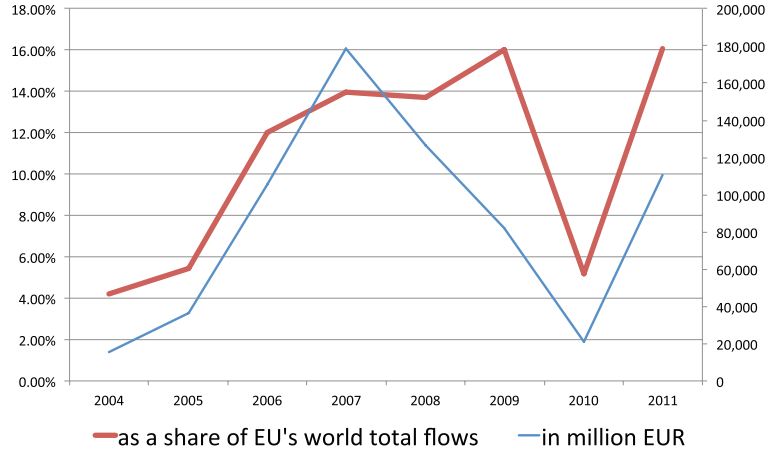
Figure 6 US outward and inward FDI to the EU and the rest of the World, 2010 (in 1000 million euros)



Source: OECD and own calculations

FDI activity between EU and US suffered the consequences of the financial crisis but is now rebounding. Just before the financial crisis, EU investment flows to the US peaked, with almost 178,510 million euros of EU investment flows going to the US in 2007 (see Figure 7). This represented about 14 per cent of the total of the EU's investment flows going abroad. During the crisis, EU investment flows to the US dropped down to almost 2004 levels, with the lowest amount of bilateral flows taking place in 2010. Nevertheless, in 2011, bilateral investment flows picked up again, although not reaching yet pre-crisis levels.

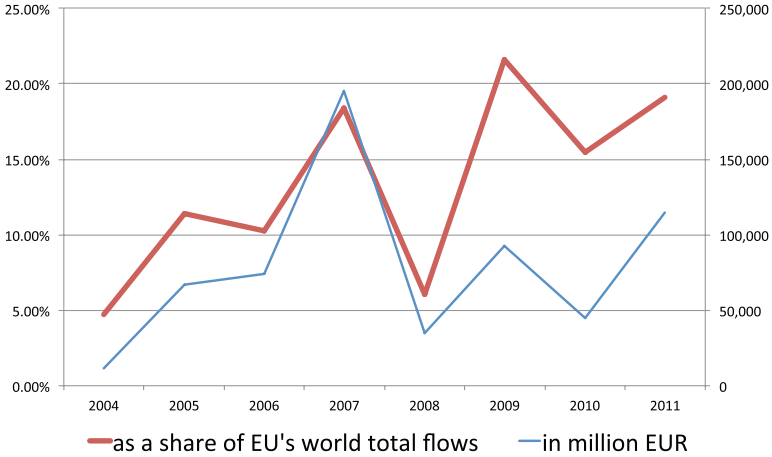
Figure 7 EU's direct investment flows to the US, 2004-2011



Source: Eurostat and own calculations.

Investment flows from the US (and from the rest of the world) to the EU also dropped dramatically during the crisis (see Figure 8). The highest amount of investment from the US took place in 2007, amounting to 195,660 million euros. In 2010, the incoming FDI flows were only 114,763 million euros. However, while the volume of FDI inflows from the US is still below the pre-crisis level, the share of investment coming from the US has reached its pre-crisis level as of 2010.

Figure 8 EU's direct investment flows from the US, 2004-2011



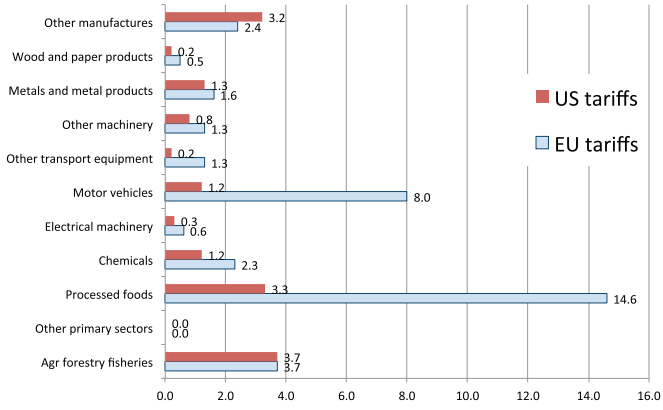
Source: Eurostat and own calculations.

Given the importance and attractiveness of the North American region for EU investors and of the European market for US investors any policy aiming to remove regulatory barriers to transatlantic investments can be expected to have a potentially very large impact.

2.2. Current patterns of tariffs

In this section we focus on existing tariff barriers. Figure 9 shows that there is some heterogeneity in terms of tariff protections between the EU and the US. While in most sectors, EU tariffs are slightly higher than those imposed by the US, they are still relatively low. However, there are two main exceptions: motor vehicles, and processed foods. The EU average tariffs on these products are substantially higher than the US tariffs. For motor vehicles[6] the EU applies an average tariff (8.0 per cent) that is almost eight times higher than the US. For processed food products, EU average tariffs (14.6 per cent) are more than four times higher than US average tariffs. For agriculture, forestry and fisheries average tariffs are also relatively high (about 3.7 per cent) but for these products there is no difference between the EU and the US.

Figure 9 Trade Weighted Applied (MFN) average tariff rates 2007



Source: WTO, CEPII, UNCTAD mapped to GTAP8

6 Motor vehicles sector in this case includes also parts and components.

Given the current tariff structure, the scope for tariff reductions to have a significant impact on trade flows is limited. Indeed, for most sectors, a further reduction in tariffs implies very small absolute changes in the level of protection. Nevertheless, in some sectors, such as processed foods, agriculture, forestry and fisheries, and motor vehicles, the impact is likely to be more substantial. For other sectors, NTBs are the primary driver of potential impact as will be shown in the next section.

2.3. Non-tariff barriers

NTBs and regulatory divergence are complex issues to deal with analytically. Even the measurement of the importance of these barriers for trade and investment is a difficult exercise. This study relies on the earlier work on this topic in the Ecorys (2009) study. The Ecorys study remains the most comprehensive and detailed to date. The methodology incorporated in that study used a multi-pronged approach that combined literature reviews, business surveys, econometric analyses (gravity modelling together with CGE modelling), as well as consultations with regulators and businesses and inputs by sector experts aiming to obtain a qualitative and quantitative estimates of transatlantic NTBs. While the Ecorys survey focused on both trade and FDI, we focus here on trade-related barriers. We will return to FDI barriers in Chapter 6.

Box 1 NTBS and the concepts of cost and rents

NTBs and regulatory differences can have two main effects. NTBs can either increase the cost of doing business for firms, or they can restrict market access. Traditional NTBs, like import quotas, are an example where NTBs market access. In contrast, regulations that require expensive reconfiguration of products (like changing voltage or reconfiguration of an exhaust system) for export are an example of cost raising NTBs. Both can have different impacts by changing market concentration and economic power (and thus profits) of companies. In order to be able to make a distinction between those two types of NTBs, the concepts of 'cost' and 'rent' are included here in modelling of NTBs, following the findings of the firm surveys (and related literature) in the Ecorys (2009) study. That study found that about 60 per cent of the price impact of NTBs could be classified as following from actual cost increases on average, while the creation of market power (economic rent) was responsible for the other 40 per cent of price increases. This is an average, and there is some variation across both sectors and countries in this regard. In the case of NTB-related cost increases, this constitutes a welfare loss to society. In case of an increase in market concentration, consumer prices may also go up. However part of the increase is then appropriated by companies as they reap increased revenues and profits. Thus there is a redistribution of welfare, and not simply a reduction in economic efficiency.

2.3.1. Indexes and econometrics

To estimate the ad-valorem equivalent of NTBs (the impact on prices and costs) and to quantify to what extent those are removable between the two economies, the Ecorys (2009) study undertook a complex set of assessments. We summarize those steps briefly here. The assessment involved surveys combined with gravity-based econometrics.[7]

7 For further discussion on the methodologies used for NTB quantification, which technically are known as gravity models see both Ecorys (2009) Chapter 3.4, and also Anderson, Bergstrand, Egger, and Francois (2008). For goods, selection based gravity modelling was used. Services barriers were based on the NTB elasticity estimates from Francois and Hoekman (2010).

The NTB estimates involved a two-part survey as a first step. The survey was conducted on firms in the EU and US engaged in trade, and firms in the EU and US engaged in FDI. They were asked both detailed questions about NTBs, and a more general set of questions about overall market access conditions.[8] In cases where NTBs were identified, companies were asked about the relative importance of such barriers. Firms also provided a comprehensive general measure of NTB-related market access (the combined impact of all barriers) in the form of a ranking scaled from 0 to 100. With the overall ranking question, 0 indicated that there were no NTBs of any type, and 100 meant there were prohibitively high NTBs. The business survey restrictiveness indicators were then crosschecked against OECD (2007) restrictiveness indicators and against the Product Market Regulation (PMR) indexes. For the service sectors the combination of the OECD restrictiveness indicators and the survey results were used. The resulting measures are summarised in Table 1 below. The firm rankings are bilateral (for example an American firm in France might give a different ranking than a German firm in France).

The reported NTB rankings (the NTB index) on goods on both sides of the Atlantic are generally higher than on services, ranging from 20 per cent to 56 per cent. The highest perceived NTB levels were found on the aerospace and space industry. On goods exported to the US, machinery also exhibits high levels of NTBs, while the lowest levels are reported for pharmaceuticals. For goods exported from the US, high levels of NTBs were reported for chemicals, cosmetics and biotechnology. Lower levels of NTBs were reported for electronics, iron, steel and metal products.

Of course, the firm rankings of general openness are relative. They do not translate into actual impacts on costs and prices. For this, the survey data was then integrated with a set of econometric models (known as gravity models) to estimate the corresponding ad-valorem of percent price impact of the variations in NTB levels. On that basis, the

8 The general ranking questions are reproduced as an annex to this report. See the annex to the Ecorys (2009) report for more information on the more detailed questions.

Ecorys (2009) report also provides price/cost estimates of existing NTBs for traded goods and services in a percentage form that can be interpreted similarly to ad-valorem tariffs. These estimates are reported in Table 2 below. They reflect the higher prices that result because of NTBs.[9]

Table 1 Perceived NTB index by business (index between 0-100)

Sector	EU exports to the US	US exports to the EU
Services Sectors:		
Travel	35.6	17.6
Transport	39.9	26.3
Financial Services	29.7	21.3
ICT	20.0	19.3
Insurance	29.5	39.3
Communication	44.6	27.0
Construction	45.0	37.3
Other Business Services	42.2	20.0
Personal, Cultural and Recreational Services	35.8	35.4
Goods Sectors:		
Chemicals	45.8	53.2
Pharmaceuticals	23.8	44.7
Cosmetics	48.3	52.2
Biotechnology	46.1	50.2
Machinery	50.9	36.5
Electronics	30.8	20.0
Office, Information and Communication Equipment	37.9	32.3
Medical, Measuring and Testing Appliances	49.3	44.5
Automotive Industry	34.8	31.6
Aerospace and Space Industry	56.0	55.1
Food and Beverages	45.5	33.6
Iron, Steel and Metal Products	35.5	24.0
Textiles, Clothing and Footwear	35.6	48.9
Wood and Paper, Paper Products	30.0	47.1

Source: Ecorys (2009)

9 The reader may note some difference between the sectors in the tables in this section. We have started in Table 1 with the full set of sectors from the original ECORYS survey. These have been consolidated when we move to sectors for the modelling, both in the original ECORYS study and in this report.

According to the estimates in Table 2, non-tariff barriers are the highest for food and beverage products, with imports from the US facing a 56.8 per cent tariff equivalent, while EU exports to the US of these products face a 73.3 per cent extra cost. Among services, financial services are one of the sectors with the highest estimated NTBs. In this sector, EU barriers against US exports amount to 11.3 per cent, while US barriers against EU exports are estimated to be about 31.7 per cent. Barriers in the services sectors are higher on the EU side for the business and ICT sector, communications sector, construction, and personal, cultural, other services. On the other hand the US barriers for EU exporters in the services sectors are higher than in the EU in the finance and insurance sectors.

It should be stressed that in contrast to reducing tariffs, the removal of NTBs is not as straightforward. In fact, it is unlikely that all areas of regulatory divergence identified actually can be addressed. As previously pointed out, there are many different sources of NTBs and thus removing them may require constitutional changes, unrealistic legislative changes, or unrealistic technical changes. Removing NTBs may also be difficult politically, e.g. because there is a lack of sufficient economic benefit to support the effort; because the set of regulations is too broad; because of consumer preferences, language and geography; or due to other political sensitivities. In recognition of these difficulties, in the assumptions of the scenarios, the degree to which an NTB or regulatory divergence can, potentially and realistically, be reduced is taken into account which is discussed in more details in the following subchapter.

Table 2 Total trade cost estimates from NTB reduction in per cent, Ecorys (2009)

Sector	Total trade barriers: EU barriers against US exports	Total trade barriers: US barriers against EU exports
Food and beverages	56.8	73.3
Chemicals	13.6	19.1
Electrical machinery	12.8	14.7
Motor vehicles	25.5	26.8
Other transport equipment	18.8	19.1
Metals and metal products	11.9	17.0
Wood and paper products	11.3	7.7
Other manufactures	N/A	N/A
average goods	***21.5***	***25.4***
Transport		
Air	2.0	2.0
Water	8.0	8.0
Finance	11.3	31.7
Insurance	10.8	19.1
Business and ICT	14.9	3.9
Communications	11.7	1.7
Construction	4.6	2.5
Personal, cultural, other services	4.4	2.5
average services	***8.5***	***8.9***

Source: Ecorys (2009), Annex Table III.1

At this stage, there are patterns in Table 2 that will carry forward in the modelling. Following from the Ecorys (2009) study, businesses perceived transatlantic NTBs as substantially lower for services than for goods. This means that, for comparable cuts in barriers in per cent terms, the differences in barriers (combined with the absolute importance in goods trade relative to services trade) imply that we can expect greater impact from NTB reductions in goods than in services.

3. Technical Discussion on CGE Modelling Set Up

The purpose of this chapter is to present and discuss the model used as basis for the policy experiments, including the sector and regional aggregation that were used.

In this report, the economic assessment of a trade agreement between the EU and US is based on a computable general equilibrium (CGE) model of global world trade. The CGE modelling exercise is meant to estimate the effects on the EU and US economies. CGE models like the ones used here help answer *what-if* questions by simulating the price, income and substitution effects in market equilibrium under different assumptions about changes in policy. The economic outcomes of the "baseline" scenario (with no policy change) can be compared to the different scenario associated with changes in trade policy. The "baseline" for the model is thus the equilibrium without policy change, and the 'scenario' is the equilibrium after the policy change. The effect of the policy change can then be benchmarked by the difference between the two.

3.1. The model

The CGE model employed is based on the widely used GTAP model (Hertel, 1997), with added features from the Francois, van Meijl, and van Tongeren (2005) model. More technical details of the model are provided in the annex.

The most important aspects of the model can be summarised as follows:

- It covers global world trade and production
- It allows for scale economies and imperfect competition

- It includes intermediate linkages between sectors
- It allows for trade to impact on capital stocks through investment effects which allows to obtain longer-run impact on the economy

Imperfect competition in the Francois, van Meijl, and van Tongeren (2005) model, as implemented here, is explained in Francois, Manchin, and Martin (2012). It involves firm level competition and supply of varieties of goods and services to both final consumers and downstream firms under what is known as monopolistic competition. The modelling of investment effects is based on Francois and McDonald (1996). This does not involve gross foreign direct investment flows, but rather changes in regional and global capital stocks (machinery and equipment) as a result of changes in levels of savings and investment.

Box 2 Key features of the model

Model simulations are based on a multi-region, multi-sector global CGE model. Sectors are linked through intermediate input coefficients (based on national social accounts data) as well as competition in primary factor markets. The model includes imperfect competition, short-run and long-run macroeconomic closure options, as well as the standard static, perfect competition, Armington-type set-up as a subset. On the policy side, it offers the option to implement tariff reductions, export tax and subsidy reduction, trade quota expansion, input subsidies, output subsidies, and reductions in trade costs. International trade costs include shipping and logistic services (the source of fob-cif margins), but can also be modelled as Samuelson-type deadweight costs. This can be used to capture higher costs when producing for export markets, due to regulatory barriers or NTBs that do not generate rents (or where the rents are dissipated through rent-seeking).

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

Taxes are included at several levels in the model. Production taxes are placed on intermediate or primary inputs, or on output. Tariffs are levied at the border. Additional internal taxes are placed on domestic or imported intermediate inputs, and may be applied at differential rates that discriminate against imports. Where relevant, taxes are also placed on exports, and on primary factor income. Finally, where relevant (as indicated by social accounting data) taxes are placed on final consumption, and can be applied differentially to consumption of domestic and imported goods.

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

Heavy manufacturing sectors are modelled with imperfect or monopolistic competition. Monopolistic competition involves scale economies that are internal to each firm, depending on its own production level. An important property of the monopolistic competition model is that increased specialisation at intermediate stages of production yields returns due to specialisation, where the sector as a whole becomes more productive the broader the range of specialised inputs. In models of this type, part of the impact of policy changes in final consumption follows from changes in available choices (the variety of goods they can choose from). Similarly firms are affected by changes in available choices (varieties) of intermediate inputs. Changes in available

varieties also involve changes in available foreign varieties, in addition to domestic one. As a result, changes in consumer and firm input choices will "spill-over" between countries as they trade with each other.

Tariffs and tariff revenues are explicit in the standard GTAP database, and therefore can be directly incorporated into the model used here directly from the standard database. However, NTBs affecting goods and services trade, as well as cost savings linked to trade facilitation are not explicit in the database and we need to take steps to capture these effects. Where NTBs leads to higher costs, we follow the standard approach to modelling iceberg or dead-weight trade costs in the GTAP framework, originally developed by Francois (1999, 2001) with support from the EC to study the Millennium Round (now known as the Doha Round).[10] It has featured in the joint EC-Canadian government study on an EU-Canada FTA, as well as the 2009 Ecorys study on EU-US non-tariff barriers. In formal terms, we model changes in the efficiency of production for sale in specific markets. In this sense, we can capture the impact that NTBs can have in raising costs when serving foreign markets. Where NTBs instead involve higher prices because of rents, we model this as additional mark-ups (higher prices) accruing to firms. As highlighted already in the discussion in Chapter 2, there is an approximate 60:40 split between cost generating NTBs and rent generating NBTs, in terms of impact.

3.2. Sectors and regions in the model

While in the GTAP data about 60 sectors and 130 different regions are available, for the purpose of this study we have aggregated sectors and regions to allow us to concentrate on the key results. The sector and regional aggregations are presented in Table 3.

10 The original Francois approach has grown from a specialized extension in early applications to a now standard feature of the GTAP model, following its incorporation by Hertel, Walmsley and Itakura (2001).

Table 3 Sectors and regions used in the CGE model

Sectors	Regions
Agr forestry fisheries	European Union
Other primary sectors	United States
Processed foods	Other OECD, high income
Chemicals	East Europe
Electrical machinery	Mediterranean
Motor vehicles	China
Other transport equipment	India
Other machinery	ASEAN
Metals and metal products	MERCOSUR
Wood and paper products	Low Income
Other manufactures	Rest of World
Water transport	
Air transport	
Finance	
Insurance	
Business services	
Communications	
Construction	
Personal services	
Other services	

4. The Policy Options Considered

In this chapter we summarize the policy scenarios used in the CGE assessment that follows in Chapter 5. This includes some explanation of concepts, such as "policy spill-overs," that are included in the scenarios.

4.1. Scenarios

As discussed in Chapter 2, while it is conceivable for all tariffs to be removed, it is not realistic to assume that all NTBs and costs from regulatory divergence can be removed. This is because of the underlying differences in the nature of these measures. As a result when modelling the liberalisation of NTBs we must take into account the degree to which NTB-related costs can realistically be reduced (via various means and techniques). On the basis of the Ecorys (2009) survey, a reasonable underlying rule of thumb is that approximately 50 per cent of the cost/price impact of NTBs can be removed – i.e. they are "actionable." While there is some variation by sector, the mapping from overall price/cost differences to those that can be negotiated on reflects this finding, which is based on expert opinions, cross-checks with regulators, legislators and businesses supported by the business survey from the Ecorys (2009) study. Against this background, the study is set up around scenarios differing with respect to levels of ambition and scope of coverage. The scenarios are summarized in Table 4 below.

The scenarios summarized in the table are relatively modest. Starting from the level of barriers reported in Table 2, only about half of the barriers are considered as negotiable or actionable. Of these, half are reduced in the most ambitious scenario (or 25 percent

of total NTBs in Table 2). This is the most ambitious scenario. The modest scenarios assume even less reduction in NTBs. Under both the ambitious and modest scenarios, it is assumed that more aggressive liberalization is applied to procurement. The scenarios reported here are therefore far less ambitious than under the original Ecorys study, where full elimination of actionable NTBs was assumed.

Table 4 Scenario Summaries

Narrow (limited) FTA Scenarios	
Tariffs only	98 per cent of tariffs eliminated
Services only	10 per cent of services NTBs eliminated
Procurement only	25 per cent of procurement NTBs eliminated
Comprehensive Scenarios	
Less ambitious	98 per cent of tariffs eliminated 10 per cent of NTBs eliminated on both goods and services (20 per cent of actionable) 25 per cent of procurement NTBs eliminated
Ambitious	100 per cent of tariffs eliminated 25 per cent of NTBs eliminated on both goods and services (50 per cent of actionable) 50 per cent of procurement NTBs eliminated

4.2. Spill-overs

The simulations that are carried out also take into account concepts of both regulatory convergence and regulatory spill-overs. More specifically, in setting up the experiments, we have included two sets of possible effects beyond bilateral liberalization. These are defined as follows. First, we have included *direct spill-overs*. These are based on the assumption that improved regulatory conditions negotiated between the EU and the US will also result in a limited fall in related trade costs for third countries exporting to the EU and US. In other words, this captures the extent to which the bilateral streamlining of regulations and standards, and reduction in regulatory burdens, also benefit other exporters to the EU and US. This positive market access effect for third countries is modelled as being around 20 per cent of the bilateral fall in trade cost related to NTBs for the core scenarios. (We have also examined 10 per cent spill-overs as a robustness

check.) This concept was introduced in the EU-Japan study by Copenhagen Economics (2009). In practice, it means that if there is 5 per cent NTB-related trade cost reduction between the EU and US, there will also be a 1 per cent trade cost reduction for third countries exporting to the EU and US. The logic is that firms in third countries may find it easier to meet either EU or US regulatory requirements if bilateral negotiations lead to simplifications that are not inherently discriminatory. Kox and Lejour (2006), for example, provide evidence that differences in regulations can increase operating costs in different markets, reducing bilateral trade.

A second indirect effect involving third countries is considered as well: the *indirect spill-overs*. These are meant to gauge the economic implications if third countries adopt some of the common standards agreed between the EU and the US. Given that, collectively, the EU and the US would stand as the world's biggest trading block, there is a very real possibility that mutual agreement on regulations and standards would be adopted, partially, also by third countries. Thus, where the EU and the US act as a regulatory hegemon, there is scope for setting de facto common, global standards. This implies that the bilateral agreement will give EU and the US improved market access in third markets from reduced NTBs. In addition, there will be scope for reductions in NTBs amongst third countries, as they converge further on common standards. Therefore, indirect spill-overs will lead to lower costs and greater trade between third countries as well. We have modelled indirect spill-overs as 50 per cent of the direct spill-over rate. This means that for example for a 5 per cent trade cost reduction between the EU and US, and with 20 per cent corresponding direct spill-overs, we will have a 1 per cent (direct spill-over) reduction for third countries exporting to the US or EU, and a 0.5 per cent (indirect spill-over) reduction for EU and US export costs to third countries, and for trade between third countries.

4.3. Sectoral effects: Preliminary ranking

At this stage, we have spelled out trade flows, tariff barriers, and non-tariff barriers. In what follows in Chapter 5, we will focus on effects. Before doing so, it is useful to benchmark expectations. What we mean is that, before we turn to modelling results, we want to provide a non-model based ranking of some important sources of likely effects. This involves the data summarized in Table 5 below. In the Table, column A summarizes the total value of tariffs and actionable NTBs (as defined by Ecorys) applied by the US against EU exports. The next two columns summarize the importance of each sector to total EU exports to the US. Column B is based on gross values, while column C is based instead on the value added contained in exports.[11] In column C, we see that while chemicals are 12.38 percent of exports on a gross value basis, they are somewhat less important on a value added basis, accounting for 11.21 percent of EU value added contained in exports to the EU. As a crude first pass at possible effects, column E provides an impact-ranking index. This is based on the value added contained in exports by sector (C), the scope for liberalization (A), and the price elasticity of demand for imports (D). Together, these provide a rough estimate of increased exports, on a value added basis, following from improved market access to the US for EU firms. For example, of the total value added contained in EU exports to the US, column E says that full liberalization in chemicals could yield an 8.39 percent increase in total exports to the US on a value added basis. As it is value added that translates into GDP, the index also provides a crude ranking of overall GDP impacts of sector-specific liberalization.

11 See Francois, Manchin, and Tomberger (2012) for explanation of the value added calculations, which are based on our CGE model database

Table 5 Impact ranking indexes

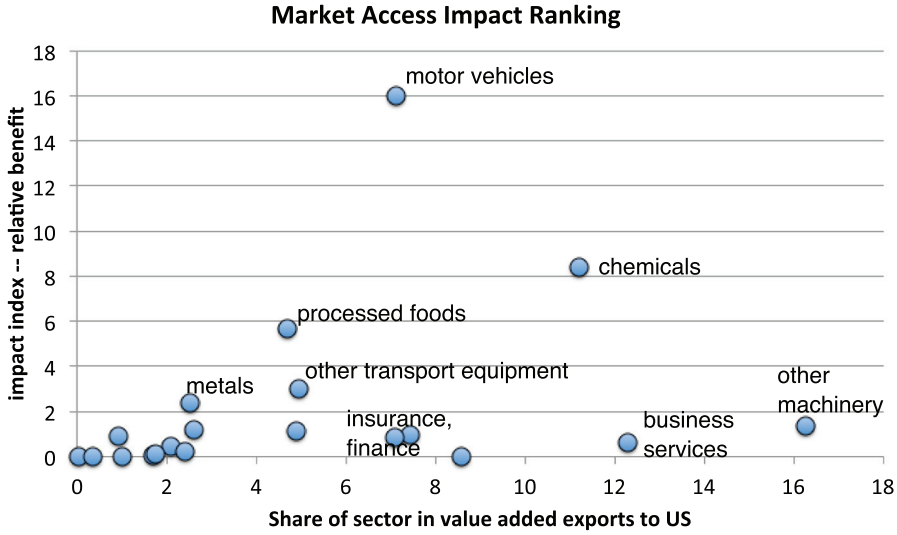
	A actionable NTBs + tariffs	B gross export share	C export value added share	D price elasticity	E=.01*A*C*D index
Agr forestry fisheries	3.70	1.73	2.09	4.77	0.37
Other primary sectors	0.00	1.36	1.70	12.13	0.00
Processed foods	48.93	4.42	4.71	2.46	5.67
Chemicals	14.69	12.38	11.21	5.09	8.39
Electrical machinery	9.91	1.09	0.94	9.65	0.89
Motor vehicles	22.49	8.81	7.11	10.00	15.99
Other transport equipment	8.63	5.31	4.94	7.14	3.04
Other machinery	0.80	16.92	16.25	9.71	1.26
Metals and metal products	6.69	2.75	2.53	13.91	2.36
Wood and paper products	5.76	2.42	2.61	7.99	1.20
Other manufactures	3.20	7.32	4.90	6.56	1.03
Water transport	0.65	0.05	0.04	3.80	0.00
Air transport	2.35	3.12	2.41	3.80	0.22
Finance	6.46	6.20	7.45	2.04	0.98
Insurance	3.84	6.02	7.10	3.18	0.87
Business services	1.58	10.07	12.28	3.18	0.62
Communications	0.65	0.85	1.01	3.18	0.02
Construction	0.90	0.35	0.36	4.21	0.01
Personal services	0.66	1.49	1.76	8.71	0.10
Other (public) services	0.00	7.36	8.59	3.92	0.00

Source: CGE calculations.

The estimates in column E of Table 5 are of course partial equilibrium. They miss cross-sector effects, including labour market interaction and intermediate linkages. They also miss consumer benefits from access to more goods and services. Even so, they provide a clear ranking of likely effects. This ranking carries through the estimates in the next chapter, and so it is worth discussing the pattern for the impact indexes briefly, as shown in Figure 10. From the figure, we can see that for some sectors, especially motor vehicles, though they are not dominant on a value added basis, the combination of

high elasticities and high trade barriers means that, overall, these sectors are likely to dominate in terms of impact. By the same logic, despite the fact that "other machinery" is a major sector on a value added basis, the low level of barriers means it does not rank highly in terms of expected benefits from improved market access. From Figure 10, the manufacturing sectors are likely to have the greatest impact by far overall. This includes motor vehicles, chemicals, processed foods, and other transport equipment. In contrast, while value added shares are comparable for the services sectors (business services is more important on a value added basis than either chemicals or motor vehicles), the combination of low elasticities and relatively low barriers means that, overall, we expect the greatest impact of market access on exports and GDP to be from liberalization on good sectors, and especially chemicals, machinery (vehicles and other transport equipment), and processed foods. The pattern in Figure 10 reveals itself again when report results in Chapter 5. Manufacturing liberalization is the primary driver of benefits from improved trade-related market access.

Figure 10 Value added and impact rankings



Source: own calculations. See Table 5.

5. Results

In this chapter we focus on the results of the CGE modelling of bilateral trade liberalization. The results are reported with respect to an economic benchmark projected out to the year 2027, which implies that that they capture the impact of the agreement a full ten years after the implementation of the agreement, providing the longer-term impact of policy changes. First, we present results for the limited scenarios. We then examine the comprehensive scenarios, assuming that an agreement would collectively cover tariffs, services, and procurement. We then move on to reporting estimated effects on output and trade, first on an aggregate and then on a more disaggregate, sector specific level. We also provide a discussion of the effects of removal of barriers on sustainability, i.e. effects on labour, CO2 emissions and the use of natural resources. The last part of this chapter summarises the resulting effects on the rest of the world.

5.1. Limited Scenarios

In this section, we present results assuming that a less ambitious, limited FTA would be implemented. We analyse the impact assuming that only a single policy pillar, i.e. only tariff liberalisation, or only services liberalization, or only procurement liberalisation would be implemented. Note that the liberalisation efforts that are being considered for each pillar are similar to those envisaged in the less ambitious scenario of the comprehensive FTA option (see Table 4), including 20 per cent spill-overs.[12] For the tariff only agreement there are obviously no spill-overs.

12 Results with 10 per cent spill-overs are reported in separate annex tables.

The first conclusion to take from the results of the partial agreements is that liberalising each policy pillars separately leads to relatively small increases in GDP for both the US and the EU (see Table 6 and Table 7 below). For the EU, the tariffs cuts lead to a GDP increase of 0.10 per cent (23,753 million euros), while the reduction of NTBs in services and in procurement increase GDP by only 0.02 per cent (5,298 and 6,367 million euros). For the US, these changes are even smaller (ranging from 0.01 to 0.04 per cent).

Table 6 Changes in GDP (in per cent), 2027 benchmark, limited agreement, 20 per cent direct spill-overs

	Tariffs Only	Services Only	Procurement Only
European Union	0.10	0.02	0.02
United States	0.04	0.03	0.01
Other	-0.01	0.00	0.00
Other OECD, high income	-0.03	0.00	0.00
East Europe	-0.04	0.00	0.00
Mediterranean	-0.04	0.00	0.00
China	0.01	-0.01	-0.01
India	-0.01	0.00	0.00
ASEAN	-0.02	0.01	-0.01
MERCOSUR	-0.01	0.00	0.00
Low Income	-0.02	0.00	0.00
Rest of World	-0.02	0.00	0.00

Source: CGE calculations.

Table 7 Changes in GDP (in million euros), 2027 benchmark, limited agreement, 20 per cent direct spill-overs

	Tariffs Only	Services Only	Procurement Only
European Union	23,753	5,298	6,367
United States	9,447	7,356	1,875
Other	-7,903	-117	-1,595
Other OECD, high income	-5,065	726	-668
East Europe	-292	26	4
Mediterranean	-580	60	-8
China	2,289	-1,713	-856
India	-489	137	79
ASEAN	-832	337	-263
MERCOSUR	-363	182	-5
Low Income	-228	39	47
Rest of World	-2,344	90	75

Source: CGE calculations.

The relative size of the services impact is linked both to the magnitude of underlying bilateral barriers that are reduced (see Table 2) and also to the relative trade volumes (see Figure 2). NTBs are perceived by businesses as roughly 2.5 times higher in goods than services, as applied in the experiments. This captures the fact that both the EU and US are relatively open, by global standards, in the service sectors. At the same time, goods trade is twice the value of services trade. Thus the relative magnitudes for goods and services NTBs are consistent with the benchmark levels of protection and trade.

Next, we look at the expected changes in trade for the EU and the US. The results are presented for each measure separately in Table 8 and Table 9 below.

Table 8 Changes in trade (in per cent), extra-EU trade for the EU, 2027 benchmark, limited agreement, 20 per cent direct spill-overs

	Tariffs Only	Services Only	Procurement Only
Exports			
European Union	1.18	0.16	0.19
United States	1.91	0.19	0.23
Imports			
European Union	1.00	0.13	0.18
United States	1.13	0.57	0.14
Terms of trade			
European Union	-0.01	0.00	0.00
United States	0.04	-0.01	-0.02

Source: CGE calculations.

Table 9 Changes in trade (in million euros), extra-EU trade in case of the EU, 2027 benchmark, limited agreement, 20 per cent direct spill-overs

	Tariffs Only	Services Only	Procurement Only
Exports			
European Union	43,740	5,777	7,136
United States	57,330	5,488	5,942
Imports			
European Union	44,338	5,742	7,881
United States	47,775	4,655	5,869

Source: CGE calculations.

Among the partial agreement options, the tariff cuts are shown to deliver the largest increase in trade flows. Here, both exports and imports are shown to increase by between 1 and 2 per cent. Extra-EU exports are estimated to increase by 1.18 per cent (corresponding to 44 billion euros) while imports from outside EU are expected to rise by 1.00 per cent (corresponding also to about 44 billion euros increase). The changes are estimated to be slightly higher for the US. Liberalising procurement and services will lead to relatively small, less than 0.5 per cent (about 6-7 billion euros) increases in exports and imports. The resulting changes in terms of trade are shown to be insignificant. While the procurement and services options lead to similar GDP effects, the trade effects are larger overall for procurement. This traces back to the

underlying trade elasticities. Goods are estimated to be more price sensitive overall (see the discussion in Chapter 4) and this translates into somewhat larger trade volume effects. However, both sets of trade volume effects are much smaller than the estimates discussed below linked to a more comprehensive agreement.

The tables below show the impact of the limited FTA on bilateral sectoral trade between the EU and the US. Limiting the liberalisation to services or procurement only would have a very marginal impact on sectoral trade, with the exception of some of the services exports and imports increasing as barriers removed under the services liberalisation. Nevertheless, on average, both bilateral exports and imports would increase by about 1 per cent or less if only services or procurement is liberalised. On the other hand, the cuts in tariffs would lead to 6.6 per cent increase of EU exports to the US and to a 12.4 per cent increase in imports. The difference in the magnitude of change is due to the initial tariff structures between the two economies, with the EU having higher barriers towards the US. Thus the difference in these average changes is mainly driven by motor vehicles. In this sector the imports would significantly increase as tariffs are removed for US exporters. In absolute terms, the greatest increase in bilateral services exports under services-only liberalization is in finance, insurance, and business services in the case of the EU, and in finance and business services in the case of the US. With procurement only, we see bilateral trade growth primarily in goods (chemicals and vehicles exports for the EU, chemicals and metals and fabricated metal products for the US). The bilateral trade effects of tariffs outweigh both the procurement and services only scenarios. There is substantial growth in bilateral trade in chemicals, vehicles, machinery, and other manufactures. Total trade (EU exports to the US, US exports to the EU) expands by almost 100 billion euros in the tariff only scenario. The sector pattern reflects the basic pattern of tariffs in the tariffs-only scenario, as discussed in Chapter 2, along with the underlying elasticities as discussed in Chapter 3. For example, US manufacturing tariffs are relatively low, and highest on other manufactures and processed foods (Figure 9).

Table 10 Changes in EU bilateral exports to US by sector (in per cent), 2027 benchmark, limited agreement, 20 per cent direct spill-overs

	Tariffs Only		Services Only		Procurement Only	
	Per cent	Million euros	Per cent	Million euros	Per cent	Million euros
Agr forestry fisheries	17.53	2,024	0.00	0	-0.15	-17
Other primary sectors	0.37	33	0.05	4	0.00	0
Processed foods	8.15	2,402	0.00	0	1.50	442
Chemicals	5.46	4,509	-0.09	-77	2.59	2,140
Electrical machinery	3.08	225	-0.19	-14	-0.22	-16
Motor vehicles	13.70	8,048	-0.05	-29	5.69	3,345
Other transport equipment	1.84	653	-0.01	-4	1.50	531
Other machinery	8.60	9,705	-0.11	-123	-0.11	-126
Metals and metal products	20.40	3,744	0.01	2	4.13	757
Wood and paper products	2.23	359	-0.02	-4	-0.19	-30
Other manufactures	23.35	11,402	-0.02	-12	-0.05	-27
Water transport	0.32	1	3.35	12	0.26	1
Air transport	0.24	50	0.79	164	0.03	7
Finance	0.22	93	4.32	1,787	-0.03	-13
Insurance	0.27	107	4.35	1,746	-0.06	-24
Business services	0.43	288	1.23	825	0.13	87
Communications	0.20	11	0.73	41	0.07	4
Construction	0.45	10	1.73	40	0.48	11
Personal services	0.46	46	2.49	247	-0.26	-25
Other services	0.27	130	-0.03	-13	-0.10	-50
total	*6.57*	*43,840*	*0.69*	*4,591*	*1.05*	*6,997*

Source: CGE calculations.

Table 11 Changes in US bilateral exports to EU by sector, 2027 benchmark, limited agreement, 20 per cent direct spill-overs

	Tariffs Only		Services Only		Procurement Only	
	Per cent	Million euros	Per cent	Million euros	Per cent	Million euros
Agr forestry fisheries	19.33	978	0.03	1	0.15	8
Other primary sectors	0.50	51	-0.04	-4	0.00	0
Processed foods	39.82	2,173	0.03	2	0.11	6
Chemicals	12.45	9,927	0.16	129	0.54	430
Electrical machinery	3.39	639	0.91	171	1.07	201
Motor vehicles	109.50	20,808	0.11	20	0.67	127
Other transport equipment	7.61	2,823	0.05	18	0.32	118
Other machinery	12.10	5,659	0.16	75	0.28	129
Metals and metal products	23.43	4,995	0.03	6	9.29	1,980
Wood and paper products	3.74	257	0.07	5	0.73	50
Other manufactures	15.80	5,836	0.04	16	0.06	22
Water transport	-0.25	-1	2.90	17	0.11	1
Air transport	-0.17	-29	0.74	125	0.08	14
Finance	-0.14	-35	2.16	546	0.66	166
Insurance	-0.24	-9	3.25	116	0.09	3
Business services	-0.36	-130	2.41	862	0.09	32
Communications	-0.18	-12	4.60	300	0.11	7
Construction	-0.31	-7	2.76	65	1.14	27
Personal services	-0.42	-29	5.07	355	0.30	21
Other services	-0.23	-116	0.07	35	0.14	69
total	12.36	53,777	0.66	2,859	0.78	3,411

Source: CGE calculations.

Table 12 below shows the corresponding estimated changes in the EU's total external trade (extra-EU). Overall, the tariff cuts are expected to cause total imports and exports to increase by 1.18 and 1.00 per cent respectively. The induced effects from liberalising trade in services and procurement are smaller, ranging from 0.13 to 0.19 per cent respectively. Nevertheless, exports in the insurance and finance sectors are estimated to increase by about 2 per cent if services are liberalised. Meanwhile, finance,

communications, and personal services imports are estimated to increase by 1-1.8 per cent due to services liberalisation. Under tariff liberalisation, the highest increase in imports would take place in motor vehicles with a 9.21 per cent, while regarding exports the most pronounced increase is estimated to take place in other manufactures with a 5.50 per cent increase.

Table 12 Changes in EU trade by sector (in per cent), 2027 benchmark, limited agreement, 20 per cent direct spill-overs

	Total exports						Total imports					
	Tariffs only		Services only		Procurement only		Tariffs only		Services only		Procurement only	
	Per cent	Mln euros	Per cent	Mln euros	Per cent	Mln euros	Per cent	Mln euros	Per cent	Mln euros	Per cent	Mln euros
Agr forestry fisheries	0.58	1,303	0.00	3	-0.05	-102	2.64	1,342	0.10	52	0.17	85
Other primary sectors	-0.27	-363	0.03	35	0.01	11	0.52	3,643	0.01	98	0.01	47
Processed foods	1.33	2,360	0.03	45	0.27	481	2.66	2,282	0.07	64	0.12	100
Chemicals	1.23	4,707	-0.01	-47	0.65	2,478	2.46	7,972	0.08	268	0.13	419
Electrical machinery	-0.03	-26	-0.02	-15	-0.31	-292	0.39	1,357	0.01	23	0.01	24
Motor vehicles	3.70	8,399	-0.02	-43	1.47	3,340	9.21	16,799	0.11	193	0.22	404
Other transport equipment	0.56	914	-0.02	-38	0.27	442	2.54	2,345	0.06	55	0.16	151
Other machinery	1.73	10,359	-0.08	-487	-0.10	-611	0.82	3,969	0.14	685	0.03	126
Metals and metal products	2.70	3,720	-0.01	-18	1.15	1,589	1.18	4,156	0.06	214	1.45	5,111
Wood and paper products	0.16	222	-0.01	-17	-0.05	-72	0.67	438	0.11	74	0.29	189
Other manufactures	5.50	11,957	0.02	34	-0.02	-36	-0.03	-250	0.05	523	0.04	412
Water transport	0.10	47	0.22	100	0.03	14	-0.02	-8	0.31	118	0.05	21
Air transport	0.14	110	0.21	162	0.01	9	-0.09	-84	0.21	203	0.05	51
Finance	0.09	87	2.00	1,864	0.00	2	0.09	63	1.02	695	0.32	221
Insurance	0.09	86	2.03	1,849	-0.03	-27	0.12	20	0.94	160	0.07	12
Business services	0.04	183	0.36	1,500	0.02	77	-0.08	-144	0.62	1,127	0.06	103
Communications	0.00	0	0.47	127	0.02	6	0.09	35	1.15	420	0.08	29
Construction	-0.02	-13	0.27	176	0.00	-1	0.09	20	0.47	110	0.22	52
Personal services	-0.13	-138	0.50	552	-0.11	-117	0.15	41	1.84	487	0.21	55
Other services	-0.06	-173	0.00	-4	-0.02	-53	0.12	341	0.06	173	0.10	267
Total	*1.18*	*43,740*	*0.16*	*5,777*	*0.19*	*7,136*	*1.00*	*44,338*	*0.13*	*5,742*	*0.18*	*7,881*

Source: CGE calculations.

The reduction of tariffs will lead US imports and exports to increase by 1.91 and 1.13 per cent respectively (Table 13). The biggest increases are estimated to take place in the export of motor vehicles (15.43 per cent), chemicals (4.05 per cent), metals and metal products (4.33 per cent). As can be seen from the Table, the estimated effects of the liberalisation of services and procurement on trade are much smaller. The biggest changes in imports are also attributable to the reduction of tariffs, with the highest sector specific increases expected to take place in processed foods and metals and metal productions (2.37 per cent and 2.43 per cent respectively) and motor vehicles (2.13 per cent). The liberalisation of the services sectors is however estimated to increase imports of finance and insurance services by around 3 per cent.

Table 13 Changes in US trade by sector (in per cent), 2027 benchmark, limited agreement, 20 per cent direct spill-overs

	Total exports						Total imports					
	Tariffs Only		Services Only		Procurement Only		Tariffs Only		Services Only		Procurement Only	
	Per cent	Mln euros	Per cent	Mln euros	Per cent	Mln euros	Per cent	Mln euros	Per cent	Mln euros	Per cent	Mln euros
Agr forestry fisheries	0.29	1,386	0.00	-16	0.03	140	1.74	1,814	0.03	35	-0.08	-82
Other primary sectors	-0.09	-166	0.00	8	0.01	18	0.14	696	0.05	265	0.00	-2
Processed foods	2.39	2,556	0.02	16	0.03	31	2.37	2,490	0.01	14	0.58	608
Chemicals	4.05	13,363	0.11	375	0.11	362	1.06	2,857	-0.06	-167	1.00	2,678
Electrical machinery	-1.10	-1,534	0.76	1,061	0.59	826	0.94	3,994	-0.26	-1,106	-0.35	-1,467
Motor vehicles	15.43	23,826	0.05	80	0.31	477	2.13	8,879	0.01	25	0.91	3,773
Other transport equipment	1.55	2,688	0.02	34	0.18	305	1.08	929	0.02	18	0.55	473
Other machinery	1.77	4,854	0.08	220	0.17	466	1.46	10,363	0.01	72	-0.14	-1,012
Metals and metal products	4.33	5,171	0.01	10	2.14	2,553	2.43	4,716	0.08	165	0.69	1,339
Wood and paper products	0.00	0	0.02	14	0.13	96	0.82	1,088	0.03	40	-0.11	-143
Other manufactures	3.40	6,989	0.03	69	0.04	84	1.06	8,190	0.03	213	-0.03	-237
Water transport	0.07	3	0.09	4	0.03	1	0.22	6	0.63	18	0.04	1
Air transport	0.04	19	0.18	96	0.04	19	0.12	66	0.34	182	0.01	7
Finance	-0.10	-78	0.98	736	0.27	203	0.26	156	3.14	1,903	-0.02	-13
Insurance	-0.26	-85	0.68	222	0.03	9	0.31	191	2.81	1,716	-0.04	-26
Business services	-0.29	-398	0.90	1,240	0.04	55	0.39	609	0.55	861	0.05	79
Communications	-0.18	-36	2.07	411	0.05	11	0.24	36	0.32	48	0.02	3
Construction	-0.33	-42	0.82	105	0.27	35	0.45	26	0.80	47	0.23	13
Personal services	-0.57	-429	0.95	712	0.13	98	0.60	124	1.43	298	-0.18	-38
Other services	-0.28	-758	0.03	90	0.06	152	0.35	544	0.01	9	-0.06	-88
Total	*1.91*	*57,330*	*0.19*	*5,488*	*0.23*	*5,943*	*1.13*	*47,775*	*0.57*	*4,655*	*0.14*	*5,868*

Source: CGE calculations.

We now turn to analysing the estimated effects on the output of the different sectors. The underlying changes for the EU and the US are presented in Table 14 and Table 15 below.

Table 14 Changes in EU output by sector (in per cent), 2027 benchmark, limited agreement, 20 per cent direct spill-overs

	Baseline shares in value added	Tariffs Only	Services Only	Procurement Only
Agr forestry fisheries	0.040	0.03	0.00	0.00
Other primary sectors	0.019	0.00	0.00	0.00
Processed foods	0.030	0.06	0.01	0.04
Chemicals	0.028	-0.11	-0.01	0.12
Electrical machinery	0.004	-0.31	0.02	0.06
Motor vehicles	0.015	-0.65	-0.01	0.30
Other transport equipment	0.007	-0.26	-0.02	0.09
Other machinery	0.037	0.35	-0.04	0.03
Metals and metal products	0.021	0.03	-0.03	-0.39
Wood and paper products	0.023	0.06	0.00	-0.01
Other manufactures	0.029	0.60	-0.01	0.01
Water transport	0.003	0.14	-0.04	0.03
Air transport	0.003	0.15	-0.01	0.01
Finance	0.032	0.06	0.11	-0.02
Insurance	0.010	0.06	0.32	0.01
Business services	0.222	0.05	0.01	0.02
Communications	0.023	0.05	-0.03	0.01
Construction	0.083	0.12	0.03	0.02
Personal services	0.035	0.04	0.02	0.00
Other services	0.338	0.05	0.01	0.01

Source: CGE calculations.

As can be seen in the Table 14, the corresponding estimated changes in sector specific output are very small. None of the sectors will expand or contract by more than 1 per cent in the case of the EU, and in most sectors output will basically remain unchanged. Similarly, only slight changes are expected to take place in US sector-level output as a consequence of the non-comprehensive FTAs that were simulated. In only two sectors the output is estimated to change by more than 1 per cent: in the electrical machinery

sector it is estimated to decrease by 1.40 per cent, while in motor vehicles it is expected to increase by 1.76 per cent (once tariffs are cut).

Table 15 Changes in US output by sector (in per cent), 2027 benchmark, limited agreement, 20 per cent direct spill-overs

	Baseline shares in value added	Tariffs Only	Services Only	Procurement Only
Agr forestry fisheries	0.031	-0.02	0.00	0.00
Other primary sectors	0.023	-0.01	0.00	0.00
Processed foods	0.017	0.06	0.02	-0.06
Chemicals	0.021	0.81	0.07	-0.27
Electrical machinery	0.003	-1.40	0.64	0.73
Motor vehicles	0.010	1.76	0.05	-0.56
Other transport equipment	0.009	0.38	0.03	-0.07
Other machinery	0.027	-0.38	0.07	0.13
Metals and metal products	0.014	0.15	0.05	0.07
Wood and paper products	0.023	-0.05	0.03	0.02
Other manufactures	0.010	0.05	0.02	0.00
Water transport	0.002	0.04	0.03	0.02
Air transport	0.004	0.00	0.00	0.02
Finance	0.074	0.00	-0.11	0.01
Insurance	0.020	-0.04	-0.27	0.01
Business services	0.099	-0.01	0.01	0.00
Communications	0.019	0.00	0.06	0.01
Construction	0.080	0.09	0.04	0.01
Personal services	0.036	-0.01	0.04	0.02
Other services	0.480	-0.02	0.00	0.00

Source: CGE calculations.

While the non-comprehensive FTA option, which would be limited to either tariff, or services trade, or procurement liberalization, would result in positive changes in sector-level output and trade patterns, these benefits would be relatively small. At an aggregate level, the changes would be even smaller. When comparing the impact of these non-comprehensive FTAs with a comprehensive FTA that will be discussed in the following section, it is clear that the overall benefits would be of much larger magnitude in the case of a trade agreement that covers more policy pillars simultaneously.

5.2. Full FTA

5.2.1. Macro Results

Here, we turn to the discussion of effects on macroeconomic variables, resulting from a reduction of barriers to trade and investment between the EU and the US under a comprehensive FTA (see Table 4 for details). In so doing, we present the results with regards to GDP.[13] As indicated above two FTA scenarios are considered: one less ambitious and one more ambitious (as described in Table 4).

Table 16 and Table 17 below show the estimated effect on GDP both for the ambitious and less ambitious scenarios for the EU and the US. The results are presented for the total impact and also decomposed into the different subcomponents that correspond to the several policy pillars, namely tariffs, total NTBs on goods, total NTBs on services, direct and indirect spill-overs, and procurement. Procurement related barriers are in fact captured by the NTBs in goods and in services. A procurement column is introduced in the table below in order to highlight the importance of this type of barriers in the negotiations. However, it is important to note that the impact of reducing procurement barriers should not be added to the effects from other pillars as it would mean double-counting.

As can be seen Table 16, the estimated impact on GDP for the EU and US range between 0.2 and 0.5 per cent, for the less ambitious and ambitious scenarios respectively. Because we are dealing with NTBs rather than tariffs, changes in trade volumes alone are not necessarily indicative of the net impact on GDP, and so the reader is cautioned when comparing Table 16 to Table 20 (changes in exports) below. This is because, as

13 The annex tables also report changes in real national income. GDP is reported here because it is a concept that will be more familiar to the reader. GDP is the value of a fixed basket of final goods and services produced by the economy. Real national income, on the other hand, is a measure of the actual purchasing power available for final consumption, given changes in both output and prices. Real national income better captures shifts in the economy toward a more efficient basket of goods and services, as well as changes in final consumption prices. Usually these two measures track each other closely. However, when the current pattern of GDP reflects strong underlying distortions, real national income is a better measure of the benefits to the agents in the economy.

discussed earlier in the report (see Chapters 2 and 3), NTBs involve higher costs and so lower productivity. The impact on GDP will therefore hinge, in part, on cost savings linked to removing NTBs. Basically, with NTBs that raise costs the opportunity costs of new exports resulting from NTB reduction are lower than with tariffs, so that the cost side of the cost-benefit analysis of increased trade is lower. The impact on GDP will also hinge on the value added composition of exports. As such, even if trade volume effects are not relatively large in a particular sector (recall our discussion of Figure 10), they may still yield relatively large gains overall. The indirect spill-over effects are more complex still (though small in absolute terms). There will be both increased income and trade in third countries (from the other sets of results discussed here), along with improved access conditions to third markets. However, there is also scope for some diversion of trade away from the US and EU and toward intra-third country trade. The total impact depends on all these things, and the direction is unknown a priori.

Table 16 Changes in GDP (in per cent), 2027 benchmark, 20 per cent direct spill-overs

	A=B+C+ D+E+F	B	C	D	E	F	G
		Stemming from the liberalisation of					
	Total	tariffs	total NTBs goods	total NTBs services	direct spill-overs	indirect spill-overs	procurement
Less ambitious experiment							
European Union	0.27	0.10	0.12	0.01	0.03	0.01	0.02
United States	0.21	0.04	0.11	0.03	0.03	0.00	0.01
Ambitious experiment							
European Union	0.48	0.11	0.26	0.03	0.07	0.02	0.05
United States	0.39	0.04	0.23	0.06	0.06	0.00	0.03

Source: CGE calculations.

An alternative measure of aggregate results is provided in Table 18 below, where a comparison is provided across scenarios of household income effects for the EU and US.[14] Starting with the limited scenarios, a tariff only scenario yields €12.9 billion in disposable income gains across European households, and €5.1 billion in disposable income gains for US households. The services and procurement agreements yield substantially less for European households, while the services only agreement yields the most for US households under the limited scenarios. These effects are far outweighed under both the less ambitious and more ambitious comprehensive scenarios. Here we have estimated gains to disposable income across European households of between €39.8 billion and €70.82 billion. In the US, household disposable income increase by between €29.9 and €58.4 billion. For a family of 4 the comprehensive scenarios yield disposable income gains between €306 and €545 annually in the EU and between €336 and €655 in the US.

Table 17 Changes in GDP (in million euros), 2027 benchmark, 20 per cent direct spill-overs

	A=B+C+D+E+F	B	C	D	E	F	G
		Stemming from the liberalisation of					
	Total	tariffs	total NTBs goods	total NTBs services	direct spill-overs	indirect spill-overs	procurement
Less ambitious experiment							
European Union	68,274	25,394	29,250	3,482	7,984	2,164	6,069
United States	49,543	9,784	25,505	6,899	7,404	-72	3,341
Ambitious experiment							
European Union	119,212	27,409	64,344	7,014	16,291	4,154	12,312
United States	94,904	10,120	56,202	14,014	14,760	-216	6,707

Source: CGE calculations.

14 Household disposable income is a subset of total income (it is less than total national income). It represents the income available to spend on final consumption (food, clothing, transport, housing), after allocations to the government and for savings. Changes in this variable therefore measure the changes in private consumption valued at current prices."

Table 18 Household disposable income, million euro, 2027 benchmark

	limited agreement: tariffs only	limited agreement: services only	limited agreement: procurement only	comprehensive agreement: low ambition	comprehensive agreement: high ambition
total EU, mill. euro	12,934	3,089	4,295	39,813	70,820
US, mill. euro	5,081	4,122	2,246	29,982	58,434
EU, percent	0.09	0.02	0.02	0.28	0.49
US, percent	0.03	0.02	0.01	0.18	0.35
EU, € per household	99	41	49	306	545
US, € per household	57	82	21	336	655

Source: CGE calculations. Per household estimates are for a family of 4.

The exact amount overall, as reported in Table 16, depends on the combination of value added, barrier levels, and underlying elasticities. It also hinges on linkages between sectors, and final demand responses to price changes. Indeed this is the reason for working with a CGE framework – we are then better able to capture the combination of these effects across sectors. In the case of the EU, if we refer back to Table 2, combined with the underlying bilateral trade balance by sector (Figure 1), the EU has a strong, positive balance in goods sectors with relatively high NTB levels. This means that on average European firms face a higher cost burden linked to transatlantic NTBs than do US firms, so that the reduction in the cost burden linked to NTBs will be somewhat disproportionate as well, benefiting European firms more on average. As such, we can expect somewhat greater benefits from improved market access for the EU than for the US. This is reflected in the result in Table 16 and Table 17. Indeed, where we have a similar change in trade volumes, this positive balance means the EU will benefit more in terms of GDP. This is reflected in the relative magnitudes of trade and GDP effects in Table 16 (above) and Table 20 (below).

For the US, around three quarters of the estimated increase in GDP, across both scenarios, stem from the lowering of NTBs. For the EU, NTBs in goods are shown to be accountable for around half of the increase, while lowering tariffs is shown to be less important. Again, this is consistent with the pattern of trade, NTBs and tariffs

as discussed in Chapter 2. When viewing these tables, it is also useful to recall the observation made in Chapter 4 about the relatively low level of perceived bilateral barriers in services, combined with a 65 per cent share of goods in bilateral trade. Together, the higher barriers and trade share for goods imply that most gains will follow from NTBs and tariffs on goods. Similarly, the original Ecorys (2009) study covered limited aspects of procurement, and the barriers identified were relatively minor as a share of total protection. As such, it is not surprising that the procurement estimates are relatively small as a share of the total.

In summary, these results highlight that the potential main impact from liberalization stems more from NTB liberalization (especially including spill-overs) rather than just reducing tariff barriers.

5.2.2. Output and Trade

Next, we take a closer look at the corresponding changes to trade and output for the EU and the US. First, we look at the overall effects on imports and exports and then we move on to studying the effects on a more disaggregate, sector specific level.

5.2.2.1. Aggregate Effects

As can be seen from Table 19 below, liberalising trade would imply some significant increases in EU-US trade. In the less ambitious scenario, EU exports to the US will increase by 16 per cent while US exports to the EU increase by 23 per cent. In the ambitious scenario, the corresponding figures are 28 and 37 per cent. About two thirds of the increase in bilateral trade in the ambitious experiment is attributable to reducing NTBs in goods sectors. Changes in tariffs are also important, though as discussed above a given change in trade translates into greater GDP effects with NTBs.

Table 19 Changes in bilateral exports to the partner country (in per cent and million euros), 2027 benchmark, 20 per cent direct spill-overs

	A=B+C+D+E+F	B	C	D	E	F	G
		Stemming from the liberalisation of					
	Total	tariffs	total NTBs goods	total NTBs services	direct spill-overs	indirect spill-overs	procurement
		In per cent					
Less ambitious experiment							
European Union	**16.16**	7.06	9.34	0.69	-0.76	-0.15	1.04
United States	**23.20**	13.67	8.80	0.67	0.01	0.02	0.78
Ambitious experiment							
European Union	**28.03**	7.67	21.00	1.40	-1.73	-0.34	2.13
United States	**36.57**	15.34	19.93	1.37	-0.08	0.03	1.62
		In million euros					
Less ambitious experiment							
European Union	**107,811**	47,083	62,289	4,598	-5,089	-989	6,957
United States	**100,909**	59,476	38,284	2,934	57	77	3,410
Ambitious experiment							
European Union	**186,965**	51,185	140,106	9,332	-11,525	-2,243	14,211
United States	**159,098**	66,720	86,698	5,966	-335	151	7,043

Source: CGE calculations.

Table 20 and Table 21 provide estimates for total (as opposed to bilateral) trade. For the EU, total exports are expected to increase by 3.37 to 5.91 per cent under the less ambitious and ambitious scenarios respectively. Similar to the results presented in the previous section, the lowering of NTBs in goods is shown to be the most important factor in increasing exports, followed by the lowering of tariffs on exports to the US.

Table 20 Changes in value of total exports (in per cent and million euros), extra-EU exports in case of the EU, 2027 benchmark, 20 per cent direct spill-overs

	A=B+C+D+E+F	B	C	D	E	F	G
		Stemming from the liberalisation of					
	Total	tariffs	total NTBs goods	total NTBs services	direct spill-overs	indirect spill-overs	procurement
				In per cent			
Less ambitious experiment							
European Union	**3.37**	1.28	1.43	0.11	0.25	0.28	0.19
United States	**4.75**	2.11	1.69	0.16	0.52	0.27	0.23
Ambitious experiment							
European Union	**5.91**	1.41	3.23	0.23	0.48	0.56	0.42
United States	**8.02**	2.34	3.79	0.33	1.01	0.54	0.48
				In million euros			
Less ambitious experiment							
European Union	**125,232**	47,577	53,341	4,211	9,442	10,564	7,163
United States	**142,071**	63,219	50,600	4,717	15,505	8,031	5,943
Ambitious experiment							
European Union	**219,970**	52,327	120,313	8,523	18,010	20,959	15,620
United States	**239,543**	70,265	113,630	9,624	30,042	15,982	14,202

Source: CGE calculations.

For the US, the corresponding effect on exports is larger. They are estimated to increase by 4.75 and 8.02 per cent respectively for the two liberalizing scenarios. In the less ambitious scenario, the lowering of tariffs is accountable for around half of that increase. In the case of the more ambitious scenario the most important contribution comes from the lowering of NTBs in goods. Meanwhile, the lowering of tariffs is still shown to be an important factor in realizing these increases in trade. It is important to recall that the EU has high tariffs on motor vehicles and processed foods. This drives part of the larger export gain for the US in the tables above. The estimated effects also tell us that spill-over effects are more important for the US than they are for the EU. (See columns E in both tables). This difference is due in part to differences in the importance of trade with third countries for the US and the EU. When we look at underlying baseline trade flows, for the US the first most important import partner is China. The EU comes second as a source of imports. Furthermore, NAFTA countries are also very important

trading partners for the US overall. In column E in both tables, given differences in trade composition the NTB-related direct spillovers yield falling costs from spill-overs for a larger share of imports in the case of the US compared to the EU. This is why we see a higher impact due to these spill-overs for the US. For the EU, the estimated changes in total imports are similar to the estimated changes in exports. The increase is expected to be in the range of 2.91 and 5.11 per cent, with NTBs in goods being the most important liberalizing measure. One last point on the pattern of results in Table 20 and Table 21 relates to export expansion linked to direct spillovers. It is a common (and even expected result) in such modelling exercises that increased imports (in column E, for example, for reduction in trade costs for third countries exporting to the US and EU) there will also be increased exports. With more direct competition from imports, domestic firms find foreign markets relatively more attractive, such that exports reflect a relative shift toward overseas markets.

Table 21 Changes in value of total imports (in per cent and million euros), extra-EU imports in case of the EU, 2027 benchmark, 20 per cent direct spill-overs

	A=B+C+D+E+F	B	C	D	E	F	G
		Stemming from the liberalisation of					
	Total	tariffs	total NTBs goods	total NTBs services	direct spill-overs	indirect spill-overs	procurement
		In per cent					
Less ambitious experiment							
European Union	**2.91**	1.09	1.22	0.10	0.23	0.27	0.18
United States	**2.81**	1.25	1.00	0.09	0.31	0.16	0.14
Ambitious experiment							
European Union	**5.11**	1.20	2.75	0.20	0.44	0.52	0.36
United States	**4.74**	1.39	2.24	0.19	0.60	0.32	0.28
		In million euros					
Less ambitious experiment							
European Union	**128,424**	48,239	53,892	4,259	10,207	11,827	7,907
United States	**118,840**	52,678	42,231	4,011	13,081	6,839	5,868
Ambitious experiment							
European Union	**225,899**	53,071	121,548	8,624	19,544	23,113	15,953
United States	**200,519**	58,543	94,830	8,183	25,351	13,611	11,896

Source: CGE calculations.

For the US, imports will increase by 2.81 and 4.74 per cent respectively. In the less ambitious scenario, the tariff cuts are shown to be the most important driving factor. Meanwhile, in the more ambitious scenario, lowering of NTBs in goods provides the biggest contribution to the changes in imports.

Terms of trade for a country reflect how much its exports are worth in terms of imports. Thus an improvement (or a positive change) in a country's terms of trade will imply that it can afford to buy more imports for every unit of its exports sold. The corresponding changes in terms of trade are summarized in Table 22 below.

Table 22 Changes in terms of trade (in per cent), 2027 benchmark, 20 per cent direct spill-overs

	A=B+C+D+E+F	B	C	D	E	F	G
		Stemming from the liberalisation of					
	Total	tariffs	total NTBs goods	total NTBs services	direct spillovers	indirect spillovers	procurement
Less ambitious experiment							
European Union	**0.00**	-0.01	0.04	0.00	-0.05	0.02	0.00
United States	**-0.08**	0.05	-0.04	-0.01	-0.11	0.03	-0.02
Ambitious experiment							
European Union	**0.01**	-0.02	0.09	0.00	-0.10	0.03	0.00
United States	**-0.19**	0.07	-0.08	-0.02	-0.21	0.05	-0.04

Source: CGE calculations.

As can be seen from Table 22, the resulting changes in terms of trade are relatively small. For the EU, terms of trade are expected to remain essentially unchanged. For the US, terms of trade are shown to decrease somewhat. In the less ambitious scenarios they are expected to decrease by 0.08 per cent. Under the ambitious scenario, the American terms of trade are expected to decrease by 0.19 per cent. As discussed above with respect to Table 20, this decrease is largely attributable to direct spill-overs, and is linked to the underlying estimated trade volume effects. The US has a relatively larger import share with third countries (especially China and Canada) in goods sectors affected by NTB reductions than does the EU. This leads to a greater impact when we

examine direct spill-overs. As NTBs are reduced also in trade with these third countries, increased US demand drives the slight deterioration in terms of trade.

Lowering of tariffs naturally implies that tariff revenues in the EU will decrease somewhat. As can be seen from the first row of Table 23, the 2027 benchmark value of tariffs collected is 78.7 billion euros. Reducing tariffs alone would cause these revenues to decrease by 7.3 billion euros, relative to baseline situation in 2027. On the other hand under the ambitious and less ambitious scenarios with full liberalisation, tariff revenues would decreases by less – 5.4 billion euros and 6.4 billion euros, respectively. This is due to increased trade with third countries from further liberalisation (with spill-over effects, or in other words the lowering of part of the NTBs on a MFN basis) relative to tariffs only, which would result in additional tariff revenues.

Table 23 Change in EU tariff revenue (in million euros), 2027 benchmark

		change
Benchmark	78,733	
ambitious, 20 percent spill-overs	73,340	-5,393
less ambitious, 20 percent spill-overs	72,372	-6,361
tariffs only	71,386	-7,347

Source: CGE calculations.

Another potential impact of the Transatlantic FTA is that the lower barriers to trade with the US will cause a shift in relative costs leading to diverting some trade away from intra-EU partners towards new trade partners (see Table 24). In the table, we have defined trade diversion as the change in intra-EU trade following implementation of an FTA. This change will amount to 72.1 billion euros under full liberalization, of which 26.0 and 23.6 billion euros are caused by spill-overs and NTBs in goods respectively. Meanwhile, NTBs in services, indirect spill-overs and procurement have a minor role in redirecting trade. Half of the estimated trade diversion effect (the change in intra-EU trade flows) is attributable to the motor vehicles sector. For this sector, the lowering of tariffs is shown to be the most important contributing factor, together with NTBs in

goods and direct spill-overs. Some trade diversion is also visible in chemicals, electrical machinery and metals and metal products.

Table 24 Trade diverted from intra-EU trade (in million euros), 2027 benchmark, 20 per cent direct spill-overs, ambitious experiment

	A=B+C+ D+E+F	B	C	D	E	F	G
		Stemming from the liberalisation of					
	Total	tariffs	total NTBs goods	total NTBs services	direct spillovers	indirect spillovers	procurement
Agr forestry fisheries	269	-101	319	17	-50	84	50
Other primary sectors	345	234	-89	0	278	-78	11
Processed foods	-425	-164	425	65	-851	98	131
Chemicals	-13,208	-3,641	-2,356	-214	-7,282	286	214
Electrical machinery	-12,829	-376	-2,847	61	-9,073	-594	206
Motor vehicles	-36,517	-13,423	-10,551	-59	-12,016	-469	996
Other transport equipment	-2,468	-583	-1,572	-8	-262	-42	25
Other machinery	492	-431	-3,692	-308	6,583	-1,661	431
Metals and metal products	-11,464	-1,196	-4,185	-176	-4,642	-1,266	-4,114
Wood and paper products	-799	183	-365	23	-685	46	0
Other manufactures	2,087	1,131	-261	-43	2,174	-913	174
Water transport	-35	41	26	-19	-118	35	10
Air transport	76	97	35	-62	14	-7	14
Finance	129	60	103	0	-51	17	-51
Insurance	84	18	36	20	5	5	8
Business services	1,068	276	827	0	-138	103	172
Communications	53	25	53	-25	-8	8	8
Construction	131	36	77	8	0	11	11
Personal services	124	39	79	-28	17	17	17
Other services	795	179	308	26	154	128	51
Total	*-72,092*	*-17,596*	*-23,631*	*-722*	*-25,952*	*-4,192*	*-1,636*

Source: CGE calculations.

Overall, EU exports to non-US, extra-EU destinations are expected to increase by 33.3 billion euros (see Table 25). From the model estimates reported in the table, this increase is attributable to spill-over effects (direct and indirect). (The positive overall trade effect from removing tariffs is 1.1 billion euros, which is essentially 0.0 per cent). The bilateral lowering of NTBs in goods causes exports to non-US, extra-EU partners to shrink as trade is diverted away from these partners toward the US with EU exports becoming relatively more competitive in the US market due the reduction in trade costs (that would still apply in third countries). Nevertheless, with direct and indirect spill-overs, the costs of exporting to third countries will also fall and will lead to increased trade beyond the transatlantic market. As a consequence, with the exception of agriculture, forestry and fisheries and electrical machinery, exports in all sectors are estimated to increase towards destinations outside the potential FTA.

Table 25 Change in EU exports to non-US, extra-EU destinations (in million euros), 2027 benchmark, 20 per cent direct spill-overs, ambitious experiment

	A=B+C+D+E+F	B	C	D	E	F	G
		Stemming from the liberalisation of					
	Total	tariffs	total NTBs goods	total NTBs services	direct spillovers	indirect spillovers	procurement
Agr forestry fisheries	-1,270	-736	-1,562	-51	1,180	-100	-154
Other primary sectors	250	-416	-5	30	211	430	95
Processed foods	3,247	-51	404	27	79	2,789	98
Chemicals	5,591	346	1,753	-15	-503	4,009	331
Electrical machinery	-2,551	-82	-1,352	3	-2,018	898	73
Motor vehicles	7,559	552	-2,333	-20	3,475	5,886	-58
Other transport equipment	1,074	359	-1,050	-64	1,210	619	-146
Other machinery	1,422	1,075	-9,718	-547	13,680	-3,068	382
Metals and metal products	4,139	85	-1,575	-53	3,391	2,292	620
Wood and paper products	2,454	-119	-995	-49	1,312	2,305	-58
Other manufactures	2,243	620	-518	68	1,915	158	108
Water transport	951	58	230	0	279	384	52
Air transport	810	67	56	-53	278	462	21
Finance	552	-12	222	11	-94	424	44
Insurance	406	10	-143	5	199	334	-9
Business services	2,808	-75	-529	16	1,311	2,086	34
Communications	295	-6	7	2	42	250	14
Construction	336	-17	-357	-21	480	251	-1
Personal services	898	-143	-1,540	-64	1,313	1,332	-139
Other services	2,065	-374	-789	-31	1,797	1,461	106
Total	*33,277*	*1,142*	*-19,794*	*-809*	*29,535*	*23,202*	*1,409*

Source: CGE calculations.

EU imports from non-US, extra-EU sources are estimated to increase by twice as much as exports, i.e. 66.9 billion euros (see Table 26). Half of this increase originates from the lowering of NTBs in goods. Spill-overs are also shown to be important contributors. As noted above with respect to Table 20 and Table 21, increased competition from imports can be expected to push domestic firms to focus more on overseas markets, at least in relative terms. On the other hand, lowering of tariffs between the EU and US decreases the imports from outside the FTA, switching imports towards intra-FTA partners. Imports in all sectors (with the exception of other machinery and other manufactures) increase. The biggest increases in total are estimated to take place in electrical machinery, motor vehicles and metals.[15]

15 On a percent basis, ranking of total changes is somewhat different. The greatest increases are in motor vehicles (7.83 per cent), wood and paper (7.53 per cent) and processed foods (5.72 per cent).

Table 26 Change in EU imports from non-US extra-EU sources (in million euros), 2027 benchmark, 20 per cent direct spill-overs, ambitious experiment

	A=B+C+D+E+F	B	C	D	E	F	G
		Stemming from the liberalisation of					
	Total	tariffs	total NTBs goods	total NTBs services	direct spillovers	indirect spillovers	procurement
Agr forestry fisheries	1,538	390	1,081	53	-344	358	153
Other primary sectors	7,282	3,830	345	86	3,151	-131	98
Processed foods	4,579	102	1,388	70	2,448	570	189
Chemicals	1,831	-2,481	-5,227	197	8,688	654	-35
Electrical machinery	12,006	646	-4,452	-363	14,433	1,742	-338
Motor vehicles	12,781	-6,391	2,514	288	13,816	2,553	550
Other transport equipment	6	-529	-275	53	341	416	84
Other machinery	-330	-2,097	15,419	961	-19,126	4,513	13
Metals and metal products	15,705	-1,343	3,710	285	9,846	3,207	6,197
Wood and paper products	4,366	153	1,544	105	1,906	659	271
Other manufactures	-36	-6,456	10,162	736	-10,628	6,151	783
Water transport	527	-10	315	-10	62	169	42
Air transport	492	-52	670	-39	-326	239	71
Finance	735	100	603	-28	-118	178	113
Insurance	237	28	216	12	-72	53	18
Business services	1,094	-73	1,816	-5	-1,286	641	129
Communications	482	46	396	-10	-61	112	48
Construction	257	24	341	21	-203	74	51
Personal services	581	52	657	23	-271	121	68
Other services	2,732	411	3,628	222	-2,376	847	404
Total	*66,864*	*-13,649*	*34,850*	*2,658*	*19,879*	*23,127*	*8,910*

Source: CGE calculations.

5.2.2.2. Sector Specific Effects

We now turn to take a closer look at the sector-specific effects underlying the aggregate economic impacts reported above. First, we look at the changes in output and then we move on to the estimated changes in trade.

Table 27 Changes in EU output by sector (in per cent). 2027 benchmark, 20 per cent direct spill-overs

Scenario/Sector	Baseline shares in value added	Less ambitious	Ambitious
Agr forestry fisheries	0.040	0.05	0.06
Other primary sectors	0.019	0.01	0.02
Processed foods	0.030	0.30	0.57
Chemicals	0.028	0.09	0.37
Electrical machinery	0.004	-3.74	-7.28
Motor vehicles	0.015	0.24	1.54
Other transport equipment	0.007	-0.17	-0.08
Other machinery	0.037	0.40	0.37
Metals and metal products	0.021	-0.71	-1.50
Wood and paper products	0.023	0.08	0.08
Other manufactures	0.029	0.69	0.79
Water transport	0.003	0.55	0.99
Air transport	0.003	0.30	0.44
Finance	0.032	0.23	0.42
Insurance	0.010	0.44	0.83
Business services	0.222	0.15	0.25
Communications	0.023	0.10	0.17
Construction	0.083	0.31	0.53
Personal services	0.035	0.15	0.26
Other services	0.338	0.16	0.28

Source: CGE calculations.

The results reported in Table 27 show that the sector output changes in the EU are in general small. Production in the primary sectors is almost unaffected, while there is a small increase across all services sectors. In manufacturing there is also a small increase in output with some exceptions. The most notable can be found in electrical machinery, where output is expected to decline by 3.74 and 7.28 per cent in the less ambitious and the more ambitious scenarios respectively. (We return to the electrical

machinery estimates when we discuss Figure 11.) In contrast, the EU production of motor vehicles is expected to increase by 0.24 and 1.54 per cent in the less ambitious and ambitious scenarios, respectively. If we compare Table 27 with Table 14, it is clear that the reductions of NTBs in goods and in services are important drivers of changes at sector level. For example, for motor vehicles, tariff reductions alone harm the EU motor vehicle sector, with falling output levels. In contrast, with NTB reductions, the sector expands. This is strongest under the ambitious scenario, with the deepest NTB reductions (half of actionable or 25% of total NTBs).

Table 28 Changes in US output by sector (in per cent), 2027 benchmark, 20 per cent direct spill-overs

Scenario/Sector	Baseline shares in value added	Less ambitious	Ambitious
Agr, forestry fisheries	0.031	-0.01	0.00
Other primary sectors	0.023	0.02	0.05
Processed foods	0.017	-0.52	-1.13
Chemicals	0.021	0.25	-0.40
Electrical machinery	0.003	-2.03	-2.04
Motor vehicles	0.010	-0.57	-2.78
Other transport equipment	0.009	0.62	0.83
Other machinery	0.027	0.71	1.66
Metals and metal products	0.014	0.27	0.45
Wood and paper products	0.023	-0.04	-0.02
Other manufactures	0.010	0.17	0.26
Water transport	0.002	0.22	0.42
Air transport	0.004	0.19	0.39
Finance	0.074	-0.06	-0.11
Insurance	0.020	-0.24	-0.44
Business services	0.099	0.03	0.07
Communications	0.019	0.15	0.32
Construction	0.080	0.23	0.39
Personal services	0.036	0.18	0.38
Other services	0.480	0.09	0.18

Source: CGE calculations.

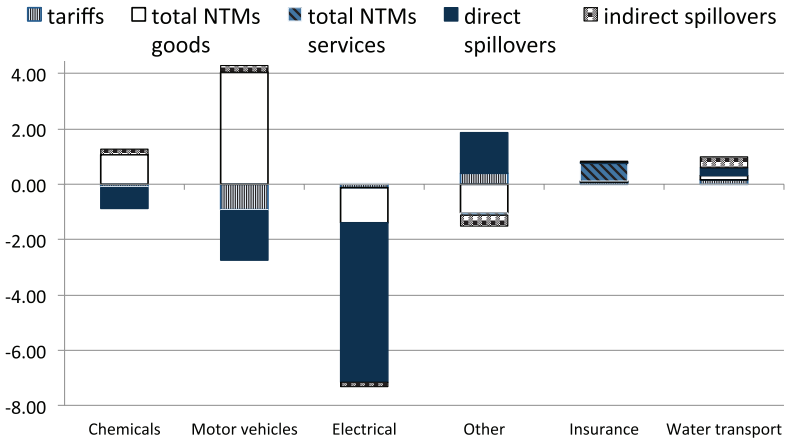
For the US, the changes in sector specific output are also found to be small, with all the services sectors changing less than one per cent (Table 28). Finance and insurance sectors will contract, however the reduction is less than half a per cent, which implies no significant change. Within manufacturing, processed foods, electrical machinery and motor vehicles are expected to see an output decline, while in the other sectors it will expand, albeit quite limitedly. Overall the resulting pattern of output changes is similar in the two scenarios with the same sectors expanding and contracting.

Figure 11 below presents a breakdown of the sources of change across selected sectors for the EU, under the ambitious scenario. We have focused on some of the largest changes, full detail is provided in the annex tables. The largest negative impact is in electrical machinery.[16] From the figure, almost all of this change is driven by direct spill-overs. If we contrast electrical machinery and motor vehicles, we can also see that bilateral NTB reduction and spill-overs work in opposite directions in the two sectors. In the electrical machinery sector, bilateral NTB reduction and direct spill-overs reinforce each other. In contrast, in motor vehicles, bilateral NTB reductions lead to an expansion of the EU motor vehicle sector. This expansion is very strong, and outweighs negative effects linked to spill-overs. In other machinery, direct spill-overs support expansion of the sector, in this case offsetting the effects of bilateral NTB reductions. Chemicals are similar, in terms of the pattern of results, to motor vehicles. In services, we see that for financial services bilateral NTB reduction matters. For transport, it is indirect spill-overs that matter the most due to an expansion of global trade volumes (with indirect spill-overs) that benefits the EU shipping industry. It must be stressed that these are general equilibrium effects. In the other machinery sector, for example, changes in NTBs in other sectors are driving the change in output. (See the NTB levels in Table 2). This is missed completely if we look at the sector in isolation (i.e. partial rather than general equilibrium.) With the complex mix of changes in barriers across sectors, combined with intermediate linkages, the final mix of outcomes will hinge

16 From the original Ecorys study, this sector maps to "Electronics & Office Information & Communication Equipment." There will be other machinery made by affected firms that is covered by the "Other Machinery" sector in the model.

on interactions across sectors. Hence, while we can say that bilateral NTBs are most important in a given case, this may follow from general equilibrium changes rather than changes limited to a particular sector. Another example of this point relates to electrical machinery. The estimated impact on the EU industry we report here is similar in magnitude to the original Ecorys estimates. The Ecorys study provides a different and valuable decomposition (sector-specific vs. overall liberalization), and reports that the drop in output in this sector is actually driven by liberalization in other sectors, which then draws resources into expanding sectors.

Figure 11 Decomposition of EU output changes, ambitious scenario



Source: CGE calculations.

We now move to looking at the corresponding changes in sector-level trade. In so doing, we first present the changes for sector specific trade for the EU, which are summarized in Table 29 below. The first four columns depict changes in exports and the last four for imports for the less ambitious and ambitious scenarios respectively.

Table 29 Changes in extra-EU exports and imports by sector (in per cent and million euros), 2027 benchmark, 20 per cent direct spill-overs

Scenario/Sector	Total exports				Total imports			
	Less ambitious		Ambitious		Less ambitious		Ambitious	
	Per cent	Million euros	Per cent	Million euros	Per cent	Million euros	Per cent	Million euros
Agr forestry fisheries	0.41	936	0.22	490	3.84	1,953	5.22	2,657
Other primary sectors	-0.02	-29	0.24	313	0.78	5,424	1.05	7,322
Processed foods	5.21	9,252	9.36	16,620	6.26	5,364	10.07	8,628
Chemicals	5.07	19,368	9.26	35,405	5.67	18,376	9.01	29,183
Electrical machinery	0.04	35	-0.01	-10	3.10	10,706	5.87	20,298
Motor vehicles	20.11	45,699	41.75	94,857	24.14	44,039	43.11	78,626
Other transport equipment	3.26	5,357	6.10	10,032	6.72	6,208	11.21	10,353
Other machinery	1.68	10,072	1.47	8,810	1.05	5,055	1.54	7,418
Metals and metal products	7.15	9,875	12.07	16,656	5.25	18,552	9.76	34,483
Wood and paper products	2.16	2,936	4.19	5,694	5.65	3,673	11.20	7,277
Other manufactures	5.82	12,663	6.13	13,327	0.26	2,586	0.63	6,132
Water transport	1.08	498	2.11	970	0.70	265	1.49	565
Air transport	0.79	621	1.45	1,142	0.35	339	0.86	832
Finance	2.20	2,046	4.37	4,068	1.45	996	2.92	2,000
Insurance	2.08	1,895	4.11	3,741	1.46	249	2.92	499
Business services	0.55	2,290	1.04	4,354	0.76	1,366	1.68	3,024
Communications	0.64	172	1.27	342	1.58	576	3.20	1,164
Construction	0.33	211	0.64	410	0.87	203	1.79	416
Personal services	0.52	568	1.02	1,126	2.83	749	5.84	1,545
Other services	0.26	767	0.55	1,623	0.64	1,745	1.27	3,476
Total	*3.37*	*125,232*	*5.91*	*219,970*	*2.91*	*128,424*	*5.11*	*225,899*

Source: CGE calculations.

For the EU, overall imports and exports are both estimated to increase by 3.37 and 5.11 per cent in the less ambitious and ambitious scenarios, respectively. With the exception of electrical machinery, both imports and exports are shown to increase across both scenarios in all sectors for the EU. Some of the largest changes are in chemicals, motor vehicles, and metals. As discussed earlier (Table 27), parallel to these changes in trade,

output in almost all sectors expands, electrical machinery being one exception. The results indicate an increase in imports of electrical machinery, which is accompanied by a decline in the output in this sector (7.28 per cent in the ambitious scenario) as more competitive imported goods replace some of the domestic production.

The biggest relative increase in imports as well as exports takes place in the motor vehicles sector. Here trade is estimated to increase by 43.11 per cent in the ambitious scenario. This is accompanied with an increase in the output of this sector (by 1.54 per cent under the ambitious scenario). This reflects the important liberalisation effort that the agreement would imply due to the initial combination of high tariffs and high NTBs. In addition, it reflects trade in parts and components in the model. This is a sector characterized by two-way trade in both vehicles and parts. Total exports are also estimated to increase significantly for metals and metal products (12.07 per cent), processed foods (9.36 per cent), chemicals (9.26 per cent), and other manufactures (6.13 per cent).

Table 30 Changes in US exports and imports by sector (in per cent and million euros), 2027 benchmark, 20 per cent direct spill-overs.

Scenario/Sector	Total exports				Total imports			
	Less ambitious		Ambitious		Less ambitious		Ambitious	
	Per cent	Million euros	Per cent	Million euros	Per cent	Million euros	Per cent	Million euros
Agr forestry fisheries	0.67	3,261	1.07	5,204	1.18	1,228	0.59	614
Other primary sectors	0.09	166	0.30	526	0.43	2,095	0.70	3,412
Processed foods	4.58	4,895	6.85	7,320	9.15	9,607	16.37	17,189
Chemicals	7.71	25,448	11.49	37,938	6.10	16,395	11.56	31,081
Electrical machinery	3.35	4,650	8.86	12,307	2.39	10,136	3.65	15,458
Motor vehicles	34.36	53,071	59.47	91,856	10.73	44,709	20.81	86,693
Other transport equipment	4.98	8,631	8.57	14,853	5.55	4,758	10.33	8,855
Other machinery	3.66	10,057	5.35	14,698	0.45	3,187	-0.37	-2,595
Metals and metal products	12.79	15,254	22.45	26,783	5.49	10,655	9.04	17,530
Wood and paper products	3.76	2,834	7.75	5,846	2.48	3,291	4.35	5,766
Other manufactures	3.88	7,972	4.31	8,861	0.97	7,463	0.93	7,194
Water transport	0.78	30	1.52	58	0.77	22	1.39	40
Air transport	0.78	413	1.52	808	0.41	221	0.75	403
Finance	1.14	861	2.40	1,809	3.27	1,986	6.40	3,884
Insurance	0.83	268	1.88	612	3.02	1,840	5.84	3,562
Business services	0.98	1,363	2.24	3,102	0.74	1,147	1.16	1,799
Communications	2.39	473	5.03	998	0.31	46	0.43	64
Construction	0.95	122	2.20	282	0.99	57	1.62	94
Personal services	1.80	1,348	4.15	3,109	0.66	137	0.83	173
Other services	0.35	954	0.94	2,571	-0.09	-142	-0.45	-697
total	*4.75*	*142,071*	*8.02*	*239,543*	*2.81*	*118,840*	*4.74*	*200,519*

Source: CGE calculations.

As can be seen from Table 30, trade in all sectors are expected to increase in the US. Here, total exports are shown to increase by 4.75 and 8.02 per cent under the less ambitious and ambitious scenarios, respectively. For many of the manufacturing sectors, these changes are quite significant. As in the case for the EU, motor vehicles are exhibiting the biggest increase in trade. Here, total exports are estimated to increase by up to 59.47

per cent under the ambitious scenario, while total imports will go up by 20.81 per cent. In part, this is due to the initial structure of trade barriers between the two economies, with the EU having quite high initial protection in the motor vehicle sector. At the same time, the reader is reminded to keep in mind the discussion following Table 27 and Table 28 about general equilibrium effects. It is problematic to assign outcomes to policy changes in individual sectors, as the changes in output and trade depend on what happens across all sectors.

Changes in bilateral trade for the two liberalisation scenarios are summarized in Table 31 and Table 32 below. The first one shows estimated changes in sector specific bilateral exports from the EU to the US, and the second the bilateral exports from the US to the EU.

Table 31 Changes in bilateral exports from the EU to the US by sector (in per cent and million euros), 2027 benchmark, 20 per cent direct spill-overs

Scenario/Sector	Less ambitious		Ambitious	
	Per cent	Million euros	Per cent	Million euros
Agr forestry fisheries	16.30	1,882	15.10	1,743
Other primary sectors	0.50	45	0.60	55
Processed foods	26.10	7,690	45.50	13,405
Chemicals	20.00	16,517	36.20	29,895
Electrical machinery	18.30	1,336	35.00	2,555
Motor vehicles	71.00	41,711	148.70	87,358
Other transport equipment	13.20	4,678	25.50	9,037
Other machinery	7.60	8,577	6.60	7,448
Metals and metal products	42.40	7,781	68.20	12,516
Wood and paper products	10.80	1,741	19.90	3,209
Other manufactures	23.00	11,230	22.80	11,132
Water transport	3.50	12	6.80	23
Air transport	0.90	187	1.60	333
Finance	4.30	1,779	8.50	3,517
Insurance	4.20	1,687	8.30	3,333
Business services	1.40	940	2.30	1,545
Communications	0.60	34	0.90	51
Construction	1.80	41	3.10	71
Personal services	1.40	139	2.30	228
Other services	-0.40	-196	-1.00	-491
Total	*16.16*	*107,811*	*28.03*	*186,965*

Source: CGE calculations.

The total exports from the EU to the US are estimated to increase significantly by 16.16 and 28.03 per cent, respectively. The increase is shown to be taking place across almost all sectors (with the exemption of 'Other Services'), however with smaller increases in the exports of services and other primary sectors than in manufactured goods. The most significant relative increases in exports are shown to occur in metals and metal

products (42.40 and 68.20 per cent, respectively) and motor vehicles (71.00 and 148.70 per cent).

Table 32 Changes in bilateral exports from the US to the EU by sector (in per cent and million euros), 2027 benchmark, 20 per cent direct spill-overs

Scenario/Sector	Less ambitious		Ambitious	
	Per cent	Million euros	Per cent	Million euros
Agr forestry fisheries	20.50	1,037	21.80	1,102
Other primary sectors	0.50	51	0.40	41
Processed foods	56.50	3,084	74.80	4,083
Chemicals	23.00	18,341	34.20	27,273
Electrical machinery	21.90	4,124	44.10	8,304
Motor vehicles	207.40	39,412	346.80	65,903
Other transport equipment	17.30	6,421	27.80	10,318
Other machinery	14.40	6,734	16.70	7,810
Metals and metal products	52.70	11,233	88.10	18,778
Wood and paper products	21.70	1,490	42.50	2,918
Other manufactures	16.30	6,022	16.70	6,170
Water transport	3.40	20	7.10	42
Air transport	1.00	170	2.20	374
Finance	2.40	607	4.90	1,240
Insurance	3.50	125	7.40	264
Business services	2.50	894	5.40	1,931
Communications	5.00	326	10.50	685
Construction	3.10	73	6.60	155
Personal services	6.40	447	13.80	964
Other services	0.60	298	1.50	744
Total	*23.20*	*100,909*	*36.57*	*159,098*

Source: CGE calculations.

Looking at the estimated increases in exports from the US to the EU, the increase in bilateral exports in percentage terms is even bigger (Table 32). This is driven mainly by the difference in increase in the motor vehicle sector. Imports from the US in this sector expand more than exports to the US. In the less ambitious scenario bilateral exports to

the EU are shown to increase by 23.20 per cent and by 36.57 per cent in the ambitious scenario. The expansion of exports is higher in all sectors in the ambitious scenario than in the less ambitious. As was the case with EU's exports to the US, the increase is most substantial in the manufacturing sectors. The increase is most notable for motor vehicles, where exports to the EU are expected to increase by 207.40 and 346.80 per cent respectively. Significant relative increases are also expected to occur in the exports for metals and metal products and processed foods. Despite the high percent increase of US exports, the FTA increases the positive EU trade balance of motor vehicles with the US. In addition, the increase in imports from the US only corresponds to roughly 4.8 percent of total sales in the EU in the baseline.

We next compare total trade effects with bilateral trade effects for selected sectors. In both cases the strongest changes are in motor vehicles. Here, we can see that there is a substantial expansion of trade between the transatlantic partners (the EU and US). Indeed, this implies relatively deep changes in the integration of the transatlantic motor vehicle sector. This reflects a relatively large share of parts and components in total sector trade, as well as the high tariffs (and so large tariff cuts) for the sector. The high tariffs are on the EU side (see Figure 9) while NTBs are high on both sides (see Table 2).

5.2.3. Sustainability Impacts

In this subchapter, we concentrate on sustainability impacts resulting from the two FTA scenarios. First, we focus on the resulting effects on the labour market with respect to changes in wages and displacements. Then we discuss the estimated effects on CO2-emissions and the use of natural resources.

5.2.3.1. Labour

First, we look at the corresponding estimated changes in wages for less and more skilled labour as a result of liberalizing trade between the two economies. These effects are summarized in Table 33 below.

Table 33 Changes in wages for less and more skilled labour, total effects (in per cent), 2027 benchmark, 20 per cent direct spill-overs

	Less skilled	More skilled
Less ambitious experiment		
European Union	0.30	0.29
United States	0.22	0.21
Ambitious experiment		
European Union	0.51	0.50
United States	0.38	0.36

Source: CGE calculations.

The resulting effects on wages for the both the EU and the US are positive. All estimated changes are equal to or less than 0.5 per cent of the wage rate. The changes in wages are shown to be similar for both skilled and unskilled labour with the impact being marginally lower for skilled workers. The ambitious experiment results in somewhat higher changes for the EU. The wage effects are in line with changes in GDP in Table 6 and Table 16, and so are consistent with an interpretation of general cost savings that lead to productivity gains as firms operate with lower tariff and NTB-related costs for transatlantic commerce. It should be stressed that the model is a long-run model, where sources of employment and unemployment are "structural" (rather than cyclical). In this sense, changes in labour demand are captured through wage changes (in this case rising wages). As wages increase in the experiments, this means a rising demand for labour, so that under a flexible labour supply specification, employment would increase instead.

Table 34, Table 35, Table 35, and Table 37 report detailed employment effects across sectors under the ambitious comprehensive scenario. As we are not modeling long run

unemployment rates, these are reallocation effects across sectors. In the EU, the motor vehicle sector sees employment expand by 1.28 per cent for skilled labor, and 1.27 per cent or less skilled labor. In contrast, there is a significant contraction in the electrical machinery and metals sectors. Mirroring this pattern, in the US the motor vehicle sector sees falling employment, and the metals and metal products sector sees a rise. In the US, like the EU, the electrical machinery sector contracts in terms of employment. Combined with rising wages, the pattern in the tables suggests that the expansion of other sectors (motor vehicles in the EU for example, and other machinery and transport equipment in the US) pulls workers out of the sectors that then contract, by offering higher wages.

Table 34 Change in more skilled employment in the EU by sector (in per cent), 2027 benchmark, ambitious scenario, 20 per cent direct spill-overs

		A=B+C+D+E+F	B	C	D	E	F	G
	Baseline shares in more skilled employment	Total	Stemming from the liberalisation of: tariffs	total NTBs goods	total NTBs services	direct spillovers	indirect spillovers	procurement
Agr forestry fisheries	0.005	0.07	0.04	-0.06	-0.01	0.09	0.01	0.00
Other primary sectors	0.004	-0.01	0.00	-0.12	-0.01	0.11	0.00	-0.01
Processed foods	0.016	0.28	0.01	0.39	-0.01	-0.21	0.10	0.04
Chemicals	0.024	0.08	-0.13	0.87	-0.06	-0.73	0.14	0.20
Electrical machinery	0.004	-7.00	-0.18	-1.29	0.00	-5.36	-0.17	0.08
Motor vehicles	0.013	1.28	-0.92	3.74	-0.04	-1.73	0.23	0.56
Other transport equipment	0.007	-0.23	-0.25	0.03	-0.04	0.02	0.01	0.16
Other machinery	0.043	0.18	0.34	-1.06	-0.09	1.36	-0.38	0.03
Metals and metal products	0.015	-1.61	0.00	-0.61	-0.06	-0.76	-0.18	-0.76
Wood and paper products	0.016	-0.16	0.02	-0.17	-0.02	-0.12	0.13	-0.04
Other manufactures	0.018	0.52	0.54	-0.21	-0.03	0.42	-0.20	0.00
Water transport	0.002	0.43	0.03	-0.10	-0.04	0.20	0.34	0.00
Air transport	0.002	0.11	0.09	-0.20	0.00	0.13	0.08	-0.02
Finance	0.041	0.12	0.00	-0.04	0.21	-0.05	0.02	-0.07
Insurance	0.015	0.57	0.02	-0.07	0.56	0.03	0.03	-0.01
Business services	0.166	-0.16	-0.04	-0.09	-0.02	-0.02	0.00	-0.01
Communications	0.026	-0.14	-0.02	-0.06	-0.07	-0.02	0.02	-0.01
Construction	0.045	0.18	0.06	0.12	0.00	-0.01	0.02	0.01
Personal services	0.043	-0.04	-0.02	-0.18	-0.03	0.11	0.08	-0.02
Other services	0.496	0.06	0.00	0.03	-0.01	0.02	0.01	0.00
Displacement Index		*0.55*	*0.15*	*0.53*	*0.09*	*0.53*	*0.10*	*0.12*

Note: Displacement index is the weighted mean deviation (square root of the weighted mean squared variation).

Table 35 Change in more skilled employment in the US by sector (in per cent), 2027 benchmark, ambitious scenario

		A=B+C+ D+E+F	B	C	D	E	F	G
			Stemming from the liberalisation of					
	Baseline shares in more skilled employment	Total	tariffs	total NTBs goods	total NTBs services	direct spillovers	indirect spillovers	procurement
Agr forestry fisheries	0.002	-0.04	-0.08	-0.13	0.00	0.16	0.01	0.00
Other primary sectors	0.004	0.11	-0.04	-0.05	0.01	0.17	0.01	0.01
Processed foods	0.008	-1.21	0.02	-0.97	0.03	-0.41	0.11	-0.13
Chemicals	0.018	-0.54	0.76	-0.87	0.13	-0.79	0.21	-0.52
Electrical machinery	0.004	-2.06	-1.92	9.01	1.23	-8.76	-1.61	1.37
Motor vehicles	0.010	-2.76	2.58	-2.59	0.10	-3.16	0.30	-1.10
Other transport equipment	0.010	0.74	0.33	-0.16	0.06	0.40	0.11	-0.14
Other machinery	0.034	1.50	-0.50	-0.46	0.13	2.50	-0.16	0.24
Metals and metal products	0.010	0.35	0.20	0.29	0.11	-0.24	-0.01	0.14
Wood and paper products	0.017	-0.13	-0.09	-0.18	0.05	-0.01	0.10	0.04
Other manufactures	0.006	0.15	0.02	-0.15	0.06	0.42	-0.20	-0.01
Water transport	0.001	0.18	0.00	0.04	0.09	-0.05	0.10	0.01
Air transport	0.002	0.17	-0.05	0.07	0.03	0.05	0.07	0.03
Finance	0.132	-0.17	-0.01	0.07	-0.19	-0.05	0.00	0.02
Insurance	0.036	-0.49	-0.06	0.01	-0.51	0.05	0.02	0.02
Business services	0.177	0.00	-0.03	0.05	0.01	-0.03	0.00	0.00
Communications	0.017	0.05	-0.06	-0.02	0.09	0.03	0.01	0.01
Construction	0.059	0.31	0.09	0.19	0.09	-0.06	0.01	0.01
Personal services	0.056	0.25	-0.04	0.09	0.05	0.12	0.03	0.03
Other services	0.399	0.00	-0.03	0.00	0.04	-0.01	0.00	0.00
Displacement Index		*0.46*	*0.32*	*0.63*	*0.15*	*0.78*	*0.11*	*0.16*

Note: Displacement index is the weighted mean deviation (square root of the weighted mean squared variation).

Table 36 Change in less skilled employment in the EU by sector (in per cent), 2027 benchmark, ambitious scenario

		A=B+C+ D+E+F	B	C	D	E	F	G
			Stemming from the liberalisation of					
	Baseline shares in less skilled employment	Total	tariffs	total NTBs goods	total NTBs services	direct spillovers	indirect spillovers	procurement
Agr forestry fisheries	0.054	0.07	0.04	-0.07	-0.01	0.09	0.01	0.00
Other primary sectors	0.006	-0.02	0.00	-0.12	0.00	0.12	0.00	-0.01
Processed foods	0.037	0.28	0.00	0.36	0.00	-0.18	0.11	0.04
Chemicals	0.031	0.08	-0.14	0.83	-0.05	-0.71	0.15	0.20
Electrical machinery	0.005	-7.01	-0.19	-1.33	0.01	-5.33	-0.16	0.08
Motor vehicles	0.024	1.27	-0.93	3.70	-0.03	-1.71	0.24	0.56
Other transport equipment	0.012	-0.23	-0.26	0.00	-0.03	0.05	0.02	0.16
Other machinery	0.052	0.17	0.33	-1.09	-0.08	1.39	-0.38	0.04
Metals and metal products	0.033	-1.62	-0.01	-0.64	-0.05	-0.73	-0.18	-0.76
Wood and paper products	0.032	-0.17	0.01	-0.21	-0.01	-0.10	0.14	-0.04
Other manufactures	0.044	0.51	0.52	-0.25	-0.02	0.45	-0.19	0.00
Water transport	0.003	0.42	0.02	-0.15	-0.03	0.24	0.34	0.01
Air transport	0.004	0.10	0.08	-0.24	0.01	0.16	0.09	-0.01
Finance	0.026	0.12	-0.01	-0.08	0.22	-0.03	0.02	-0.07
Insurance	0.009	0.56	0.00	-0.10	0.56	0.06	0.03	0.00
Business services	0.103	-0.17	-0.05	-0.12	-0.01	0.01	0.01	-0.01
Communications	0.017	-0.15	-0.03	-0.09	-0.06	0.01	0.02	-0.01
Construction	0.106	0.17	0.04	0.08	0.01	0.02	0.03	0.02
Personal services	0.027	-0.05	-0.03	-0.21	-0.03	0.13	0.09	-0.02
Other services	0.375	0.05	-0.01	-0.01	0.00	0.05	0.02	0.01
Displacement Index		*0.65*	*0.20*	*0.69*	*0.07*	*0.62*	*0.12*	*0.17*

Note: Displacement index is the weighted mean deviation (square root of the weighted mean squared variation).

Table 37 Change in less skilled employment in the US by sector (in per cent), 2027 benchmark, ambitious scenario

		A=B+C+ D+E+F	B	C	D	E	F	G
			Stemming from the liberalisation of					
	Baseline shares in less skilled employment	Total	tariffs	total NTBs goods	total NTBs services	direct spillovers	indirect spillovers	procurement
Agr forestry fisheries	0.015	-0.04	-0.08	-0.13	0.00	0.16	0.01	0.01
Other primary sectors	0.007	0.10	-0.04	-0.04	0.00	0.17	0.01	0.02
Processed foods	0.020	-1.23	0.01	-0.95	0.00	-0.39	0.11	-0.13
Chemicals	0.018	-0.56	0.74	-0.85	0.10	-0.77	0.21	-0.51
Electrical machinery	0.003	-2.07	-1.94	9.03	1.20	-8.74	-1.61	1.38
Motor vehicles	0.012	-2.77	2.56	-2.57	0.07	-3.14	0.30	-1.09
Other transport equipment	0.012	0.72	0.31	-0.15	0.03	0.41	0.11	-0.14
Other machinery	0.029	1.49	-0.52	-0.44	0.09	2.52	-0.16	0.25
Metals and metal products	0.021	0.33	0.18	0.31	0.08	-0.22	-0.01	0.15
Wood and paper products	0.031	-0.15	-0.11	-0.16	0.02	0.01	0.09	0.04
Other manufactures	0.015	0.13	0.00	-0.13	0.03	0.44	-0.20	0.00
Water transport	0.002	0.16	-0.03	0.07	0.05	-0.02	0.09	0.02
Air transport	0.006	0.15	-0.08	0.10	-0.01	0.08	0.06	0.03
Finance	0.061	-0.19	-0.03	0.09	-0.22	-0.03	0.00	0.03
Insurance	0.017	-0.50	-0.08	0.03	-0.54	0.07	0.02	0.02
Business services	0.081	-0.01	-0.05	0.07	-0.02	-0.01	0.00	0.01
Communications	0.008	0.03	-0.08	0.00	0.06	0.05	0.01	0.01
Construction	0.135	0.30	0.07	0.21	0.06	-0.04	0.00	0.01
Personal services	0.026	0.24	-0.06	0.11	0.02	0.14	0.02	0.03
Other services	0.483	-0.02	-0.05	0.02	0.01	0.01	-0.01	0.01
Displacement Index		*0.48*	*0.33*	*0.62*	*0.12*	*0.75*	*0.11*	*0.17*

Note: Displacement index is the weighted mean deviation (square root of the weighted mean squared variation).

In addition to the effects on wages Table 34, Table 35, Table 35, and Table 37 also report a summary statistic on the effect on movement of the labour force between sectors – a labour displacement index. We have reported a summary of the index changes under all the scenarios in Table 38 below. This is the "across displacement" index, based on Francois (2004) and Francois, Jansen, and Peters (2012). In formal terms, the index is defined as follows:

$$S_{L,\,across} = \sqrt{\sum_{j=1}^{n} \lambda_j \,(\hat{l}_j - \hat{m}_L)^2}$$

Following the notation of Francois, Jansen, and Peters (2012), λ_j is the sector j share of total employment, $\hat{l}_j$ is the per cent change in sector j employment, and $\hat{m}_L$ is total per cent change in employment across all sectors. Since we do not model changes in total employment levels here, and employ a long-run closure where overall labour participation and employment levels are determined by factors outside the model, $\hat{m} = 0$. This means out index reduces to the following:

$$S_{L,\,across} = \sqrt{\sum_{j=1}^{n} \lambda_j \,(\hat{l}_j)^2}$$

The index $S_{L,\,across}$ gives us a measure of variation of employment across sectors and thus a measure of the actual number of workers that change jobs by moving across sectors. In essence, an index value of 0.5 means, that roughly 5 workers out of 1,000 have moved across sectors. The index provides a useful indicator for the adjustments taking place in labour markets following trade liberalisation.[17]

Table 38 Displacement of less and more skilled labour in the EU and US, total effects (in per cent), 2027 benchmark, 20 per cent direct spill-overs

	Less skilled		More skilled	
	Less ambitious	Ambitious	Less ambitious	Ambitious
EU	0.33	0.65	0.28	0.55
US	0.21	0.48	0.21	0.46

Source: CGE calculations.

17 The index is a lower bound on labour displacement, as it is likely to underestimate the actual amount of job churning that occurs. Workers who change jobs but do not change sectors are not captured by the above measure. In order to capture those workers, it would be necessary to have information on employment changes at the firm level. In the model, we treat labour as mobile but not perfectly mobile, even in the long-run. This means that there is a transformation elasticity for labour between sectors that is less than infinite.

As was shown to be the case for wages, the estimated effect on movement of labour is relatively small. Here, no more than 0.7 per cent of the labour force is expected to move across sectors as a result of measures taken to liberalise trade between the EU and US. The impact is estimated to be somewhat bigger for less skilled workers than for more skilled workers. The resulting changes are somewhat bigger for the EU than for the US, but the effects are still quite small. To put this in perspective, this is a change following full implementation. According to Eurostat, the average annual change in employment in the EU in manufacturing before the crisis (2001-2007) was 2.1 per cent, and in the years after the crisis this increased to 3.7 per cent. Taking this as a benchmark, if we assume just 2 per cent labour turnover per year through natural entry and attrition, then over five years we would have roughly 10 per cent labour turnover, such that the labour displacement from FTA implementation over a five year phase in period will be minimal by comparison. In this sense it ought to be easily absorbed through normal entry and attrition rates. Additionally, the FTA-related labour movement is largely driven by "pull factors" (higher wages). By this we mean that wages are going up, and so the mechanics of labour reallocation will involve attraction of workers from lower to higher paying sectors on net.

5.2.3.2. CO2 Emissions

Next, we move on to discuss the estimated impact on CO2-emissions. These are summarized in Table 39 below.

Table 39 Changes in CO2-emissions (in thousand metric tons), 2027 benchmark, 20 per cent direct spill-overs

	Less ambitious	Ambitious
European Union	2.7	3.6
United States	2.9	3.9
Other	-1.5	3.8
Other OECD, high income	0.1	0.9
East Europe	-0.9	0.3
Mediterranean	-1.4	-1.6
China	1.4	4.3
India	-0.1	0.1
ASEAN	-0.5	-0.4
MERCOSUR	-0.1	-0.2
Low Income	0.2	0.8
Rest of World	-0.2	-0.3
Total, thousand metric tons	***4.0***	***11.3***
Total, percentage share of annual rate	***0.02***	***0.07***

Source: CGE calculations.

The less ambitious FTA scenario is estimated to lead to a total global increase of 4 and 11 thousand metric tons under the two different experiments respectively. CO2-emissions are expected to increase in the EU and US by around 3 and 4 thousand metric tons, respectively. On the other hand, emissions are expected to decrease somewhat across some other countries. Looking at the percentage increase, the estimated changes are shown to be very small, being 0.02 per cent in the less ambitious case and 0.07 per cent in the ambitious case. Depending on future changes in the coverage of emissions trading in the EU (increased and more binding coverage), and possibilities for future introduction of such a scheme in the US, the net effect would then be even smaller than reported here. It should be pointed out that the estimates in Table 39 can be considered as comprehensive as the model considers all economic activities, including international shipping and transport that are associated with changes in trade flows. The latter are endogenous within the model as increases in trade flows lead to changes in demand for transport services. As transport activities are modelled explicitly, this will lead in turn to changes in emissions linked to these activities.

5.2.3.3. Natural Resource Usage (Land intensity)

We now take a look at the resulting effect on the land use. In the model, land is an explicit factor, like capital and labour. Increase in value added in sectors using land translates into its more intensive use (more output per unit of land). Alternatively, in sectors where activities fall, there will be a drop in land use intensity. By this we mean there is less capital, labour, and inputs such as fertilizers in use on a given piece of land when intensity falls. Our estimates of changes in land use intensity (based on total value added activity for a fixed stock of land) are summarized in Table 40 below.

Table 40 Changes in land use (in per cent), 2027 benchmark, 20 per cent direct spill-overs

	Less ambitious	Ambitious
European Union	0.05	0.06
United States	-0.01	0.00
Other	0.00	0.01
Other OECD, high income	-0.01	-0.01
East Europe	0.02	0.03
Mediterranean	0.03	0.04
China	0.01	0.03
India	0.00	0.01
ASEAN	-0.04	-0.07
MERCOSUR	0.01	0.02
Low Income	0.00	0.00
Rest of World	0.01	0.01
Total	*0.00*	*0.01*

Source: CGE calculations.

The resulting impact from removing barriers to trade between the EU and the US on the use of natural resources is negligible. The expected changes are practically zero in all regions, including the EU and the US. These negligible results indicate that the liberalisation measures will not impact significantly on land use in any of the economies

5.2.4. Global Effects

Changing the conditions for trade between two major global trading partners, such as the EU and the US, changes the trading conditions for other countries as well. In a traditional set-up, when tariffs are lowered, this implies trade diversion and trade creation due to relative as well as absolute changes in trading costs. In this set-up, the additional measure of lowering of NTBs and assumption of spill-overs adds another channel through which bilateral liberalisation potentially affects third countries (see Section 4.2).

Overall, the rest-of-world impact hinges critically on the assumed potential for streamlining of EU and US regulations in the process of negotiations and convergence of EU-US standards, linked to scope for some resulting convergence on global standards and cross-recognition as well. These effects imply some improvement of market access for third countries, helping to offset trade diversion.

The purpose of this subsection is to take a closer look how liberalizing trade between the EU and US is expected to affect the rest of the world. The estimated impact on GDP is summarized in Table 41 below. In general, the increased trade between the EU and the US is estimated to have a positive impact on other parts of the world.

As can be seen from the table, under the less ambitious scenario, the overall gain for third countries is estimated to be 46.6 billion euros, which amounts to a percentage increase of GDP of 0.07 per cent. In the more ambitious case, the increase would be 99.2 billion euros or 0.14 per cent of world GDP.[18]

18 Excluding the EU and the US.

Table 41 Total effects on GDP for rest of the World (in million euros and per cent), 2027 benchmark, 20 per cent direct spill-overs

	Less ambitious		Ambitious	
	Million euros	Per cent	Million euros	Per cent
European Union	68,274	0.27	119,212	0.48
United States	49,543	0.21	94,904	0.39
Total Other Countries	46,636	0.07	99,171	0.14
Whereof:				
Other OECD, high income	15,942	0.08	36,322	0.19
Eastern Europe	1,019	0.14	2,328	0.33
Mediterranean	237	0.02	1,063	0.08
China	3,810	0.02	5,487	0.03
India	946	0.02	2,338	0.04
ASEAN	15,081	0.45	29,834	0.89
MERCOSUR	624	0.01	1,545	0.03
Low Income	1,064	0.09	2,366	0.20
Rest of World	7,913	0.05	17,887	0.12

Source: CGE modelling.

Looking at the selected regions a little more closely reveals that all other economies are expected to experience welfare increases. Most notably, this is the case for ASEAN, where GDP is expected to increase by 15.1 billion euros and 29.8 billion euros, or 0.45 per cent and 0.89 per cent respectively. The driver for ASEAN is the third-country spill-overs combined with very high trade to GDP ratios in the ASEAN economies. Basically, if there is a drop in global trade costs linked to indirect spill-overs, the ASEAN economies benefit greatly from this.

Table 42 shows a regional breakdown of the change in exports. These results provide insight regarding the pattern of results in Table 41. Not surprisingly, the primary effects are realized in the FTA partner regions – the US and EU. However, the spill-over effects also contribute to exports growth in third countries. This is especially true for ASEAN, which is a region with a high trade to GDP ratio and with a structural focus in exports in those sectors that see the greatest NTB reductions. With ASEAN, stronger GDP effects also support strong trade effects.

Table 42 Change in exports by region (in per cent), 2027 benchmark, 20 per cent direct spill-overs

	Less ambitious	Ambitious
European Union	3.37	5.91
United States	4.75	8.02
Total Other Countries	0.51	1.04
Whereof:		
Other OECD, high income	0.50	1.00
Eastern Europe	0.42	0.95
Mediterranean	0.28	0.59
China	0.47	0.96
India	0.43	0.94
ASEAN	1.17	2.31
MERCOSUR	0.47	0.97
Low Income	0.42	0.95
Rest of World	0.37	0.76

6. FDI Barriers

In this chapter, we focus on possible benefits of reducing NTBs facing affiliates of European firms operating in the US, and affiliates of US firms operating in Europe. This involves a review of recent benchmark NTB survey results for FDI, and an econometric mapping of NTB levels to the activities of European firms (as captured by foreign investment income, number of employees, and number of firms).[19] To do this we build on an extended database of market access rankings for FDI, which consolidates information from several recent NTB surveys, all based on the same core questions.[20] These NTB survey data are discussed in more detail in Chapter 2. The analysis in this chapter is independent of the CGE analysis in the previous chapters, which is focused on trade NTBs rather than investment NTBs. The difference in terms of the underlying methodologies do not allow direct comparisons between these results and the results from the CGE analysis presented in the previous chapters.

6.1 Indexes and comparison of levels of openness

The original ECORYS (2009) study reported overall rankings of market access for operations of MNEs, in addition to rankings of market access for direct trade in goods and services. Like the trade-related questions in the firm survey, the FDI-related

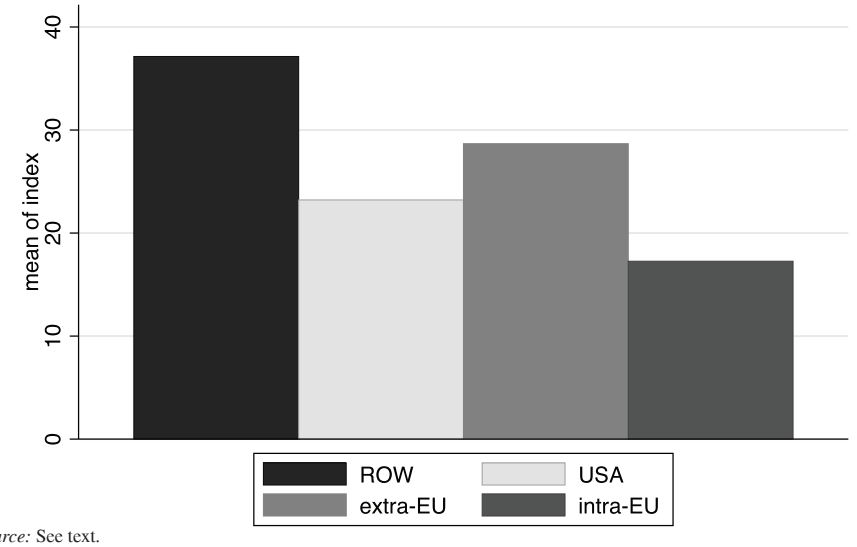
19 These data come from both Eurostat FATS (foreign affiliate trade statistics) and foreign investment statistics. Eurostat defines FDI income as the income accruing to direct investors - i.e. EU firms - including reinvested earnings, dividends and net branch profits, and interest earned. 'Employees' is the number of employees working in a local affiliate of an foreign firm, while number of affiliates is reported bilaterally.

20 See ECORYS (2009), European Commission and the Government of Canada (2009), and Francois, Sunesen, and Thelle (2009, 2012). The consolidated survey covers 2,608 individual firm responses. The period covered is 2007-2009, though essentially as a cross-section.

questions included both detailed questions about specific barriers, and a more general question on levels of openness for FDI. The general question, which is available in the annex, requested respondents to provide bilateral rankings of market access. The FDI responses from the Ecorys survey, scaled from 0(=full openness) to 100(=totally closed), have since been supplemented with follow-up survey data supporting EC studies of NTBs affecting trade with Canada, Japan, and China. These data are incorporated in this analysis.

For an overview of the pattern of openness indicated by the survey responses, Figure 12 below summarizes the average levels of the NTB indexes in our survey data. In the figure, the average index levels are reported for NTBs facing firms operating in the EU, the US, and in third countries (labeled as "rest of world" index). We have further split the average index values into indexes for NTBs facing EU firms operating in the EU (the "intra-EU" index), and non-European firms operating in the EU (extra-EU). The figure illustrates a number of useful points. First, intra-EU NTBs (the ranking of market access restrictions facing European firms operating affiliates in other EU Member States) are shown to be substantially lower than NTBs reported by non-EU firms when operating in those same EU markets. This fact reflects the success of the European Union in reducing internal barriers to cross-border operation of European firms within Europe. Hence, while the EU NTB index for FDI averages approximately 28 for firms from outside the EU, it averages roughly 18 for firms inside the EU. The difference is an effective preference margin (lower NTBs) for intra-EU FDI. The US level is somewhere between the EU intra-and extra-levels, averaging approximately 24.

Figure 12 Average Value of NTM Indexes for FDI

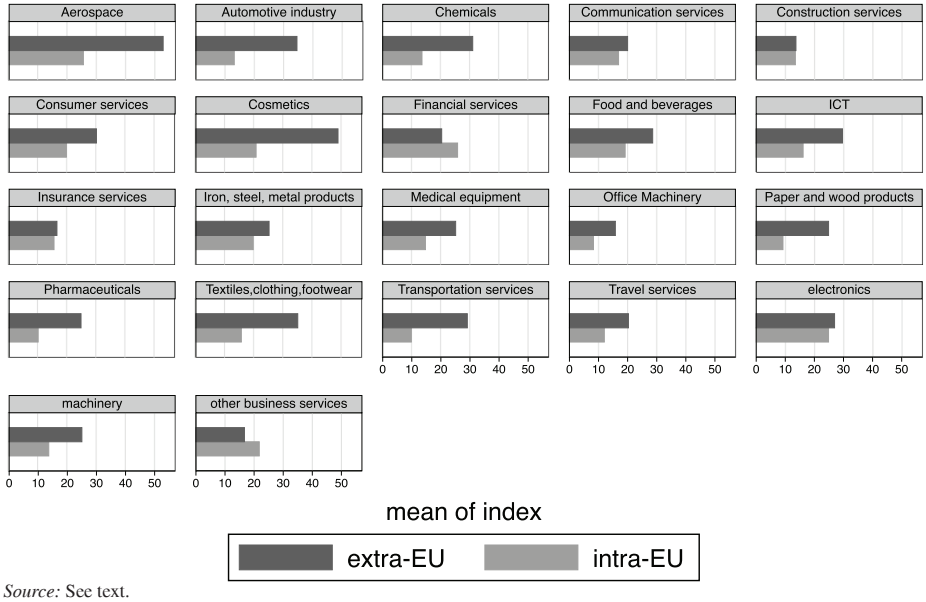


Source: See text.

Notes: Extra-EU (Intra-EU) refers to NTMs faced by non-EU(EU) firms operating in EU.

Figure 13 and Figure 14 provide further breakdown by sector. In Figure 13, we again see the intra- and extra-EU NTB index variations for non-European and European firms operating affiliates within the EU. In terms of NTB rankings, the greatest differences for goods are apparent in aerospace, chemicals (including drugs and cosmetics), and motor vehicles. For services, the greatest differences are in transport, travel, and ICT services. As can be seen from the figure, however, the financial services indexes are shown to be more or less the same for intra-EU and extra-EU investment. This implies that there are similar levels of openness for European and extra-EU banks engaged in FDI in Europe. The same message holds for insurance, construction, and business services.

Figure 13 Average NTM index values for FDI located in the EU

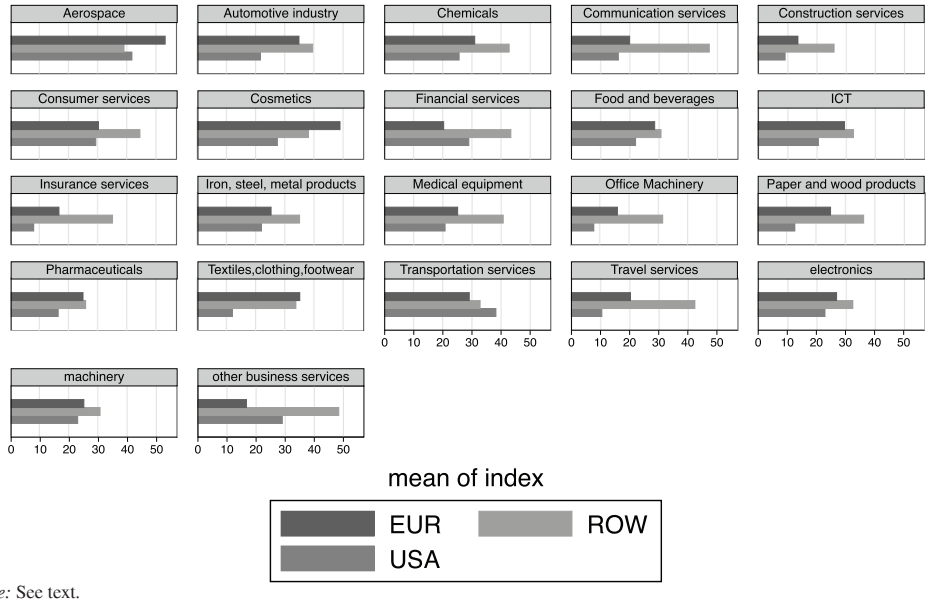


Source: See text.

Notes: Extra-EU (Intra-EU) refers to NTMs faced by non-EU(EU) firms operating in the EU.

While Figure 13 above focused on the EU as an FDI destination, in Figure 14 we have a different dis-aggregation. Here, we have a sector-by-sector comparison between the EU, US, and rest of world all as FDI destinations. This set up enables a comparison of apparent levels of openness in the transatlantic economies to FDI, with the average level for the rest of the world. As can be seen from the figure, with a few exceptions, both the US and EU are shown to be relatively open by the standard of third countries (i.e. compared to the rest-of-world average). The sector specific exceptions are aerospace (the US and EU), motor vehicles (the EU), cosmetics (the EU), ICT (the EU), and transport (the US). The figure further shows that for processed foods, there is little difference between the US, EU, and rest of world.

Figure 14 Breakdown of NTBs for FDI by sector



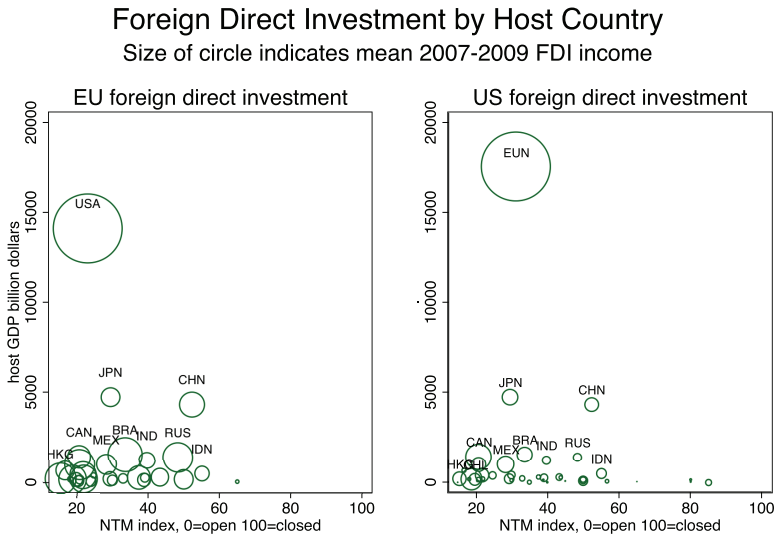
Source: See text.

Notes: The EU NTM index is based on responses of non-EU firms operating in the EU (extra-EU).

The impact of changes in market access for MNEs will naturally be affected by the sensitivity of MNE activities to market access restrictions. The impact will also depend on the relative market potential of the EU for US firms, and the US for EU firms. To provide an overview of this potential, Figure 15 presents a mapping of market size, investment income (recall this is defined by Eurostat as the FDI-based earnings of European-owned affiliates) and NTB rankings.

In Figure 15, NTB index levels (where a high number means more restrictions) are mapped on the horizontal axis, while average 2007-2009 GDP is shown on the vertical axis. The size of the bubble in the figure is scaled by the value of direct investment income in each market, again averaged for the years 2007-2009.

Figure 15 Income from FDI, market size, and openness, 2007-2009



Source: NTM surveys and Eurostat FATS statistics as explained in text, exculding intra-EU FDI.

As can be seen from the left panel of Figure 15, the US market is shown to be relatively open to FDI investments. At the same time, the US market is also revealed to be the single most important source of income for EU foreign direct investment. Therefore, as in the discussion of underlying activity and NTBs in the earlier trade analysis, the simple size of the US market implies potential gains even if relatively small barriers are removed. Indeed, in terms of value, the US markets dominates, by far, both Japan and China. As such, and given the size of the base, improvements in market access are likely to imply substantial changes in FDI levels and thus corresponding direct investment earnings of European firms. While one might be tempting to conclude from the figure that there is little scope for further liberalization, Figure 12 and Figure 13 belay this. The substantially better market access conditions for intra-EU FDI shown in these figures, point to potential room for maneuver in lowering barriers further. The right hand panel of Figure 15 shows that Europe is the dominant source of investment income for US-owned affiliates. As made visible in the figure, the transatlantic relationship dominates the investment earnings reported for affiliates in China and Japan. While the EU is relatively open (compared to China, for example), the level of US MNE activity

as measured by the income of US-owned affiliates in Europe, viewed in conjunction with the NTB preference margins in Figure 13, again suggest substantial potential for absolute gains to direct investment earnings from reductions in regulatory barriers facing US firms in the EU.

6.2 Impact of NTBs on foreign affiliates

Next, in order to take a closer look and estimate the potential impacts from NTB reductions for FDI we employ gravity regressions. Our gravity model has been estimated using a set-up that allows for pairwise observations, and also for observations where there is no foreign investment income or MNEs' activity (i.e. a so called Poisson-based maximum likelihood estimator). While we focus on the results of the modeling here in the text, the derivation of the exact specification of the estimating equation is provided in the annex. The resulting NTB coefficient provides an estimate of the impact of changes in the level of the NTB index on three indictors: (1) the level of investment income (the elasticity of FDI income with respect to the NTB index); (2) the number of affiliates from a home country in a given host country (the elasticity of number of affiliates with respect to the NTB index); and (3) the number of affiliate employees (the elasticity of number of affiliates with respect to the NTB index). Table 43 below reports regression results for our gravity model for 2007-2009 for each of these indicators.

Table 43 Regression estimates for NTMs and FDI

	Poisson ML estimates		
	FDI income	Number of enterprises	Number of employees
log distance	-0.5381***	-0.9525***	-0.9773***
	-(0.0011)	-(.0049)	-(0.0006)
log NTB index for FDI	-0.5057***	-0.3463***	-0.3136***
(based on EU margin)	-(0.0034)	-(0.0095)	-(0.0039)
log Network index	0.2188***	1.1177***	0.6728***
	(0.0154)	(0.6058)	(0.0065)
Obs	11,140	8,304	7,253
chi2,Pr>chi2	2.41e+06,0.00	1.81e+04,0.00	2.14e+07,0.00
Pseudo-R2	.8915	.8969	.8945
		conditional fixed effects	

Standard errors in parentheses. *** denotes significant at 1 per cent level. log NTB margin is the difference between intra- and extra-EU NTB indexes for firms operating in the EU with EU Members as host countries, as discussed in the annex. Log Network index is an index of overlapping trade networks.

Source data: Eurostat and NTB survey data, UN COMTRADE data (for network index). Data cover 2007-2009.

The NTB coefficients in the table can be interpreted as follows. Taking the FDI income coefficient the first column of results, for every 10 per cent increase in the NTB index (for example an increase in restrictiveness from 20 to 22), we estimate, on average, a reduction in observed income from foreign investment (meaning the net income earned by affiliates and reported as a return on foreign investment in that same market), of 5.057 per cent.

What does this mean in practical terms? Consider the level of market access in Figure 12, and the level of EU investment income in Figure 15. To get some sense of magnitudes, let us assume, hypothetically, that negotiations lead to a gain in market access for the affiliates of European firms in the US, such that EU firms face a level of access in the US similar to the access they enjoy within the EU itself. In terms of Figure 12, this would imply a drop in the NTB index from 24 to 18, which corresponds to a relative drop in NTB levels as measured by the index of 25 per cent (a reduction of 6 out of 24). Taking this change in NTB levels, and applying the elasticity in the first column of Table 43 to EU FDI income from US operations in 2007 (€65,980 billion), this implies a gain in income for affiliates of European firms of roughly 10.3 billion

euros.[21] Of course, actual effects will vary depending on level of ambition, but this provides a rough order of magnitude for a 25 per cent reduction in US FDI barriers against EU firms. From the second and third column of results, this increased income would be accompanied by more European affiliates in the US, and an approximate 9.44 percent increase in employment of US workers by European firms. On a similar basis, there would be a 10.85 percent increase in employment of EU workers by US firms.[22]

21 This follows from taking log differences in the average index (from 24 to 18), and applying the FDI income elasticity from Table 43with respect to the NTB index:
exp[(ln(18)-ln(24))*-0.5381+ln(65,980)]-65,980= investment income change.

22 This follows from taking log differences in the average index (from 24 to 18 for the US, 25 to 18 for the EU), and applying the FDI employment elasticity with respect to the NTB index.

7. Conclusions

This study provides new estimates of the economy wide impact of removing both tariff and non-tariff barriers to transatlantic trade between the EU and the US. Several scenarios are analysed in the report. On the one hand specific trade liberalisation with regards to tariffs only, services only or procurement only is discussed. On the other hand, the option of comprehensive trade and investment liberalisation is scrutinised. The first FTA scenario, a moderately ambitious FTA assumed a 10 per cent reduction in NTBs-related costs and an "almost full" elimination of tariffs. The second, ambitious FTA scenario assumes the elimination of 25 per cent of costs linked to NTBs together with full tariff elimination.

The results indicate positive and significant gains for both the EU and the US. GDP is estimated to increase by 68-119 billion euros for EU and 50-95 billion euros for the US (under the less ambitious and the ambitious FTA scenarios, respectively). However, if the trade initiative would be limited to tariff liberalisation only, or services or procurement liberalisation only, the estimated gains would be significantly lower. An FTA limited to tariff liberalisation would lead to 24 billion euros increase in GDP for the EU and 9 billion euros increase for the US. Thus implementing a comprehensive FTA would bring greater benefits to both economies.

A core message following from our results is that a focus on NTBs is critical to the logic of transatlantic liberalization. Different approaches to the same regulatory challenges can have the unintended consequence of increasing costs for firms, and so dragging down labour productivity. Negotiation on NTBs provides the opportunity to pursue a mix of cross-recognition and regulatory convergence to reduce these barriers. The

estimates reported here point to substantial gains, if reductions in the costs of NTBs can be achieved. Limiting the exercise to tariffs alone would lead to positive effects, but these would be much more limited leaving a huge potential for economic and welfare gains untapped.

In terms of labour market impacts, wage effects are in line with changes in output and so are consistent with an interpretation of general cost savings that lead to productivity gains as firms operate with lower NTB-related costs for transatlantic commerce. It should be stressed that the model is a long-run model, where sources of employment and unemployment are "structural." In this sense, changes in labour demand are captured through wage changes (in this case rising wages) rather than aggregate employment levels. As wages increase in the experiments, this means a rising demand for labour. At sector level, roughly 0.2 to 0.5 per cent of the EU labour force (in terms of allocation across sectors) is de-located. However, this is due to "pull factors" as expanding sectors (like motor vehicles in the case of the EU) hire workers away from other sectors (like metals).

The impact on the rest of the world is estimated to be positive and amounts to a total of approximately 99 billion euros as an upper bound in the ambitious FTA scenario. The EU and US, collectively, are a huge economic force. To the extent that they can work together to better promote establishment and recognition in standards, reduce regulatory divergence, and otherwise reduce the impact on rules and regulations on the cost of business, it is likely that parts of such a framework (for example recognized product or safety standards) will be adopted elsewhere, reducing trade costs for third markets, which is captured in the model by introducing spill-overs to the simulations. To the extent the EU and US together drive global standards, this has potential to promote economic gains across the globe.

Depending on the approach followed, EU-US trade liberalisation has the potential to make a positive contribution not only to the transatlantic economy but also to the global economy.

8. References

Aguiar, Angel H., McDougall, Robert A., and Narayanan, G. Badri (ed.), (2012), "*Global Trade, Assistance, and Production: The GTAP 8 Data Base*", Center for Global Trade Analysis, Purdue University.

Anderson, J. E., J. H. Bergstrand, P. Egger and J. Francois (2008), "*Non- Tariff Barrier Study Methodology*" background paper prepared for Ecorys report "*Non-Tariff Measures in EU-US Trade and Investment – An Economic Analysis.*"

Baldwin R.E. and J. Francois (1999), "Is it time for a TRAMP? Quantitative perspectives on transatlantic liberalization", in O.G. Mayer and H.E. Scharrer, eds., "*Transatlantic Relations in a Global Economy*", Hamburg: Nomos Verlagsgesellschaft, 1999.

Baldwin R.E. and J. Francois (1997a), "*Transatlantic Trade Liberalization--A Computable General Equilibrium Analysis*", a report for the United Kingdom Foreign and Commonwealth Office.

Baldwin R.E. and J. Francois (1997b), "Preferential Trade Liberalization in the North Atlantic", Richard Baldwin and Joseph Francois, CEPR Discussion Paper 1611.

Copenhagen Economics (2009), "*Assessment of Barriers to Trade and Investment Between the EU and Japan*", (TRADE/07/A2). Report prepared by J.F. Francois, E.R. Sunesen, and M.H. Thelle for European Commission, Directorate-General for Trade, Reference: OJ 2007/S 180-219493.

Copenhagen Economics (2012), "*EU-China Investment Study*", (TRADE/07/A2). Report prepared by J.F. Francois, E.R. Sunesen, and M.H. Thelle for European Commission, Directorate-General for Trade.

Ecorys (2009), "*Non-Tariff Measures in EU-US Trade and Investment – An Economic Analysis*". Report prepared by K. Berden, J.F. Francois, S. Tamminen, M. Thelle, and P. Wymenga for the European Commission, Reference OJ 2007/S180-219493.

European Commission and Foreign Affairs and International Trade Canada (2008), "*Assessing the Costs and Benefits of a Closer EU-Canada Economic Partnership*." Joint report, Brussels and Ottawa.

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

Francois, J.F. (2001), "*The Next WTO Round: North-South stakes in new market access negotiations*", Centre for International Economic Studies, Adelaide, ISBN 0-86396 474-5.

Francois, J. F. (1998), "Scale Economies and Imperfect Competition in the GTAP Model", GTAP Technical Paper No 14.

Francois, J.F. and D.W. Roland-Holst (1997), "Scale economies and imperfect competition", in Francois, J.F. and K.A. Reinert, eds. (1997), "*Applied methods for trade policy analysis: a handbook*", Cambridge University Press: New York.

Francois, Joseph and McDonald, Brad (1996), "*Liberalization and Capital Accumulation in the GTAP Model*". GTAP Technical paper No: 07, Center for Global Trade Analysis, Purdue University.

Francois, J.F. (2004), "Assessing the Impact of Trade Policy on Labor Markets and Production", *Economie International*.

Francois, J.F., M. Jansen and R. Peters, in M. Jansen and R. Peters eds (2012), "Trade Adjustment Costs And Assistance: "Labour Market Dynamics", *Trade and Employment: From Myths to Facts*, ILO: Geneva

Francois, J.F., H. van Meijl and F. van Tongeren (2005), "The Doha Round and Developing Countries", *Economic Policy*.

Francois, J.F., M. Miriam and W. Martin (2012), "Market Structure in CGE Models of International Trade", in P. Dixon and D. Jorgenson, eds., *Handbook of Computable General Equilibrium Modeling*, 1st Edition, Elsevier: Amsterdam.

Hertel, T.W., E. Ianchovichina, and B.J. McDonald (1997), "Multi-Region General Equilibrium Modeling", Chapter 9 in J.F. Francois and K.A. Reinert, eds, "*Applied Methods for Trade Policy Analysis: a Handbook*", Cambridge University Press: Cambridge.

Hertel, T. W., (ed.) (1997), "*Global Trade Analysis: Modeling and Applications*", Cambridge: Cambridge University Press.

Kox, H. and A. Lejour (2006), "Regulatory heterogeneity as obstacle for international services trade" CPB discussion paper 49, the Hague.

McDougall, R.M. (2002), "A New Regional Household Demand System for GTAP". GTAP Technical Paper No. 20.

Narayanan, B. N., Hertel, T. W., and Horridge, M., (2010), "Linking Partial and General Equilibrium Models: A GTAP Application Using TASTE", GTAP Technical Paper No 29.

Narayanan, G. Badri., Hertel, Thomas W. and Horridge,J. Mark (2010), "Disaggregated Data and Trade Policy Analysis: The Value of Linking Partial and General Equilibrium Models", *Economic Modelling*, 27(3): 755-66.

Nicoletti, Giuseppe, Stephen Golub, Dana Hajkova, Daniel Mirza and Kwang-Yeoul Yoo (2003), "Policies and international integration: influences on trade and foreign direct investment", OECD Economics Department Working Papers, No. 359.

Rutherford, T. and S. Paltsev (2000), "GTAPinGAMS and GTAP-EG: Global Datasets for Economic Research and Illustrative Models", University of Colorado: Boulder, working paper.

Annexes

Annex 1: Mapping of model sectors

Table A1 Mapping of Model Sectors to GTAP

No.	GTAP Sector	Model Sector	No.	GTAP Sector	Model Sector
1	pdr	1 Agr forestry fisheries	30	lum	10 Wood and paper products
2	wht	1 Agr forestry fisheries	31	ppp	10 Wood and paper products
3	gro	1 Agr forestry fisheries	32	p_c	4 Chemicals
4	v_f	1 Agr forestry fisheries	33	crp	4 Chemicals
5	osd	1 Agr forestry fisheries	34	nmm	11 Other manufactures
6	c_b	1 Agr forestry fisheries	35	i_s	9 Metals and metal products
7	pfb	1 Agr forestry fisheries	36	nfm	9 Metals and metal products
8	ocr	1 Agr forestry fisheries	37	fmp	9 Metals and metal products
9	ctl	1 Agr forestry fisheries	38	mvh	6 Motor vehicles
10	oap	1 Agr forestry fisheries	39	otn	7 Other transport equipment
11	rmk	1 Agr forestry fisheries	40	ele	5 Electrical machinery
12	wol	1 Agr forestry fisheries	41	ome	8 Other machinery
13	frs	1 Agr forestry fisheries	42	omf	11 Other manufactures
14	fsh	1 Agr forestry fisheries	43	ely	20 Other services
15	coa	2 Other primary sectors	44	gdt	20 Other services
16	oil	2 Other primary sectors	45	wtr	20 Other services
17	gas	2 Other primary sectors	46	cns	18 Construction
18	omn	2 Other primary sectors	47	trd	20 Other services
19	cmt	3 Processed foods	48	otp	20 Other services
20	omt	3 Processed foods	49	wtp	12 Water Transport
21	vol	3 Processed foods	50	atp	13 Air Transport
22	mil	3 Processed foods	51	cmn	17 Communications
23	pcr	3 Processed foods	52	ofi	14 Finance
24	sgr	3 Processed foods	53	isr	15 Insurance
25	ofd	3 Processed foods	54	obs	16 Business services
26	b_t	3 Processed foods	55	ros	19 Personal services
27	tex	11 Other manufactures	56	osg	20 Other services
28	wap	11 Other manufactures	57	dwe	20 Other services
29	lea	11 Other manufactures			

Table A2 Mapping of Model Sectors to ISIC rev 3.1

Model Sector	ISIC Sectors
1 Agr forestry fisheries	ISIC 01-05
2 Other primary sectors	ISIC 10-14
3 Processed foods	ISIC 15-16
4 Chemicals	ISIC 24-25
5 Electrical machinery	ISIC 30-32
6 Motor vehicles	ISIC 34
7 Other transport equipment	ISIC 35
8 Other machinery	ISIC 29,31,33
9 Metals and metal products	ISIC 27-28
10 Wood and paper products	ISIC 20-22
11 Other manufacturing	ISIC 15-37, all remaining
12 Water transport	ISIC 61
13 Air transport	ISIC 62
14 Finance	ISIC 65,67
15 Insurance	ISIC 66
16 Business services	ISIC 70-74
17 Communications	ISIC 64
18 Construction	ISIC 45
19 Personal services	ISIC 91-93
20 Other services	ISIC 40,41,50,51,52,63,75,80,85,90

Annex 2: CGE model technical overview

In the computational model, the ”whole” economy, for the relevant aggregation of economic agents, is modelled simultaneously. This means that the entire economy is classified into production and consumption sectors. These sectors are then modelled collectively. Production sectors are explicitly linked together in value-added chains from primary goods, through higher stages of processing, to the final assembly of consumption goods for households and governments. These links span borders as well as industries. The link between sectors is both direct, such as the input of steel into the production of transport equipment, and also indirect, as with the link between chemicals and agriculture through the production of fertilizers and pesticides. Sectors are also linked through their competition for resources in primary factor markets (capital, labour, and land). The data structure of the model follows the GTAP database structure, and basic models of this class are implemented in either GEMPACK or GAMS (Hertel et al 1997, Rutherford and Paltsev 2000). We work here with a GEMPACK implementation.

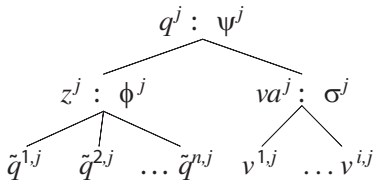
Production

We start here with a representative production technology using a basic, constant returns to scale specification. Where we have scale economies, this serves as the cost structure for composite input bundles. Assume that output q^j in sector j can be produced with a combination of intermediate inputs z^j and value added services (capital, labour, land, etc.) va^j. This is formalized in equation 1. Assuming homothetic cost functions and separability, we can define the cost of a representative bundle of intermediate inputs z^j for the firm producing q^j and similarly the cost of a representative bundle va^j of value

added services. These are shown in equations 2 and 3. They depend on the vector of composite goods prices $\widetilde{P}$ and primary factor prices ω. Unit costs for q then depend on the mix of technology and prices embodied in equations 1,2,3. We represent this in equation 4, which defines unit cost ζ^j. In the absence of taxes, in competitive sectors ζ^j represents both marginal cost and price. On the other hand, with imperfect competition on the output side (discussed explicitly later) ζ^j can be viewed as measuring the marginal cost side of the optimal markup equation, with markups driving a wedge between ζ^j and P^j.

To combine production technologies with data, we need to move from general to specific functional forms. We employ a nested CES function, with a CES representation of value added activities va^j, a CES representation of a composite intermediate z^j made up of intermediate inputs, and an upper CES nest that then combines these to yield the final good q^j. Our set-up is illustrated in Figure 2 below, on the assumption we have i primary factors v, as well as n production sectors that can be represented in terms of composite goods $\widetilde{q}$ as defined below.

Figure 3 Representative nested production technology



These composites may (or may not, depending on the goods involved) be used as intermediate inputs. In Figure 2, we have also shown the CES substitution elasticity for intermediate inputs ϕ, the substitution elasticity for value added σ, and the substitution elasticity for our ”upper nest” aggregation of value added and intermediates, ψ. In the absence of taxes, total value added Y will be the sum of primary factor income, as in equation 5.

Given our assumption of CES technologies, we can represent value added in sector j as a function of primary inputs and the elasticity of substitution in value added σ^j. This yields equation 6, and its associated CES price index shown in equation 7. Similarly, we can specify the CES price index for composite intermediates, as in equation 7. This gives us equation 8, where the coefficient ϕ^j is the elasticity of substitution between intermediate inputs. This is assumed to be Leontief (i.e. $\phi^j = 0$). Finally, following Figure 2, we will also specify an aggregation function for value added and intermediate inputs, in terms of its CES price index. This is shown as equation 9. From the first order conditions for minimizing the cost of production, we can map the allocation of primary factors to the level of value added across sectors. This is formalized in equation 10. We can also specify the total demand for composite intermediate goods across sectors $\tilde{q}^{int,i}$ as a function of the producer price $P_z j$ of composite input price in each sector, the scale of intermediate demand across sectors z^j, and prices of composite goods $\tilde{P}_i$. This is shown in equation 11. With the upper nest CES for goods we can also map value added va^j and intermediate demand z^j in terms of equations 7 and 8, output q^j and the elasticity of substitution ψ^j between inputs and value added. This yields equations 12 and 13, where the terms γ are the CES weights (similar to those in equation 6) while ψ^j is the upper nest elasticity of substitution in the production function.

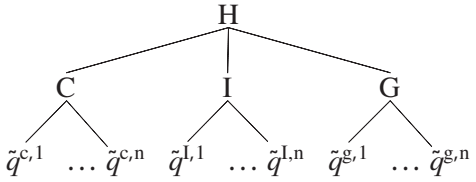
We also model some sectors as being characterized by large group monopolistic competition. In reduced form, this can be represented by an industry level scale economy that reflects variety effects. We define the price of output at industry level as in equation 14. In this case, ς^j is defined by equation 9 and represents the price of a bundle of inputs, and equation 14 follows directly from average cost pricing, homothetic cost functions, and Dixit-Stiglitz type monopolistic competition. (See Francois and Roland-Holst 1997, Francois 1998, and Francois, van Meijl, and van Tongeren 2005, Francois, Manchin and Martin 2012, for explicit derivations.)

Together, equations 1 through 14 map out the production side of the economy. For an open economy, given resources, technology (represented by technical coefficients in the CES functional forms), and prices for foreign and domestic goods and services, we can determine factor incomes, national income, and the structure of production. We close this system by discussion of the demand side of the economy, and basic open economy aspects, in the next sections.

Final Demand

In the system we have spelled out so far, we have mapped the basic, national structure of production. We close the system with a demand specification for a representative household. This involves allocation of regional income by the household to composite consumption *H*, which is separated over private consumption *C*, public consumption *G*, and investment *I*. Each of these components of H involves consumption of composite goods and services $\tilde{q}$ indexed by sector *j*. This is illustrated in Figure 3 below. Where we assume fixed expenditure shares (i.e. with taking a Cobb-Douglas functional form), then we also have a fixed savings rate. Otherwise, given the equilibrium allocation of household income to consumption and investment, we will denote these expenditure shares by θ. We maintain a fixed-share allocation between public and private consumption.

Figure 4 Representative household demand



We assume a well-defined CES utility function for personal consumption defined over goods $\tilde{q}$. From the first order conditions for utility maximization, we can then derive the price of utility from private consumption P_U as a function of prices $\tilde{P}$, as in equation 15. The corresponding expenditure function is then $U = U^c P_U$ where U^c is the level of

utility from private consumption. Taking national income as our budget constraint, then combining equation 5 with the expenditure function yields equation 16. From 16, we can define U^c from the expenditure function and income, as in equation 17. Consumption quantities, in terms of composite goods, can be recovered from equation 17, as shown in equation 18. Like private consumption, the public sector is also modelled with a CES demand function over public sector consumption. This implies equations 19-22. For investment demand, in the short run, we assume a fixed savings rate. In the long-run, the model can alternatively incorporate a fixed savings rate, or a rate that adjusts to meet steady state conditions in a basic Ramsey structure with constant relative risk aversion (CRRA) preferences. We employ the CRRA version here. (Francois, McDonald and Nordstrom 1996). With fixed savings, and assuming a Leontief composite of investment goods that make up the regional investment good, investment demand is defined by equation 23. With CRRA preferences, steady-state conditions implies equation 24 as well, related to the price of capital ω_k. Where 24 holds, the additional equation allows us to make the savings rate coefficient θ^I endogenous. In equation 24 ρ is the rate of time discount and δ is the rate of depreciation. With a short-run or static closure, investment demand means we apply equation 23. With a long-run closure, we also apply equation 25. When we impose CRRA preferences in the long-run, we then employ all three equations on the model 23-25, and savings rates are endogenous. With a fixed savings rate, we drop equation 24 and make θ^I exogenous.

Cross-border linkages and taxes

Finally, individual countries, as described by equations 1-25 above, are linked through cross border trade and investment flows. With either monopolistic competition or Armington preferences, we can define a CES composite good $\widetilde{q}$ in terms of foreign and domestic goods. The price index for this composite good is defined by equation 26. Given equation 26 and the envelope theorem, we can define domestic absorption D as in equation 27, where h indexes home prices and quantities. The difference between production q_j and domestic absorption D_j in equilibrium will be imports (where a

negative value denotes exports), as in equation 28. Across all countries indexed by *r*, we also have a global balanced trade requirement, shown in equation 29. Similarly, balancing the global capital account also requires equations 30 and 31 (where we now index source *r* and home destination *h*).

Trading costs are modelled as in Ecorys (2009), and benchmark values for NTBs come from this source. Information on the extent to which policies affect prices and costs is important for accurate modelling of policy reforms, including whether policies create ”rents” as opposed to being resource-using (generating ”waste”), and the identity (ownership) of the entities and groups to whom any rents accrue. This is a well-known issue that can have a major bearing on the magnitude of the welfare impacts of policies and policy reforms. For example, if a policy generates rents for domestic groups and liberalization results in a share of these rents accruing to foreign entrants, the result may be lower national welfare. Recent work supported by the EC (Ecorys 2009, Copenhagen Economics 2009) has been focused explicitly on this distinction, and the results of this analysis feed into the estimated reported in this study. In the estimates below, we distinguish between cost and rent generation under NTBs on the basis of Ecorys (2009), assuming 2/3 of rents accrue to importer interests, and 1/3 to exporter interests. Rents are modelled, in effect, like export and import taxes. For cost-raising barriers, we follow the now standard approach to modelling iceberg or dead-weight trade costs in the GTAP framework, originally developed by Francois (1999, 2001) with support from the EC to study the Millennium Round (now known as the Doha Round). This approach has grown from an extension in early applications to a now standard feature of the GTAP model, following Hertel, Walmsley and Itakura’s (2001) integration of the Francois approach into the standard GTSP model. It has featured in the joint EC-Canadian government study on a EU-Canada FTA, as well as the 2009 Ecorys study on EU-US non-tariff barriers. In formal terms, changes in the value of this technical coefficient capture the impact of non-tariff measures on the price of imports from a particular exporter due to destination-specific reduced costs for production and

delivery. This has been further modified to split NTB wedges into those linked to costs and those that generate from rents.

The basic system outlined above provides the core production and demand structure of each region, as well as the basic requirements for bilateral import demand, global market clearing for traded goods and services, and global capital account balancing. Within this basic structure, we also introduce taxes, transport services, iceberg (deadweight) non-tariff barriers, and rent-generating non-tariff barriers. These drive a wedge between the ex-factory price originating in country *r* and the landed prices in country *h* inclusive of duties and transport costs. Taxes and rent-generating trade costs mean that *Y* is also inclusive of tax revenues and rents. In the short-run we fix *B*, while in the long-run this is endogenous (such that the distribution of relative global returns is maintained). All of this adds additional complexity to the system outlined above, but the core structure remains the same.

Macroeconomic Projections

The macroeconomic projections discussed in the core text and used to benchmark the model to 2027 are summarized in the table below.

Table A3 Annualized GDP growth rates

	2001-2007	2007-2016	2007-2027
European Union	2.28	0.70	1.17
USA	3.30	1.74	1.90
Other OECD	2.54	1.84	2.02
Eastern Europe	6.55	2.03	3.20
Mediterranean	4.98	3.55	3.93
China	11.21	9.06	8.24
India	7.91	7.53	6.19
ASEAN	5.70	5.01	5.19
MERCOSUR	4.28	3.86	3.97
Low Income	5.94	5.43	5.56
Rest of World	6.12	3.81	4.41

Note: 2007-2027 are used for projections

(1) $q^j = f^j\left(z^j, \mathrm{va^j}\right)$

(2) $P_z = g\left(\tilde{P}\right)$

(3) $P_{\mathrm{va}} = h\left(\omega\right)$

(4) $\zeta_j = c\left(P_z, P_{\mathrm{va}}\right)$

(5) $Y = \sum_i \omega_i v_i$

(6) $\mathrm{va}_j = \left[\sum_i \alpha_{ij} v_{ij}^{\frac{\sigma^j-1}{\sigma^j}}\right]^{\frac{1}{\sigma^j-1}}$

(7) $P_{v^j} = \left[\sum_i \alpha_{ij}^{\sigma^j} \omega_i^{1-\sigma^j}\right]^{\frac{1}{1-\sigma^j}}$

(8) $P_{z^j} = \left[\sum_i \beta_{ij}^{\phi^j} \tilde{P}_i^{1-\phi^j}\right]^{\frac{1}{1-\phi^j}}$

(9) $P_j = \left(\gamma_{vj}^{\psi^j} P_{\mathrm{va}^j}^{1-\psi^j} + \gamma_{zj}^{\psi^j} P_{z^j}^{1-\psi^j}\right)^{\frac{1}{1-\psi^j}}$

(10) $v_i \geq \sum_j \mathrm{va}^j \left(\frac{\alpha_{vj}}{\omega_i}\right)^{\sigma^j} P_{\mathrm{va}^j}$

(11) $\tilde{q}^{\mathrm{int,i}} = \sum_j z^j \left(\frac{\beta_{ij}}{\tilde{P}_i}\right)^{\phi^j} P_{z^j}$

(12) $\mathrm{va}^j = q^j \left(\frac{\gamma_{vi}}{P_{v^j}}\right)^{\psi^j} P_j$

(13) $\bar{z}^j = q^j \left(\frac{\gamma_{zi}}{P_{z^j}}\right)^{\psi^j} P_j$

(14) $P_j = q_j^{\psi} \left(\gamma_{vj}^{\psi^j} P_{\mathrm{va}^j}^{1-\psi^j} + \gamma_{zj}^{\psi^j} P_{z^j}^{1-\psi^j}\right)^{\frac{1}{1-\psi^j}}$
where $1 > \psi > 0$

(15) $P_{U^c} = \left(\sum_{i=1}^{n} \alpha_{c,i}^{\eta^c} \tilde{P}_i^{1-\eta^c}\right)^{\frac{1}{1-\eta^c}}$
where $0 < \frac{\eta^c - 1}{\eta^c} < 1$

(16) $U^c \left(\sum_{i=1}^{n} \alpha_{c,i}^{\eta^c} \tilde{P}_i^{1-\eta^c}\right)^{\frac{1}{1-\eta^c}} = Y\theta^c$

(17) $U^c = \left(\sum_{i=1}^{n} \alpha_{c,i}^{\eta^c} \tilde{P}_i^{1-\eta^c}\right)^{\frac{1}{\eta^c-1}} Y\theta^c$

(18) $\tilde{q}^{c,i} = U^c P_{U^c}^{\eta^c} \alpha_{c,i}^{\eta^c} \tilde{P}_i^{-\eta^c}$

(19) $P_{U^g} = \left(\sum_{i=1}^{n} \alpha_{g,i}^{\eta^g} \tilde{P}_i^{1-\eta^g}\right)^{\frac{1}{1-\eta^g}}$
where $0 < \frac{\eta^g - 1}{\eta^g} < 1$

(20) $U^g \left(\sum_{i=1}^{n} \alpha_{g,i}^{\eta^g} \tilde{P}_i^{1-\eta^g}\right)^{\frac{1}{1-\eta^g}} = Y\theta^g$

(21) $U^g = \left(\sum_{i=1}^{n} \alpha_{g,i}^{\eta^g} \tilde{P}_i^{1-\eta^g}\right)^{\frac{1}{\eta^g-1}} Y\theta^g$

(22) $\tilde{q}^{g,i} = U^c P_{U^c}^{\eta^g} \alpha_{g,i}^{\eta^g} \tilde{P}_i^{-\eta^g}$

(23) $\left(\sum_{j=1}^{n} \alpha_{I,j} \tilde{P}_j\right) = Y\theta^I$

(24) $\omega_k = P^c\left(\rho + \delta\right)$

(25) $dK/K = dI/I$

(26) $\tilde{P}_j = \left(\sum_{r=1}^{R} b_{r,j}^{s^j} P_{r,j}^{1-s^j}\right)^{\frac{1}{1-s^j}}$
where $0 < \frac{s^j - 1}{s^j} < 1$

(27) $D_j = \left(\tilde{q}^{\mathrm{c,j}} + \tilde{q}^{\mathrm{I,j}} + \tilde{q}^{\mathrm{g,j}} + \tilde{q}^{\mathrm{int,i}}\right) \tilde{P}_j^s b_{h,j}^s P_{h,j}^{-s}$

(28) $M_j = D_j - q_j$

(29) $\left(\sum_{r=1}^{rr} M_{r,j}\right) = 0$

(30) $\left(\sum_j \sum_{r \neq h} P_{r,j} M_{r,h,j}\right) = B_h$

(31) $\left(\sum_r B_r\right) = 0$

Annex 3: High tariff sectors, ranked by HS2 applied tariff rates

Table A4 HS-2 Classification, top 2 per cent of tariff lines

HS-2	description	share of lines	total share	tariff rate
	U.S. top 2 per cent of tariff lines			
24	Tobacco and manufactured tobacco substitutes	0.383	0.383	43.2
23	Residues & waste from the food indust; prepr ani	0.172	0.554	23.2
4	Dairy prod; birds' eggs; natural honey; edible pr	2.160	2.714	17.9
	EU top 2 per cent of tariff lines			
23	Residues & waste from the food indust; prepr ani	0.531	0.531	71.0
2	Meat and edible meat offal	1.033	1.563	46.6
4	Dairy prod; birds' eggs; natural honey; edible pr	1.353	2.916	46.3

Annex 4: Derivation of foreign investment income equation

In this annex, we provide the analytical derivations behind the estimating equation for foreign investment income in Chapter 6. We start with the basic gravity model in equation (1), focusing on the first specification where the value of sales/turnover of MNEs from source country i in host country j, represented as $v_{i,j}$, is specified as a function of source country variables S, host country variables X, and bilateral variables Z.

$$(1) \quad v_{i,j,t} = \sum_{s} \alpha_s S_{s,i,t} + \sum_{h} \beta_h X_{h,j,t} + \sum_{k} \gamma_k Z_{i,j,t}$$

Note that we can group the source-specific and host-specific variables and represent them with exporter and importer fixed effects. This leaves us with fixed effects and pairwise variables Z as in equation (2).

$$(2) \quad v_{i,j} = \underbrace{\sum_{s} \alpha_s S_{s,i}}_{\text{FDI source fixed effect}} + \underbrace{\sum_{h} \beta_h X_{h,j}}_{\text{FDI host fixed effect}} + \underbrace{\sum_{k} \gamma_k Z_{i,j}}_{\text{pairwise variables}}$$

To go further, we assume that the set of pairwise variables includes the effect of non-tariff measures. NTMs are represented by the index I_{NTM} with corresponding coefficient γ_{NTM}. While NTMs may vary between source and host, as in the left hand side of equation (3), we can re-write this as a function of average NTMs and the difference between average and pair-wise NTMs. This is the right hand side of equation (3).

$$(3) \quad \gamma_{NTM} \ln\left(I_{NTM}\right)_{i,j} = \gamma_{NTM}\left[\ln\left(\overline{I}_{NTM}\right)_{j} + \left(\ln\left(I_{NTM}\right)_{i,j} - \ln\left(\overline{I}_{NTM}\right)_{j}\right)\right]$$

Next, we substitute equation (3) into equation (2), which yields equation (4) below.

$$(4)\quad v_{i,j} = \underbrace{\sum_s \alpha_s S_{s,i}}_{\text{FDI source fixed effect}} + \underbrace{\sum_h \beta_h X_{h,j} + \gamma_{NTM} \ln\left(\bar{I}_{NTM}\right)_j}_{\text{FDI host fixed effect}} + \underbrace{\sum_k \gamma_k Z_{i,j} + \gamma_{NTM}\left(\ln\left(I_{NTM}\right)_{i,j} - \ln\left(\bar{I}_{NTM}\right)_j\right)}_{\text{pairwise variables}}$$

Finally, we assume average NTM levels apply in most cases, except where we have estimates to the contrary for intra-EU FDI. In particular, from the NTM survey data for FDI, we have estimates of the term $\gamma_{NTM}\left[\left(\ln\left(I_{NTM}\right)_{i,j} - \ln\left(\bar{I}_{NTM}\right)_j\right)\right]$ for FDI NTMs applied between EU Member states, in terms of the difference from average levels applied to third countries. This means our final regression equation takes the form:

$$(5)\quad v_{i,j} = \underbrace{S_i}_{\text{FDI source fised effect}} + \underbrace{X_j}_{\text{FDI host fixed effect}} + \underbrace{\sum_k \gamma_k Z_{i,j} + \gamma_{NTM}\left(\ln\left(I_{NTM}\right)_{i,j} - \ln\left(\bar{I}_{NTM}\right)_j\right)}_{\text{pairwise variables}}$$

Under this specification, and with the assumption that third-country j NTMs can be represented by the average level in equations (3) and (4) (so that in general $\gamma_{NTM}\left(\ln\left(I_{NTM}\right)_{i,j} - \ln\left(\bar{I}_{NTM}\right)_j\right) = 0$ when $j \neq$ EU Member) we use intra-EU variation from NTMs applied by EU Member States against third countries, in equation (5), to estimate the NTM coefficient γ_{NTM}.