A General Equilibrium assessment of the EU-Mercosur Association Agreement

1. Introduction

The EU-Mercosur agreement is currently the subject of a hot debate. Even though negotiations officially concluded in July 2019, there is some remarkable resistance from several European countries. France, for instance, has ruled out ratification until concerns over environmental protection are resolved (Brunsden & Fleming, 2021). On the other hand, regarding China's growing presence in Mercosur countries, some researchers point out that while the EU has been negotiating the agreement for the last 20 years, China has stablished a strong commercial position. They claim that if the EU-Mercosur agreement had been closed earlier on time, the situation would have been different (Fariza & Rivas, 2021).

The European Union (EU) has become the first major partner to sign a trade agreement with Mercosur (Argentina, Brazil, Paraguay and Uruguay). The EU will formalize an agreement with Mercosur, which neither the US nor China has, granting preferential access to the EU countries in an area that is currently highly protected. In terms of the dimension of the agreement, this is the biggest trade deal signed by both regions. The agreement covers a population of 780 million citizens (10% of the world population) and almost a quarter of the world's GDP (23,5%) (Inter-American Development Bank, 2019). Not only it is the first time in which Mercosur signs an agreement with another large regional block, but also the first time that Mercosur signs a trade agreement that regulates trade on services (Timini & Viani, 2020). The relief of tariffs and non-tariff measures (NTMs) on goods trade, as well as services trade and investment, is included in this agreement. It also has big ambition for government procurement openness, particularly on the Mercosur side, which has previously been closed to foreign bidders.

Many recent studies estimate the economic impact of Free Trade Agreements (FTAs) by means of computable general equilibrium (CGE) models, which are cutting-edge tools for assessing trade agreements at the region, country and broad sector level. These models are computer-based simulations that forecast the future state of the global economy (including any country or region specifically examined) as a result of a predetermined set of (trade) policy changes (Nilsson, 2018). Specifically, for the analysis of this trade agreement, LSE (2020), Latorre et al. (2021), Sanguinet & Alvim (2000) and Carrico et al. (2020) use CGEs. One of the main advantages of this methodology is that it combines both macro and sectoral variables and the relations among them (Nilsson, 2019).

An additional advantage of the CGE approach is the inclusion of both tariffs and non-tariff measures (NTMs) in our simulations. NTMs still represent a challenge for analysts and policymakers when estimating their impact on trade, mainly due to their complex nature and lack of evidence (Fougazza, 2008). While tariffs are easily quantified, NTMs are difficult to manage and can have a high cost for suppliers. In section 3 we offer a detailed description of these.

We use the well-known and widely used GTAP CGE model. Our model has 9 regions (EU-Argentina-Brazil-Paraguay-Uruguay-US-Canada-China-ROW), 4 factors of production (Land, Labor, Capital and Natural Resources) and 36 sectors. An innovative aspect of this analysis is not only the combination of tariffs and NTMs reduction, but also the combination of both goods and services sectors (26 goods sectors and 10 services sectors). The latter is lacking in several New Quantitative Trade Models (NQTMs) that have previously analyzed the EU - Mercosur agreement (Timini & Viani, 2020; Sinabell et al., 2020).

Another advantage of the analysis of this paper is that we have based our simulations on official documents issued by the European Commission (European Commission, 2019) and by the ministries of the Mercosur countries, whose official webpages show the same documents (e.g. Ministerio de Relaciones Exteriores del Paraguay, 2019). The negotiated tariffs that are cited in these documents are offered at the 8-digit level. We have estimated tariff reductions, including the impact of the new quotas agreed. An important effort has been made to carefully aggregate data on tariffs, quotas and NTMs for the sectors of our model. Regarding NTMs, both the EU and Mercosur countries have detailed, on a qualitative manner, their level of openness for each sector. Again, a detailed analysis as been conducted to translate them into the simulations we run in our model. In addition, we pay particular attention to how government procurement openness has been negotiated. All in all, this paper constitutes an effort to base our simulations on the particular agreement that has been negotiated. Our approach, thus, contrasts with other previous studies undertaken while the final outcomes of the negotiations were unknown.

Our general equilibrium analysis allows to estimate a broad set of macroeconomic outcomes for GDP, welfare, wages, aggregate trade, prizes, together with detailed sectoral impacts for production the 36 sectors in which our model economies have been split. We also conduct a special analysis focusing on the impact on the bovine sector, which is at the center of the debate regarding this agreement.

The rest of the paper is organized as follows. Section 2 offers an overview of the trade patterns among the signatory regions and also of these regions with the US and China. Section 3 explains the different sources of data we have used and our detailed modelling strategy for tariffs, quotas, Non-tariff Measures and Government procurement impacts. Section 4 describes the model, while section 5 offers the macro and microeconomic impacts. Finally, section 6 concludes.

2. Starting point: signatory regions' trade

Our study divides the world in 9 regions: European Union (EU), Canada, United States (US), China, the 4 countries which integrate Mercosur (Argentina, Brazil, Paraguay and Uruguay) and the Rest of World (ROW). The EU and the US have the largest bilateral trade and investment relationship and enjoy the most integrated economic relationship in the world. Although overtaken by China in 2021 as the largest EU import source for goods, the US remains by far as the EU's largest trade and investment partner (European Commission, 2021). China's importance in Mercosur countries has grown exponentially in the last decade, to the point of becoming the main trading partner of Brazil, Latin America's largest economy. Moreover, China is close to overtaking the US as the political

and geostrategic dominator in Mercosur. While in 2016 China remained the third largest importer of goods in Brazil (17% of total imports) behind the EU (20.5%) and the US (17.5%), in 2019 it became the largest importer of goods (19.9%), followed by the EU (17.5%) and the US (17.1%). China even made steps towards signing a trade agreement with Uruguay (Ministry of Foreign Affairs, the People's Republic of China, 2018). However, the rest of Mercosur countries did not support the initiative.

Deepening into the signatory regions trade data that have been used in our model, we first show imports and exports shares in Mercosur (as a region) in Tables 1 and 2. Similar calculations for Europe are presented in Tables 3 and 4. Do note that these shares include trade in services, which does not always receive attention in trade studies.

Table 1. Origin of Mercosur Imports (2014), in $US million and % share

Sector aggregation	EU		Mercosur		US		China		TOTAL
	Total ($million)	%share	Total ($million)	%share	Total ($million)	%share	Total ($million)	%share	
Agriculture	604	7.2%	3942.1	46.8%	1234.7	14.6%	288.7	3.4%	8428.4
Manufacturing	61480.9	17.7%	40414.8	11.6%	55231.4	15.9%	67722	19.5%	347655.3
Services	37903.2	37.6%	1309.7	1.3%	16140.8	16.0%	3394.7	3.4%	100831
Total	**99988.1**	**21.9%**	**45666.6**	**10.0%**	**72606.9**	**15.9%**	**71405.4**	**15.6%**	**456914.7**

Source: authors' elaboration based on Aguiar et al. (2019)

Table 2. Destination of Mercosur exports (2014), in $US million and % share

Sector aggregation	EU		Mercosur		US		China		TOTAL
	Total ($million)	%share	Total ($million)	%share	Total ($million)	%share	Total ($million)	%share	
Agriculture	9558	12.2%	3596.5	4.6%	3299.7	4.2%	23298.6	29.8%	78220.1
Manufacturing	32368.4	13.9%	38602.8	16.5%	28657	12.3%	28965.6	12.4%	233572.2
Services	15145	28.5%	1309.7	2.5%	7191.1	13.5%	3785.1	7.1%	53135
Total	**57071.4**	**15.6%**	**43509**	**11.9%**	**39147.8**	**10.7%**	**56049.3**	**15.4%**	**364927.3**

Source: authors' elaboration based on Aguiar et al. (2019)

Although the percentages may change from year to year, especially at a more disaggregated level, our tables show that the EU is the main trading partner in Mercosur, both as an origin of its imports (21,9% share) and destination of its exports (15,6% share). If we disaggregate by agricultural goods, manufacturing goods and services, each of Mercosur's three main trading partners have an important position in each one. Highest share of imports from the EU rely on services imports in Mercosur, with a 37.6% share (37.9 $US billion). After intra-regional trade among Mercosur members (46,8% share), the US imports the most in agricultural sectors, with a 14.6% share (1,2 $US billion). Although Mercosur has an overall negative trade balance of 92 $US billion, it records the highest trade surplus in agricultural goods (70 $US billion), where exports represent nearly 10 times of imports from the same sectors. At this point China stands out as the main destination of agricultural Mercosur exports with almost a 30% share (23,3 $US billion). China's growing importance in the region is also represented by the fact that it is the main importer of manufactured goods in Mercosur, with a share of 19,5% (67,7 $US billion). However, as can be seen in Table 1, the difference between the three main powers in manufactures is small, since the US and the EU have a share of 15.9% (55.2 $US billion) and 17,7% (61.5) respectively.

Tables 3 and 4 show origin and destination of EU imports and exports, respectively. Intra-regional trade in the EU is very relevant. Imports among EU member countries represent more than a half (52.1%, US$ 3254 billion) of total. Of the remaining, the US and China have a similar share (6.6% and 6.9%, respectively), in global terms. At a more disaggregated level, China accounts for the highest share in manufacturing EU imports with an 8% of total manufacturing EU imports (374 $US billion), while the US stands as the main services exporter to the EU with a 13.7% of EU manufacturing imports (186 $US billion). Regarding imports from Mercosur, 57% correspond to Manufacturing sectors (36.6 $US billion). However, Mercosur has a higher share (4.7% or 11.1 $US billion) in the agricultural sectors than US and China (3.1% and 1.7%, respectively).

Table 3. Origin of EU Imports (2014), in $US million

Sector aggregation	EU		Mercosur		US		China		TOTAL
	Total ($million)	%share	Total ($million)	%share	Total ($million)	%share	Total ($million)	%share	
Agriculture	153859.5	65.0%	11133	4.7%	7324.2	3.1%	4000.8	1.7%	236828.1
Manufacturing	2540615.7	54.6%	36621.7	0.8%	220490.2	4.7%	374157.5	8.0%	4650768.4
Services	559796.2	41.1%	16447.5	1.2%	186493.2	13.7%	50722.4	3.7%	1362881.2
TOTAL	**3254271.4**	**52.1%**	**64202.2**	**1.0%**	**414307.6**	**6.6%**	**428880.7**	**6.9%**	**6250477.7**

Source: authors' elaboration based on Aguiar et al. (2019)

Table 4. Destination of EU exports (2014), in $US million

Sector aggregation	EU		Mercosur		US		CHINA		TOTAL
	Total ($million)	%share	Total ($million)	%share	Total ($million)	%share	Total ($million)	%share	
Agriculture	142862.2	68.5%	493.6	0.2%	2876.7	1.4%	5033.2	2.4%	208587.4
Manufacturing	2475504.1	54.1%	52533.2	1.1%	314273.9	6.9%	206656.9	4.5%	4575919.4
Services	559796.2	40.1%	33048.1	2.4%	145905	10.5%	98252.1	7.0%	1395044.4
TOTAL	**3178162.5**	**51.4%**	**86074.9**	1.4%	**463055.6**	**7.5%**	**309942.2**	**5.0%**	**6179551.2**

Source: authors' elaboration based on Aguiar et al. (2019)

One clear take-away for these trade data is that, in general, the EU and the US play a more important role than China in services sectors, while China is stronger in manufacturing than the EU and the US.

3. Model data and simulations

We use the latest version of the GTAP Database (Aguiar et al., 2019), which provides very detailed information on the world economy for four reference years (2004, 2007, 2011 and 2014). The world economy is split into 121 countries (and 20 regions), providing data on 65 goods and services sectors for each country or region. This global data base describes bilateral trade patterns, production, consumption and intermediate use of commodities and services. As mentioned in the introduction, data has been aggregated into 9 regions, 36 sectors and 4 factors of production.

The agreement contemplates both reduction on Tariffs and Non-tariff measures (NTMs). The difference between Tariffs and Non-tariff measures relies on their nature. The former reflects direct costs and clear numerical values. NTMs are more difficult to analyze, since they are not defined *a priori* at a quantitative level, but rather at a qualitative level (price controls, specific requirements, health regulations, etc.).

According to the International Trade Centre (2012), “NTMs are complex legal texts specific to the product and applying country. They are more difficult to quantify or compare than tariffs. Depending on how they are applied, these measures may or may not amount to trade barriers”. We differentiate between technical and non-technical NTMs in this section.

To estimate the overall impact of the Agreement, we run three simulations: (1) Tariffs & quotas, (2) Non-tariff measures (3) Public Procurement openness.

3.1. Tariffs & quotas

Data on initial tariffs and quotas are expressed in ad valorem equivalents (AVEs) and extracted from the GTAP 10 Database (Aguiar et al., 2019). Regarding tariff reductions, Mercosur will fully liberalize 91% and the EU 95% of lines in their respective schedules (European Commission, 2019). Tariffs are significantly higher on the Mercosur side, especially in Manufactures. In some cases, the difference is almost 500% (i.e. Textiles).

In our model, tariff reductions and the new quotas are based on official tariff elimination schedules, which are the same in the different sources available: Ministerio de Relaciones Exteriores del Paraguay (2019), Ministerio de Relaciones Exteriores del Uruguay (2019) and Ministerio de Relaciones Exteriores, Comercio Internacional y Culto de la Argentina (2019).

As reductions on these schedules are expressed in Tariff Line codes (8-digit level) and in the H4 version of the Harmonized System (HS), a previous treatment of the figures has been necessary. To obtain the corresponding ad valorem equivalent (%) MFN (Most Favored Nation tariff), we first obtained the trade volumes data at the HS 8-digit level from the TradeMap tool (average of the period 2017-19) (International Trade Centre, 2021). To cross-reference the agreed tariffs with the trade data for the years 2017-2019, an update was made to the H5 version implemented in 2017, so that the codes used for the tariffs were the same as those used for the trade flows.

We have carried out a thorough work to quantify these reductions considering the quotas that affect different sub-sectors, especially agricultural sectors. For this purpose, we have calculated the average quantities or units for the period 2017-2019 (according to TradeMap ITC tool) expressed at 6-digit HS that will enter the regime.

3.2. Non-Tariff Measures (NTMs)

Due to nature of NTMs, modelers transform them into quantitative values, according to the degree of the effect for trade. NTMs do not bring an economic benefit to government agents. Contrasting with tariffs, we translate NTMs into rents for importers and exporters and into trade inefficiencies, following Francois et al. (2013) and Latorre & Yonezawa (2018). Further details on this transformation can be found in the section below.

For the estimation of NTMs in the goods sectors, we use the latest data available (Ad Valorem Equivalents, AVEs) of the World Bank (2019). This database is internationally recognized as the best source for NTMs in agriculture and manufacturing, having been used in previous work on this treaty (LSE, 2020). As they are presented in "ad valorem"

terms, their interpretation is like that of a tariff, i.e., they indicate the initial barrier existing before the EU-Mercosur treaty. The World Bank reports AVEs of NTMs at the HS6 level (6-digit HS nomenclature) for the goods sectors. For this reason, an "aggregated AVE" calculation at the model sector level has again been performed, considering the most recent trade volumes provided by Trade Map (International Trade Centre, 2021).

For services sectors we use the AVEs estimated by the OECD researchers (Benz and Jaax, 2020), who present 2019 estimates of NTMs for five services sectors and 46 countries – Communications, Business Services, Banking (Financial Services), Insurance and Transport services as a whole (Maritime Transport, Air Transport, Railway Transport and Road Transport). However, since this source only provides data for Brazil, for the other countries we use the data provided by Fontagné et al. (2016).

In the analysis of NTMs in the Mercosur countries, UNCTAD (2017) differentiates two types of NTMs: "(a) traditional trade policy instruments, such as quotas or price controls, which are often termed non-tariff barriers (NTBs[1]); and (b) regulatory and technical measures that stem from important non-trade objectives related to health and environmental protection (i.e. sanitary and phytosanitary (SPS) measures or technical barriers to trade (TBT))" (p. ix). Technical and non-technical measures present a different scope for reductions.

3.2.1. Technical measures

Provisions on sanitary and phytosanitary measures and technical barriers are included in the agreement for safety reasons and, therefore, its reduction is not recommended. The adoption of a particular standard may make it more expensive for a country or region to produce for other markets. This effect may be mitigated when harmonization takes place on the basis of international standards (Fontagné et al, 2016). The Agreement does not bind Mercosur countries to adopt European standards, but to look for international standards as a reference. According to the official text: "the Parties shall use relevant international standards as a basis for their technical regulations including any conformity assessment elements therein, except when such international standards would be an ineffective or inappropriate means for the fulfillment of the legitimate objectives pursued" (European Commission, 2019a).

Mercosur applies regulations to a wide range of products. According to the World Integrated Trade Solution (WITS), in 2016 Brazil regulates up to 68% of product lines and prohibits up to 54% for TBT reasons (WITS, 2016). According to this source, Argentina had stablished full prohibition (import ban) in more than 47% of product lines. This information is consistent with the results of a paper based on data from the International Trade Centre's (ITC) business survey on non-tariff measures (NTMs) in the EU and conducted with the support of the European Commission in 2015 and 2016. Results show that, on average, in 58.8% of export transactions to Brazil and in 56.5% of transactions to Argentina, EU exporters encountered burdensome regulation (International Trade Centre, 2017).

[1] Non-technical barriers to trade.

Technical measures in the EU are significantly higher than in Mercosur, ranging between 20% and 30% in the agri-food sectors. Compared with Mercosur partners, the EU remains by far the most difficult market to access (UNCTAD, 2017). However, technical measures are more justified in the EU than in Mercosur countries. In the latter, the prevalence of discretionary technical measures is high. Vegetables, fruits and nuts require special import authorization or registration in all Mercosur countries (UNCTAD, 2017). In the light of all this information, for our simulations in goods sectors, we estimate a technical NTMs reduction of 5% in Mercosur countries for imports coming from the EU and a technical NTMs reduction of 3% in goods imports in EU whose origin is the Mercosur region.

3.2.2. Non-technical measures

As they are conceived initially to protect domestic markets, non-technical measures are usually addressed when signing a trade agreement (Hayakawa & Kimura, 2014; Cadot et al, 2014). "A number of recent bilateral and regional trade agreements require or encourage members to initiate regulatory co-operation. Horizontal chapters in these agreements anchor the principles and commitments to engage in regulatory co-operation or regulatory coherence in the legal text" (OECD, 2021). The EU-Mercosur agreement is an example, as it includes reduction of non-technical measures (commonly known as non-tariff barriers) in its legal texts. "Non-automatic import or export licenses are prohibited, except for those needed to implement measures of this agreement (i.e. tariff rate quotas for products not fully liberalized)" (European Commission, 2019).

Non-technical measures are especially high in the Mercosur region. "The estimated impact of these barriers is particularly high in the manufacturing sectors, especially on the crucial vehicles and machinery sectors. These NTMs cause price increases on traded goods of 3 to 4 per cent" (UNCTAD, 2017, p. x). Brazil ranked 141 out of 141 economies for burden of government regulation in the World Economic Forum's 2019 Global Competitiveness Report (World Economic Forum, 2019) and one of the countries with the highest overall Product Market Regulation (PMR) Indicator in the OECD (OECD, 2019). For instance, U.S. companies often mention duplicative, arbitrary, or sometimes discriminatory regulations as barriers to trade for U.S. products in Brazil (ITA, 2021). In Argentina, in sectors like textiles and wearing apparel or leather products and furniture, more than 70% of imports are still subject to non-automatic import licenses, and more than 30% of all imports of sectors like machinery and electronic equipment or optical and medical instruments, among other, are still subject to non-automatic import licenses (Grundke & Arnold, 2019). However, this working paper developed by OECD researchers also states that Argentina has made considerable progress in reducing the number of items subject to non-automatic import licenses. On the EU side, non-technical NTMs have a very small and symbolic presence.

We have estimated a 20% reduction in Mercosur countries and a 10% reduction in the EU for non-technical NTMs in goods sectors. These percentage reductions may give the impression that the cuts are substantial, but they represent a modest and conservative reduction measured in percentage points of tariffs.

In services sectors, reductions are based on the level of openness expressed in chapters containing supply of services[2] (i.e., Mode 1 Services Supply) in the EU and in Mercosur. As a first step, we have assigned a level of commitment to each sector mentioned in the documents issued by each country/region. We rely on the approach of Benz and Jaax (2020), who compare NTM levels between the EU and other countries, specifically with countries that are not part of the European Economic Area (single market). The difference in NTMs between one and the other ranges between 80% and 90%, which is what we could translate into "NTMs reductions" after signing a trade agreement. To be on the safe side, we estimate a maximum reduction of a quarter of those differences between NTMs with countries of the single market and the NTMs with respect to countries outside of the single market for those sectors where liberalization is the largest. Lowest NTM cuts in services sectors are assumed in Banking[3] and Insurance[4] sectors in both regions. Air Transport will not experiment cuts in either the EU or Mercosur, as stated in the negotiated agreement.

3.2.3. Public Procurement

For its first time, public contracts will be opened in Mercosur for foreign companies. The "Agreement in Principle" states that "The agreement will open markets on both sides and will provide, in the area of goods and services (including construction services), secure reciprocal legal access to government procurement markets where public procurement contracts are above specified thresholds." (European Commission, 2019). This is a historic milestone, as up to date Mercosur has only opened its public contracts at a regional level (i.e., among Mercosur countries) and this process has begun quite recently, so there is an important scope for public procurement openness.

We deal with public procurement in a separate simulation, as it is also differentiated in the offers of the signatory countries. The commitments are individual for each country specifying the sectors and Central State - level agencies opening to procurement for signing countries, generally through a mix of positive and negative lists. Moreover, the Agreement in Principle envisages that Mercosur countries will also consult the possibility to extend the opening of public procurement at a regional level in the first two years after entry into force.

Reductions in NTMs are derived directly from the bids of the EU and each Mercosur country. These offers specify each sector that is opened to contracting and at what level (through positive and negative lists according to the country's choice). Modeling and reduction estimation of the openness of public procurement has been harder than in the case of NTMs, for two reasons. Firstly, because of the difficulty of interpreting the chapters referring to it in the bids. Each country expresses such openness in detail for each sector and as mentioned above, in a different way (positive or negative lists). Secondly, the nomenclature is different depending on whether the sector is goods or services sector. In the first case, the sectors are expressed in ISIC Revision 3.1, and in the case of services in the United Nations Provisional CPC nomenclature.

[2] Modes of supply can be found in https://www.wto.org.

[3] No reduction in the EU and Brazil and between 3% and 6% in the rest of Mercosur countries.

[4] No reduction in the EU and less than 6% reduction in Mercosur countries, except for Uruguay (10.5%).

Moreover, we have contemplated several issues regarding public procurement: (1) Gradual openness expressed in the amount of money involved in the bids. Both regions establish minimum amounts that are reduced over the years. In the case of the EU, they are reduced earlier than in Mercosur. (2) Paraguay is the region with the most restrictive openness of public contracts, and its reductions extend up to 19 years after the entry into force of the agreement. Furthermore, it will not initially open its tenders to foreign companies. There are doubts on whether it will eventually do so. (3) Gas, energy, and water utilities will not be open to public procurement either in the EU or in any other Mercosur country. (4) Business services are quite opened in both the EU and Mercosur regions. (5) Argentina's openness is smaller and stands between Brazil and Uruguay. The latter offers the most open regime. We have simulated reductions in NTMs only in sectors that are open to public procurement. In Argentina and Uruguay the reductions have been of 10%, since they are the most open regimes. By contrast, in Brazil reductions in NTMs are of 6%, while in Paraguay there are no reductions.

4. The General Equilibrium Model

We use a CGE model that comprises 4 factors of production (land, labor, capital, and natural resources), 9 regions (EU, Argentina, Brazil, Paraguay, Uruguay, US, China, Canada and Rest of World) and 36 sectors (including agricultural, manufacturing and services sectors). CGE models are well-known in trade policy analysis and their utility for policymakers has been proved (Hertel et al, 2007).

CGEs provide quantitative results, for a large set of both macro and microeconomic variables. To be more precise, we use the static setting of the Global Trade Analysis Project (GTAP) in its latest version (Corong et al., 2017). The static setting of the GTAP model allows estimating the differences in an economy between two possible states (pre and post-FTA scenario), assuming perfectly competitive markets and constant returns to scale. There is perfect competition, and therefore no gains from trade from procompetitive effects nor increasing returns to scale, which could lead to market power erosion or product/input varieties increases (Francois J., 1998; Nordås et al., 2006). Regarding model closure, we have defined fixed national endowments of factors of production and, therefore, results are expressed as a percentage change in factor remuneration. In terms of mobility, we have set Labor and Capital as perfectly mobile factors. Perfect mobility implies that prices should be equated across all uses. Therefore, the percent change in endowment returns is uniform across activities and market equilibrium is determined by setting aggregate demand equal to (exogenous) supply (Corong et al., 2017). Land and Natural Resources are defined as sluggish. A succinct explanation, including model equations, can be found in Zhou and Latorre (2014).

To analyze the impact of the agreement, we have sought a balance between the detail of the results and the ease of drawing conclusions, derived from an appropriate aggregation of sectors. We have therefore aggregated the 65 original GTAP 10 sectors into 36, 26 of which are goods (agricultural goods from 1-8, manufacturing goods 9-26) and 10 of which are services sectors (27-36). Table A1 (Appendix 1) shows model sectors and correspondence with GTAP 10 sectors.

The agreement contemplates the asymmetries between the two blocs based on a gradual liberalization scheme, with up to 15 years for tariffs reduction for Mercosur, and

10 years for the EU. Our results show the impact once the agreement is fully implemented. As stated in the previous sections, we estimate the impact of the agreement due to tariff reductions and the quotas negotiated, NTMs reductions related to the convergence to international standards that have been negotiated in goods and services sectors and NTMs reductions related to public procurement openness. To sum up:

1) *Tariffs' reduction and new quotas:* they are modelled together as negotiated in the agreement, through the corresponding ad valorem reduction in our model tariffs. The reductions are based on official data provided by signatory governments.
2) *NTMs' reductions*: following the literature, we include the concepts of "costs" and "rents" when modeling NTMs. Sixty percent of the price impact of NTMs correspond to trade efficiency costs, while economic rents where responsible for the remaining 40%. From this 40%, we assume that importer rents gather 2/3 (27%) of the rents and exporter rents the remaining 1/3 (13%). These are the percentages we have followed for modelling the NTMs in our model both in defining baseline scenario and when introducing shocks defined in each experiment.
3) *Public Procurement NTMs' reduction:* in this simulation, we estimate additional reductions in NTMs related to the opening of public contracts to foreign companies. We follow the same scheme method as for *NTMs reduction*. It should be noted that the agreement contemplates the opening of public procurement at two levels: national and regional. In a first phase of the implementation process, public procurement would be opened at the national level and for larger contracts. However, the agreement goes further and provides that within two years Mercosur countries will consult with regional governments on the possibility of extending public procurement to a regional level. If there is a positive response, the EU would also open public procurement at the regional level. Our analysis contemplates the full implementation of the agreement, i.e., in the long run. Therefore, it includes the opening of public procurement at the two levels. In addition, this simulation grasps the fact that, as time passes by, more clauses of the agreement are implemented and additional reductions in trade barriers occur.

5. Results

5.1. Macroeconomic results

Table 5 shows the estimated impact of the EU-Mercosur agreement on the main macroeconomic variables for the EU, the Mercosur countries, China and US[5]. We report variations in GDP, private consumption, aggregated exports and imports, Wages, capital remuneration, consumer price index (CPI) and welfare expressed in terms of equivalent variation. All these variables are expressed in percentage change from the baseline scenario except for Equivalent Variation, which is expressed in $US million. These results express the impact that the reduction of both tariff and non-tariff measures (including public procurement openness) would have on the regions, once the agreement is fully

[5] The impact of the agreement on Canada was negligible (i.e., very close to zero), so we have taken it out of the tables.

implemented (approximately after 15 years from entry into force). Results are expressed in percentage change in real values, i.e., considering changes in purchasing power due to price effect of the FTA.

Table 5. Impact on main macroeconomic variables in year 16

Region	GDP	Private Consumption	Aggregated Exports	Aggregated Imports	Wages	Capital remuneration	CPI	Welfare
EU	0.04	0.08	0.11	0.23	0.20	0.19	0.10	10040.75
Argentina	0.26	0.30	1.14	2.77	0.09	0.02	-0.26	1494.64
Brazil	0.13	0.16	2.49	4.49	0.40	0.41	0.09	3257.23
Paraguay	0.04	0.04	0.06	0.30	0.06	0.10	-0.20	10.90
Uruguay	0.61	1.14	-2.45	3.35	0.02	2.37	1.12	563.10
US	0.00	-0.01	0.05	-0.13	-0.07	-0.07	-0.06	-1288.13
China	-0.01	-0.01	0.03	-0.13	-0.08	-0.08	-0.07	-1589.80

Source: Authors' estimation.

Notes: results are express in percentage change compared to the benchmark except for Welfare, which is expressed in $US million.

It is important to note that our simulations consider exclusively the negotiated reductions within the EU-Mercosur agreement. Thus, our estimated impacts isolate the effects of the EU-Mercosur agreement. The impact of other recently approved agreements or events such as the Covid pandemic should be added or subtracted from our results.

Our results show an increase in terms of real GDP, exports, imports and factor remuneration (wages and capital remuneration) for all FTA countries, with the only exception of exports in Uruguay. GDP increases in a range from 0.04% (Paraguay) to 0.61% (Uruguay) in Mercosur. As expected, due to its commercial capacity and to the difference in size with the Mercosur countries, the EU would increase the most its welfare results (10 $US billion), although its GDP expected growth is of 0.04%. In terms of exports and imports, Brazil experiences the highest growth, with a rise of 2.49% (6.6 $US billion) and 4.49% (14.2 $US billion), respectively. All signatory countries would experiment an increase in their real wages, with Uruguay leading the list with a 2.31% increase. Results are in line with the level of current trade barriers and the liberalization commitment that have been negotiated. Paraguay, the most conservative in terms of opening to trade, hardly benefits in terms of welfare (10.9 $US million) and could experiment a loss of competitiveness with respect to the rest of the Mercosur countries. Uruguay, which is somewhat larger in size than Paraguay but smaller than Argentina and Brazil, also faces difficulties to increase its exports, which can be related to the rise of factor remunerations that it experiences.

US and China would be negatively impacted, with a welfare loss of -1.3 $US billion in US and -1.6 $US billion in China. Moreover, they would even experiment small falls in wages (-0.07% and -0.08%, respectively) and capital remuneration (-0.07% and -0.08%, respectively).

We disaggregate the welfare effect using the welfare decomposition utility from the GTAP model. Welfare is decomposed in: resource allocation efficiency effects, endowment effects due to changes in factor supplies, technical change due to productivity gains or losses, the effects of population growth, changes in terms of trade

for goods and for savings and investment flows, and changes in preferences (Burfisher, 2016). Welfare effects are reported in levels in Table 6 (in $U.S. million).

Table 6. Welfare decomposition (expressed in $US million)

Region	Resource allocation (efficiency)	Endowment effects	Technical change	Population growth effect	Terms of trade (Goods)	Terms of trade (savings and investment flows)	Preferences (aggregate demand)	Equivalent Variation (Total)
European Union	4994.4	0.0	599.9	0.0	4600.1	-153.6	0.0	10040.8
Argentina	803.7	0.0	630.5	0.0	32.9	27.5	0.0	1494.6
Brazil	2011.5	0.0	1143.3	0.0	351.7	-249.2	0.0	3257.2
Paraguay	8.1	0.0	4.3	0.0	6.4	-7.9	0.0	10.9
Uruguay	238.9	0.0	115.8	0.0	195.9	12.5	0.0	563.1
US	-94.0	0.0	0.0	0.0	-851.0	-343.2	0.0	-1288.1
China	-733.0	0.0	0.0	0.0	-1336.6	479.7	0.0	-1589.8
ROW	-375.0	0.0	0.0	0.0	-3003.1	234.1	0.0	-3144.0
Total	**6854.6**	**0.0**	**2493.8**	**0.0**	**-3.7**	**0.1**	**0.0**	**9344.8**

Source: Authors' estimation

Factors of production, population, and preferences are defined as exogenous in our model and, therefore, they have no influence in the welfare results. Last column shows total welfare effects on each economy (sum of previous columns). The first column in Table 6 is referred to allocative efficiency gains due to the FTA, this is, production and consumption efficiency gains as a result of trade liberalization. At least 50% of total welfare (EV) results in signatory countries correspond to allocative efficiency gains. FTA countries are expected to increase their welfare from trade creation because of expanding their markets among FTA partners. However, these effects are reduced due to trade diversion, in which countries shift its import demand from more efficient partners (outside the agreement) towards high-cost partners (agreement partners) due to the lower tariffs and other barriers agreed. In signatory countries, the trade creation effect dominates the trade diversion. However, trade diversion plays a significant role in some of them, thus reducing welfare. In Mercosur, imports from the EU would grow up to more than 47% (42.2 $US billion), whereas imports from the rest of regions (including trade within Mercosur) decline in all cases, resulting in a net increase in imports in Mercosur of 15.9 $US billion[6]. Because trade creation dominates trade diversion, the agreement would leave a positive impact on Mercosur`s regional welfare of 3 $US billion[7]. In the EU, the increase in imports from Mercosur almost equal the decrease in intra-regional imports, but imports from the rest of regions increase in almost all sectors, leaving a net increase of 12.9 $US billion.

As we have seen in Section 4, NTMs reduction impacts trade efficiency, by improving it. Therefore, results from third column in Table 6 come from simulations on NTMs reduction and Public Procurement openness. Brazil would experiment the highest welfare gains due to productivity gains, while Paraguay, the country with most conservative trade liberalization within the agreement, would see negligible results related to productivity changes.

[6] These results are not displayed in Table 6.

[7] Aggregated results for Mercosur, including welfare gains from Argentina, Brazil, Paraguay and Uruguay.

Terms of trade also have an important share in total positive welfare results in the EU and Mercosur countries, whereas non-signatory countries would lose import-purchasing power on a larger scale. The EU would mostly experience terms of trade gains, while Mercosur's terms of trade would experiment smaller positive gains. US and China would experiment losses of 0.9 and 1.3 $US billion due to terms of trade losses. Terms of trade gains of one country correspond to losses in the same for other country, and therefore terms of trade cancel at a global level[8]. The agreement increases the global welfare by 9.3 $US billion, as can be seen in the Equivalent Variation of the last column.

We compare our results with those obtained in recent studies (after 2019). Some studies use General Equilibrium Models in its simulations (LSE, 2020; Sanguinet & Alvim, 2020; Carrico et al., 2020), while others use New Quantitative Trade Models (NQTMs) (Timini & Viani, 2020; Sinabell et al., 2020).

We obtain similar but slightly lower results than those from the Sustainability Impact Assessment carried out by the London School of Economics (LSE, 2020), who estimates for the conservative scenario an increase of 0.1% of EU-28's GDP, 0.5% for Argentina, 0.2% for Brazil, 0.1% for Paraguay and a 0.2% for Uruguay. This study was initiated before the Agreement in Principle was reached. Therefore it does not include real reductions agreed upon[9]. Moreover, it was last updated in December 2020 and simulations remain the same (LSE, 2020). Although it considers specific tariff cuts for several agricultural products, it does not differentiate among the different sensitive agricultural sectors and, therefore, expected gains from these sectors are higher (higher tariff reductions). By contrast, we have included the different negotiated regime for each of the sensitive agricultural sectors. In the LSE's conservative scenario with a 5% tariff cut for all sensitive sectors, EU's GDP would increase by € 10.9 billion. Moreover, this study uses a dynamic version of the GTAP model. Dynamic models capture the gains derived from economic growth of participating countries and, therefore, the expected results from this kind of models are higher than those from static setting (Baldwin, 1992). In the static setting there is no factor accumulation and GDP growth comes from changes in productivity.

Our results are also in line with Sinabell et al. (2020), who use a NQTM. They estimate GDP increases between 0.03% and 0.16% in EU countries, and between 0.33% and 0.52% in Mercosur countries. In terms of what they call *absolute gains*[10], the EU gains the most from the agreement, with € 12.2 billion, while Mercosur as a region would increase its welfare by € 7.2 billion. Timini & Viani (2020) also use a NQTM to estimate the quantitative impact of the EU-Mercosur agreement. In terms of changes in real welfare, they estimate increases between 0.33% and 0.71% in Mercosur and between 0.01% and 0.39% in EU countries. They also estimate higher GDP impact for smaller Mercosur countries (Paraguay and Uruguay), but they do not contemplate public procurement opening (in Paraguay we see a lower commitment).

[8] Table shows a global loss of 3.7 $US million, which corresponds to an unavoidable error in the software calculations.

[9] LSE (2020) only considers NTB reductions in non-agricultural sectors in Mercosur: a 5% cut in the conservative scenario and a 10% in the ambitious scenario.

[10] They do not explicitly name these gains as "welfare gains".

Latorre et al. (2020) explain that NQTMs use a small group of structural-type variables to estimate trade impacts. Some of these are national income, geographical distance, technology and trade obstacles like tariffs and NTBs. Timini & Viani (2020) describe that NQTMs use one sector and one factor of production. Among other differences with CGEs, NQTMs do not consider substitution elasticities deviating from 1 in the choice between intermediates and between factors of production (Bekkers, 2017). It is also important to emphasize that neither Sinabell et al. (2020) nor Timini & Viani (2020) take into account trade in services. In addition, a CGE offers the impact across the different sectors considered and a broader set of results for more macroeconomic variables.

Finally, we reached similar conclusions to those obtained by Carrico et al. (2020), which uses a CGE model for its estimation, and include both tariff and NTMs reductions. This study, which does not take into account opening of public contracts, estimates the highest GDP increase in Uruguay (0.9%) and the lowest in Paraguay (0.25%) for Mercosur countries. Regarding the EU, it estimates a GDP increase of 0.02%.

As noted above we run our model in a climate of perfect competition and constant returns to scale, as other studies do (e.g., LSE, 2020; Carrico et al., 2020). This implies that products are differentiated by country-of-origin à la Armington (i.e., there is a single domestic variety in each country for each sector). Other studies that introduce imperfect competition find that trade effects are more pronounced. For example, Latorre et al. (2021), who study the impact of this agreement considering imperfect competition and economies of scale à la Krugman (1980) for some service sectors and à la Melitz (2003) for some manufacturing sectors find more sizeable trade impacts than we do.

Table 7 decomposes the results from Table 5 by tariffs reductions and new quotas, NTMs reductions and Public Procurement openness. In the EU most of the impact would be caused by tariffs and quotas because Mercosur is highly protected through higher tariffs. The EU has a longer historical track record in the reduction of non-tariff barriers both in the overall reduction of NTMs and in the opening of public procurement and, therefore, tariffs and new quotas negotiated contribute more than the rest of components. Tariffs are the main driver for aggregate results, contrasting with general wisdom that NTMs are more important than tariffs.

On the Mercosur side, the general wisdom of NTMs being crucial holds for Argentina (with a 0.11% increase in GDP out of a total increase of 0.26%). It is in aggregate imports that we find the biggest differences. For example, in Argentina, imports increased by 0.56% of the total 2.77%, with almost a half of total welfare gains (0.686 $US billion) due to these reductions. By contrast, NTMs reductions represent only a 2% from a total increase of 0.23% in imports on the EU side.

What is more remarkable, however, is the very important role played by government procurement for all the Mercosur countries. Uruguay, which has the most open regime, stands out with 0.28% GDP increases rising from this component out of a 0.61% total GDP increase. Public procurement openness also plays a very important role in Argentina, increasing GDP by 0.10% out of 0.26, with the impact being only slightly smaller than the one caused by the reduction in NTMs. In Brazil the impact of public procurement openness on GDP is slightly superior to the one of NTMs (0.05% vs 0.04%).

Finally, in Paraguay, the impact is smaller and more related to the growth of its Mercosur trade partners than to public procurement impacts within Paraguay.

Region	Description	GDP	Private Consumption	Aggregated Exports	Aggregated Imports	Wages	Capital remuneration	CPI	Welfare
EU_27	Tariffs & quotas	0.02	0.06	0.11	0.20	0.16	0.15	0.08	7469.33
	NTMs	0.00	0.01	0.00	0.02	0.02	0.02	0.01	1069.3
	Public Procurement	0.01	0.01	0.00	0.01	0.02	0.02	0.01	1502.12
	Total	**0.04**	**0.08**	**0.11**	**0.23**	**0.20**	**0.19**	**0.10**	**10040.75**
Argentina	Tariffs & quotas	0.05	0.04	0.80	1.57	-0.25	-0.31	-0.35	187.20
	NTMs	0.11	0.14	0.14	0.56	0.11	0.11	-0.01	686.38
	Public Procurement	0.10	0.12	0.20	0.64	0.23	0.22	0.10	621.08
	Total	**0.26**	**0.30**	**1.14**	**2.77**	**0.09**	**0.02**	**-0.26**	**1494.66**
Brazil	Tariffs & quotas	0.04	0.03	2.35	3.84	0.16	0.18	-0.03	574.67
	NTMs	0.04	0.05	0.03	0.24	0.07	0.07	0.03	1035.49
	Public Procurement	0.05	0.08	0.11	0.41	0.17	0.16	0.09	1647.06
	Total	**0.13**	**0.16**	**2.49**	**4.49**	**0.40**	**0.41**	**0.09**	**3257.22**
Paraguay	Tariffs & quotas	0.00	-0.03	0.12	0.22	-0.10	-0.07	-0.27	-8.75
	NTMs	0.03	0.04	0.00	0.04	0.05	0.04	0.00	11.52
	Public Procurement	0.01	0.03	-0.06	0.04	0.11	0.13	0.07	8.13
	Total	**0.04**	**0.04**	**0.06**	**0.30**	**0.06**	**0.10**	**-0.20**	**10.90**
Uruguay	Tariffs & quotas	0.17	0.43	-1.07	2.05	1.12	1.10	0.57	214.50
	NTMs	0.16	0.26	-0.54	0.44	0.40	0.44	0.18	127.19
	Public Procurement	0.28	0.45	-0.84	0.86	0.79	0.83	0.37	221.41
	Total	**0.61**	**1.14**	**-2.45**	**3.35**	**2.31**	**2.37**	**1.12**	**563.10**
US	Tariffs & quotas	0.00	-0.01	0.04	-0.10	-0.05	-0.05	-0.04	-930.28
	NTMs	0.00	0.00	0.01	-0.02	-0.01	-0.01	-0.01	-168.11
	Public Procurement	0.00	0.00	0.01	-0.02	-0.01	-0.01	-0.01	-189.74
	Total	**0.00**	**-0.01**	**0.06**	**-0.14**	**-0.07**	**-0.07**	**-0.06**	**-1288.13**
China	Tariffs & quotas	-0.01	-0.01	0.02	-0.11	-0.06	-0.06	-0.05	-1337.73
	NTMs	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-136.15
	Public Procurement	0.00	0.00	0.01	-0.01	-0.01	-0.01	-0.01	-115.91
	Total	**-0.01**	**-0.01**	**0.03**	**-0.13**	**-0.08**	**-0.08**	**-0.07**	**-1589.79**

Table 7. Macroeconomic impact disaggregated by simulation

Source: authors' own elaboration.
Notes: results are expressed in % change, except for Welfare results (expressed in $US million).

5.2. Sectoral analysis

5.2.1. Production and trade

Table 8 presents the impact on output (Prod.), exports (Exp.) and imports (Imp.) for the EU-Mercosur partners. The rows of the Table 8 show the 36 sectors of the model followed by three aggregates showing the effects on aggregates for the agricultural sectors (1 to 8 of the model), manufacturing (sectors 9 to 26) and services (sectors 27 to 36). The last row collects the aggregate impact for all 36 sectors and, thus, coincides with the aggregate results that we have seen in Table 5 (aggregated exports and imports).

Results show similar behavior in Mercosur countries, with the largest impact taking place on the imports. Mercosur aggregated results show an increase in imports by 4.0% (17.0 $US billion), while aggregate exports increase by 1.9% (7.2 $US billion). Trade diversion effects reduce significantly trade creation effects in many sectors, both in the

EU and in Mercosur. We have highlighted some examples at an aggregated level previously, but their effects differ across sectors. In the EU, for instance, imports of Food products from the Mercosur countries increase by 153% (3.8 $US billion) but decrease from the rest of regions (including intra-regional trade) by more than 2.9 $US billion, leaving a total net increase of 0.59% (0.886 $US billion). In Mercosur, Motor vehicles would increase its imports from the EU by 112% (6.9 $US billion) but would decrease its imports from the rest of regions (including intra-regional) by 4.7 $US billion, leaving a total net increase of 2.1 $US billion (6.54 %). Trade diversion effects will be smallest when Preferential Trade Agreement (PTA) countries have low levels of trade with the rest of the world or when the rest of the world is not as competitive as the nations joining the agreement (Lawrence, 1996). Leather products sector in Mercosur is a good example, as its imports from the EU grow by 64% (0.076 $US billion) while imports from the rest of regions (including intra-regional) decrease by 0.012 $US billion.

Although value added goes up, as reflected in GDP results, all Mercosur countries reduce their production slightly at an aggregated level, with values ranging between -0.03% and -0.07%. However, tendencies vary at a sectoral level among countries. We see important output increases in Argentina and Brazil in some sectors. In agricultural sectors, these two countries experiment the biggest output increases due to the easier access to the EU market, compared to the other Mercosur economies. Vegetables, fruits and nuts increase output by 2.2% (0.73 $US billion) in Brazil and Bovine and other ruminant meats by 4% (0.77 $US billion) in Argentina. These increases are mainly derived from tariffs' reductions in the EU. Agricultural exports from Mercosur to the EU would rise by 19.2% (1.8 $US billion). On the EU side, although total output would slightly increase (0.01%, 4.1 $US billion), agricultural sectors would experiment a decline of 0.47% (3.8 $US billion). Results indicate that Bovine and other ruminant meats sector would reduce its production by 1.73% (2.1 $US billion).

In manufacturing sectors, the EU would experiment the highest increases in its output levels. Highest increase would rely on Motor vehicles and parts, going up by 0.57% (5.3 $US billion). By contrast, aggregate production would experiment a 0.05% (2.6 $US billion) decrease in the Mercosur region, where Motor vehicles and parts, Other machinery and Metals and metal products would experiment reductions of 3.01% (4.1 $US billion), 4.01% (3.6 $US billion) and 2% (3.5 $US billion), respectively. Brazil would experiment strongest impacts on production in some manufacturing sectors. Food products nec would increase its output levels by 4.05% (3.6 $US billion), mainly derived from an increase of exports to the EU (153% or 3.4 $US billion). Other important output increases rely on Live animals, meat and animal products (2.52% or 0.73 $US billion) and Leather products (2.3% or 0.52 $US billion).

Table 8. Total impact in percentage change on production (Prod), exports (Exp) and imports (Imp) in EU, Argentina, Brazil, Paraguay, Uruguay and Mercosur as a region

Sector	EU27			Argentina			Brazil			Paraguay			Uruguay			Mercosur		
	Prod.	Exp.	Imp.	Prod.	Exp.	Imp.	Prod.	Exp.	Imp.	Prod.	Exp.	Imp.	Prod.	Exp.	Imp.	Prod.	Exp.	Imp.
Cereals	-0.33	-0.29	-0.36	0.45	0.16	1.05	0.18	-1.36	3.68	0.11	0.28	-0.46	-1.48	-1.36	0.35	0.19	-0.90	3.41
Vegetables, fruits, nuts	-0.32	-0.33	-0.07	2.03	6.69	5.24	2.20	6.68	3.27	0.05	1.04	-1.87	1.32	9.03	4.50	2.11	6.76	3.64
Sugar	-0.32	-0.44	-0.11	0.44	1.78	13.07	-0.23	-0.73	9.22	0.16	1.46	8.63	-1.22	-5.13	0.38	-0.21	-0.69	5.90
Plant & animal fiber, others	-0.27	-0.19	-0.19	0.77	4.83	3.48	0.01	-1.17	1.73	-0.40	1.84	-1.40	-0.37	-4.28	-0.45	0.11	-0.78	1.57
Bovine and other ruminant meats	-1.73	-4.67	1.19	3.97	32.45	8.36	1.32	7.55	1.33	0.36	0.62	-2.78	3.23	6.70	9.49	1.90	9.72	1.78
Other animal products	-0.59	-0.41	-0.58	1.10	2.46	1.23	1.98	-1.63	1.93	0.04	0.46	-0.56	0.61	-0.58	2.82	1.77	-0.05	1.42
Dairy products	-0.09	-0.08	0.01	0.20	-0.03	25.46	-0.20	0.44	11.66	0.18	-0.32	1.57	-5.15	-9.50	16.70	-0.28	-2.95	12.41
Forestry	-0.06	-0.24	0.10	-0.55	1.51	3.99	-0.03	-1.05	2.93	-0.38	-0.62	-0.60	-2.05	-5.36	-0.21	-0.12	-2.05	3.05
Gas, coal, oil extraction or distribution	-0.21	-0.45	0.18	-0.05	1.18	-0.14	-0.06	0.49	-0.50	0.05	-0.32	0.61	-0.08	-10.72	-1.26	-0.06	0.52	-0.45
Live animals, meat and animal products	-0.82	-1.59	0.65	0.33	3.06	9.56	2.52	6.52	29.79	0.01	0.72	-0.31	-4.30	-17.38	11.92	1.87	6.15	16.89
Vegetable oils and fats	-0.52	-0.31	-0.22	0.20	0.20	5.87	1.61	2.86	13.82	-0.76	-0.88	1.56	-8.25	-9.55	1.40	0.99	0.86	11.14
Food products nec	-0.68	-1.12	0.59	1.56	7.37	3.53	4.05	57.22	6.09	-0.22	0.10	0.40	-1.59	-3.50	4.33	3.36	32.75	5.20
Beverages and tobacco products	-0.05	-0.03	0.19	0.33	2.32	4.42	0.19	5.61	11.16	-0.22	0.35	0.83	-0.05	-4.09	5.59	0.21	4.34	7.03
Textiles	0.21	0.65	0.20	-2.42	-2.61	5.38	-1.44	-0.38	6.66	-1.74	-6.80	-0.38	-4.86	-11.70	6.78	-1.60	-1.67	6.18
Wearing apparel	-0.09	-0.02	0.14	-0.15	9.91	7.06	-0.77	14.41	11.15	-1.52	-5.96	5.85	-2.06	-0.32	7.61	-0.70	9.85	10.26
Leather products	-0.86	-0.93	0.03	2.16	8.22	0.85	2.30	10.58	3.21	0.90	1.19	-0.02	0.64	2.82	3.60	2.21	9.27	2.54
Wood products	-0.04	-0.03	0.09	-0.77	-1.83	9.15	-0.47	-0.03	12.09	-0.56	-3.22	1.31	-3.08	-9.23	3.59	-0.57	-0.50	9.94
Petroleum, coal and other chemical products	0.18	0.38	0.16	-0.37	2.39	1.81	-0.35	1.71	1.66	-0.55	-0.52	0.07	-1.49	-1.55	0.79	-0.37	1.81	1.60
Pharmaceutical products	0.02	0.05	0.05	-5.58	-0.30	4.81	-1.70	-2.13	6.26	-1.14	-0.15	0.93	-4.17	-6.46	4.51	-2.12	-1.79	5.82
Rubber and plastic products	0.03	0.05	0.15	-1.87	-0.36	3.58	-0.59	-1.53	3.89	-1.76	-4.46	-0.05	-4.10	-8.64	1.54	-0.77	-2.04	3.52
Other manufactures	-0.03	-0.03	0.22	-0.24	0.26	6.95	-0.05	-1.15	10.53	-0.93	-7.70	1.86	-0.62	-9.09	9.93	-0.10	-1.36	9.41
Metals and metal products	0.21	0.34	0.32	-2.52	1.25	4.50	-1.93	-0.47	9.87	-0.90	-0.71	0.49	-6.09	-13.02	5.71	-2.00	-0.25	8.39
Electronic products	0.09	0.25	0.24	-3.64	6.08	0.63	-0.49	-0.10	3.78	-0.16	-1.34	0.13	-4.82	-6.93	3.75	-0.58	0.66	3.00
Other machinery	0.43	0.76	0.30	-6.58	0.02	3.83	-3.84	0.33	11.15	-10.76	-16.71	0.20	-7.32	-20.53	6.12	-4.01	-0.03	9.16
Motor vehicles and parts	0.57	0.76	0.30	-9.73	-13.32	2.49	-2.07	-1.35	8.69	-2.44	1.28	0.81	-13.34	-17.94	3.09	-3.01	-6.52	6.54
Transport equipment	-0.40	-0.45	0.07	-0.63	3.10	2.71	0.32	4.69	4.88	-0.59	1.47	0.12	-0.56	-6.57	3.40	0.23	4.60	4.29
Other services	0.00	-0.44	0.25	0.14	0.41	0.17	0.03	-0.97	0.76	-0.04	0.25	-0.03	0.29	-5.05	4.40	0.05	-1.14	0.55
Construction	0.06	-0.28	0.34	1.48	8.32	6.13	1.52	5.93	23.78	0.41	5.73	0.74	4.40	-0.18	26.51	1.59	6.54	35.80
Hotels and Restaurants	0.05	-0.15	0.14	-0.06	0.10	10.82	0.01	-1.22	0.96	-0.06	0.29	0.07	0.13	-6.15	10.91	-0.01	-1.23	3.98
Maritime Transport	0.02	0.03	0.06	0.79	3.65	0.07	-0.02	0.01	0.34	-0.36	0.96	-0.65	7.48	12.94	-12.26	0.11	0.47	0.39
Air Transport	-0.14	-0.23	0.18	1.41	6.36	-0.25	0.15	3.43	0.45	0.60	5.32	-0.37	2.47	6.81	3.61	0.40	4.68	0.10
Communication	0.03	0.40	0.32	0.15	15.40	13.25	-0.34	7.47	8.97	0.20	14.50	0.08	0.28	11.45	15.87	-0.27	11.48	15.23
Banking	-0.11	-0.56	0.20	0.17	12.61	0.92	-0.01	11.58	0.56	-0.18	13.87	-0.09	0.34	14.85	1.86	0.03	11.95	0.75
Insurance	-0.05	-0.24	0.13	0.09	-0.07	0.46	-0.28	-0.88	0.52	-0.54	-0.14	-0.09	0.34	9.74	-7.47	-0.20	-0.51	5.87
Business Services	-0.03	0.04	0.49	-0.22	9.13	12.46	-0.29	5.93	10.13	2.54	8.87	19.27	-3.37	4.36	8.46	-0.30	6.47	6.38
Personal Services	-0.04	-0.49	0.15	0.21	0.54	0.12	0.03	-0.87	0.76	0.04	0.41	0.00	-0.73	-6.55	1.82	0.07	-0.91	0.46
Total Agriculture	**-0.47**	**-0.66**	**-0.04**	**1.45**	**4.07**	**5.65**	**0.64**	**0.06**	**3.77**	**0.14**	**0.42**	**-0.83**	**-0.13**	**-0.02**	**1.83**	**0.75**	**0.84**	**3.70**
Total Manufactures	**0.09**	**0.26**	**0.22**	**-0.99**	**-0.65**	**2.69**	**-0.48**	**3.11**	**5.61**	**-0.70**	**-1.85**	**0.37**	**-2.79**	**-6.61**	**3.61**	**-0.58**	**2.02**	**4.75**
Total Services	**0.00**	**-0.19**	**0.23**	**0.23**	**5.34**	**2.15**	**0.11**	**3.03**	**0.91**	**0.10**	**1.21**	**-0.04**	**0.68**	**-2.11**	**2.18**	**0.14**	**3.05**	**1.12**
TOTAL	**0.01**	**0.11**	**0.22**	**-0.03**	**1.14**	**2.77**	**-0.05**	**2.49**	**4.49**	**-0.07**	**0.06**	**0.30**	**-0.06**	**-2.46**	**3.34**	**-0.05**	**1.94**	**4.00**

Source: Authors' estimation

Regarding exports, Mercosur agricultural exports would grow by 0.84% (0.66 $US billion), while EU agricultural exports would decrease by -0.66% (1.4 $US billion). In the Bovine sector, Mercosur would increase its exports by 9.72% (1.1 $US billion). Almost a half of this increase corresponds to Argentina, which would increase its exports in this sector by 32.45% (0.45 $US billion). Moreover, Argentina shows highest increases in agricultural exports, with an increase of 4.07% (0.62 $US billion). In manufacturing sectors, although some sectors experience important reductions in Mercosur, others undergo high increases in production. For instance, Textiles reduce its output by -1.6% (0.71 $US billion), while the EU increases its output in this sector by 0.21% (0.35 $US billion). This sector is highly protected in Mercosur countries, where its import taxes stand from 12.5% (in Paraguay) to 20.1% (in Brazil). All the Mercosur countries experiment comparatively high reductions in production in this sector. Although exports from EU to Mercosur in manufacturing sectors would grow by 71.7% (38.5 $US billion), exports to regions outside the agreement would decline in all cases, especially to China (reduction of 1% or 12.7 $US billion) leaving a positive increase of 11.3 $US billion at the aggregate level.

5.2.2. The Bovine sector

We dedicate special attention to the Bovine and other ruminant meats sector[11] in both regions. According to International Trade Centre (2021), Brazil is the second largest Meat and edible meat exporter[12] after the US. This sector has traditionally been protected in the EU and it has the highest tariffs of all those applied to imports from Mercosur countries. The EU applies a tariff[13] over 43% to Bovine and other ruminant imports from Uruguay. In Brazil and Argentina, the applied tariff is over 50%. As shown in Table 8, the EU would reduce its production in this sector by 1.73% (2.1 $US billion), while Mercosur would increase it by 1.9% (1.9 $US billion).

Importantly, Table 8 shows the increase in production of this sector would be 1.32% (0.94 $US million) in Brazil. This does not seem to be a sizeable increase compared to the claims that often appear in the press. The increase in production would be somewhat larger in Argentina (3.97%, 0.78 $US billion) and Uruguay (3.23%, 0.15 $US billion), while being much smaller in Paraguay (0.36%, 0.012 $US billion).

Table 8 also shows that exports from this sector would go up particularly in Argentina (by 32.45%), followed at some distance by Brazil (7.55%) and Uruguay (6.70%), while experiencing a very small increase in Paraguay (0.62%). The increase in exports is very important in Argentina. However, other sectors experience larger increasing exports in Brazil and Uruguay. It is also remarkable that for Uruguay the increase in exports from this sector is particularly important in the context of agricultural exports and more broadly across all its exports, which experience a contraction in general.

Table 9 offers more detail by focusing on the effects for bilateral exports in this sector from Mercosur to the EU. Brazil would account for less than half of the total increase in exports from Bovine coming from Mercosur (i.e., 1.187 $US billion of a total of 2.839 $US billion). Moreover, it shows the small importance this sector has in terms of share in total exports to the EU in Brazil before the agreement (1.3%) and after the agreement (2.45%). In Argentina and Uruguay bilateral EU exports from this sector are much more important (4.2% and 14.9%, respectively).

Table 9. Impact on Bovine and other ruminant meats exports to the EU from Mercosur countries

Country	Pre-Agreement exports to the EU ($US Million)	Initial share in total exports to the EU	Percentage Change in exports to the EU	Post-Agreement exports to the EU ($US Million)	Post-Agreement share in total exports to the EU
Argentina	497.3	4.2%	98.9%	989.2	6.89%
Brazil	526.7	1.3%	125.5%	1187.6	2.45%
Paraguay	7.7	0.4%	-6.7%	7.2	0.37%
Uruguay	331.1	14.9%	97.8%	654.7	24.32%
Total	**1362.7**	**2.5%**	**108.3%**	**2838.8**	**4.20%**

Source: authors' elaboration

[11] Do note that this sector includes bovine meat but also cattle, sheep, goats, and horses, as well as their corresponding manufactures. It does not include pork neither poultry meat, which are in sector "Live animals, meat and animal products".

[12] In 2019 data from the International Trade Centre TradeMap tool shows that in 2019 Brazil exported 15.1 $US billion, and the US 17.6 $US billion.

[13] Weighted tariff, including the effects of quotas for the sectors in our model (Aguiar et al., 2019).

Exports of Bovine and other ruminant meats from Mercosur (except from Paraguay) to the EU countries would experiment important percentage increases. However, this is due to the small initial values of trade to the EU in these sectors.

5.2.3. US and China

A shown in Tables 6 and 7, US welfare would be reduced by 1.3 $US billion, which would be mainly caused by terms of trade losses. Our results are in line with the conclusions of the preliminary analysis published by the United States Department of Agriculture (USDA, 2021). They highlight that "based on presumed tariff reductions and quotas, (…) US agricultural products that compete with MERCOSUR and EU products will be at a significant disadvantage (…). Nearly $4 billion in US products are potentially threatened by MERCOSUR competition and tariff reductions under the new EU-MERCOSUR trade deal." (USDA, 2021). In particular, USDA states that products like Feeds, Fooders or Beef & Beef products would be at risk. Regarding exports to Mercosur, the USDA highlights some overlapping competitive interests at risk for some sectors, such as Dairy products or Processed vegetables. Our estimates are also in line with this intuition. With respect to US exports to Mercosur, Sugar and Dairy products would be especially affected, with reductions of 5.3% (0.002 $US billion) and 10.9% (0.003 $US billion) in exports. However, aggregated agricultural exports to Mercosur would experiment increases, mainly due to Cereals, whose exports to Mercosur would increase by 3.7 % (0.027 $US billion). Although US aggregated exports to the EU show an increase of 0.6% (2.5 $US billion), agricultural sectors would experience a reduction of 0.6% (0.038 $US billion). As the USDA preliminary analysis show, sectors in which Mercosur countries compete with the US in exports to the EU would be affected. US Vegetables, fruits and nuts would reduce its exports to EU by 0.4% (0.012 $US billion) and the Bovine sector by 6.2% (0.021 $US billion). These sectors experiment the highest increases in exports to the EU from Mercosur. Highest impacts on the US take place in manufactures, where exports to Mercosur experiment important reductions, i.e., Pharmaceutical products by 12.4% (0.25 $US billion) or Other machinery by 20.4% (1.7 $US billion). US would also lose competitiveness in Services sectors, with an overall reduction of its exports to Mercosur of 3.3% (0.54 $US billion).

At a sectoral level, although results show some reductions in China's exports to the EU, the main impacts are driven by a decrease in trade with the Mercosur region. China would increase its manufacturing exports to the EU by 0.9% (3.1 $US billion), whereas it would reduce its manufacturing exports to the Mercosur region by 11.7% (6.5 $US billion). Highest decreases in exports rely on Electronic products and Other machinery, with reductions of 9.1% (1.4 $US billion) and 6.3% (2.9 $US billion), respectively. These negative impacts could have a higher importance than perceived, as China could lose competitiveness in manufacturing sectors, in which it traditionally has had a dominant position in the world. They would reinforce the change in China's strategy due to a rise in wages and competitiveness erosion in labor-intensive manufacturing industries (Lawrence, 2019; Latorre et al., 2018).

The robustness of the results is analyzed in the sensitivity analysis displayed in Appendix 2.

6. Conclusions

This study provides a quantitative estimation of the impact of the EU-Mercosur trade agreement. Our analysis includes trade liberalization in goods and services, by means of tariff, quotas and non-tariff measures, together with a specific simulation for public procurement openness.

Our results are largely in line with previous studies, such as LSE (2020), Sinabell et al. (2020) or Timini & Viani (2020), which basically find positive outcomes for all signatories that are larger for Mercosur economies. However, we extend the micro and macro results offered in those studies. Besides, we provide tailor made sectoral impacts. LSE (2020) simulations started before the agreement was reached and they do not differentiate among sensitive agricultural sectors. As some of these sectors include quotas, we have considered them when defining the model sectors. Sinabell et al. (2020) and Timini & Viani (2020) focus on the quantitative impacts at the macroeconomic level derived from trade in goods (i.e., not including services) using NQTMs. The main differences with respect to these studies are: (1) we use the GTAP model, which allows us to extract not only a broader set of results at the macro level but also the impact on production, imports and exports for 36 sectors and (2) our estimates are based on official documents from the European Commission and Mercosur countries, instead of being based on how previous treaties shocked trade. In addition to the tariff reduction and non-tariff reduction simulations, we have performed a specific simulation for the reductions in NTMs related to the openness of public contracts, which has not been included in any previous analysis of this kind (to the best of our knowledge). The impact of this component of the agreement is quite remarkable, particularly, for Mercosur countries.

Macroeconomic results show clear gains for signatory countries and small losses for the US and China. Moreover, on the Mercosur side, these gains are proportional to the size of each economy along with the level of commitment with trade liberalization. Uruguay is the country that would benefit the most, with a GDP increase of 0.61% and a welfare gain of 0.97% (measured as a percentage of GDP). On the opposite extreme, Paraguay is the country that *a priori* shows most conservative openness (e.g., no opening of public contracts) and, therefore, it would have the most conservative gains (0.04% increase GDP and 0.04% welfare gain). Regarding the EU, it would increase its GDP by 0.04% and its welfare by 0.06%, which is in line with previous studies. Wages would increase by 0.20% in the EU. We find that EU results are mostly driven by tariffs' reductions, while generally for Mercosur non-tariff measures and public procurement play a larger role than tariffs.

We pay particular attention to the impact on the Bovine sector. We find that after the agreement Brazil would increase its exports by 7.55% and its production by only 1.32%. Furthermore, Brazil would not account for the majority of exports coming from Mercosur to the EU in this sector. Brazil would account for less than half, while Argentina and to a lesser extent Uruguay would account for the largest shares.

The negative impacts are mainly located on non-signatory regions. Overall, the agreement would have a negative impact on the US and China, reducing its welfare and its wages, among others. However, it would be slightly higher in China than in the US, since the agreement would especially impact on manufacturing sectors, in which China

has a major presence in Mercosur the US does. However, both the US and China would experiment a competitivity loss in some sectors in which they have an important presence on signatory regions, especially on Mercosur. Pharmaceutical products, Motor vehicles, Construction or Communication services, among others, would experiment reductions over 18% in its exports to some Mercosur countries.

Finally, our sensitivity analysis supports the robustness of the positive outcomes we derive for this agreement, under different elasticities' values.

Appendix 1: Tables

Table A1. Model sectors and correspondence with GTAP 10 sectors

Nº	Code	Description	Equivalent GTAP Sector/s	Type
1	CER	Cereals	1, 2, 3, 5, 23	Agriculture
2	V_F	Vegetables, fruits, nuts	4	Agriculture
3	SGR	Sugar	6, 24	Agriculture
4	OCR	Plant & animal fiber, others	7, 8, 12, 14	Agriculture
5	CMT	Bovine and other ruminant meats	9, 19	Agriculture
6	OAP	Other animal products	10	Agriculture
7	MIL	Dairy products	22	Agriculture
8	FRS	Forestry	13	Agriculture
9	GAS	Gas, coal, oil extraction or distribution	15, 16, 17, 18, 47	Manufactures
10	OMT	Live animals, meat and animal products	20	Manufactures
11	VOL	Vegetable oils and fats	21	Manufactures
12	OFD	Food products nec	25	Manufactures
13	B_T	Beverages and tobacco products	26	Manufactures
14	TEX	Textiles	27	Manufactures
15	WAP	Wearing apparel	28	Manufactures
16	LEA	Leather products	29	Manufactures
17	L_P	Wood products	30, 31	Manufactures
18	PCH	Petroleum, coal and other chemical produc	32, 33	Manufactures
19	BPH	Pharmaceutical products	34	Manufactures
20	RPP	Rubber and plastic products	35	Manufactures
21	OMF	Other manufactures	36, 45	Manufactures
22	MMP	Metals and metal products	37, 38, 39	Manufactures
23	ELQ	Electronic products	40	Manufactures
24	OMA	Other machinery	41, 42	Manufactures
25	MVH	Motor vehicles and parts	43	Manufactures
26	OTN	Transport equipment	44	Manufactures
27	OSE	Other services	48,50,52,55,62,63,64,65	Services
28	CNS	Construction	49	Services
29	AFS	Hotels and Restaurants	51	Services
30	WTP	Maritime Transport	53	Services
31	ATP	Air Transport	54	Services
32	CMN	Communication	56	Services
33	OFI	Banking	57	Services
34	INS	Insurance	58	Services
35	OBR	Business Services	59, 60	Services
36	ROS	Personal Services	61	Services

Source: authors' elaboration based on Aguiar et al. (2019)

Appendix 2: Sensitivity analysis

We carry out a sensitivity analysis following the approach of Ortiz & Latorre (2019). We have doubled and halved the initial values of the following three elasticities:

- Elasticity of substitution between primary factors in production (ESUBVA)
- Armington elasticity of substitution between imported/domestic varieties (ESUBD)
- Armington elasticity of substitution for regional allocation of imports (ESUBM)

We rerun all three simulations (Tariff reduction, NTM reduction, Public Procurement reduction) with the new elasticities and compare the results for GDP with the ones presented above. Table A2 shows that our results are robust to changes in the elasticities.

Table A2. Sensitivity analysis results

qgdp	Original GDP impact	ESUBVA		ESUBD		ESUBM	
		Double	Half	Double	Half	Double	Half
EU_27	0.04	0.04	0.04	0.05	0.04	0.07	0.02
ARGENTINA	0.26	0.26	0.26	0.29	0.25	0.39	0.20
BRAZIL	0.13	0.13	0.13	0.14	0.13	0.17	0.10
PARAGUAY	0.04	0.04	0.04	0.04	0.04	0.09	0.03
URUGUAY	0.61	0.61	0.62	0.60	0.63	0.73	0.53
USA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHINA	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00

Source: authors' own elaboration.

GDP impact remains unaffected when the elasticity of substitution between primary factors in production (ESUBVA) is modified. Besides, the changes in ESUBD elasticities (imported/domestic) lead to small changes in GDP, in which higher values lead to larger GDP impacts, and vice versa. Larger elasticities increase the easiness with which consumer and producers can substitute varieties. Thus, reduction of trade restrictions leads to higher GDP because the number of similar imported varieties increases.

Regarding the elasticity of substitution for regional allocation of imports, the expected gains are higher with larger elasticities because consumers perceive the different imported varieties as more similar. Therefore, Mercosur varieties can displace varieties coming from other areas more easily and the same applies to EU varieties in Mercosur.

Harrison et al. (2002) compared different scenarios under Chile's strategy negotiation of bilateral free trade agreements. They use two levels of elasticities for ESUBD and for ESUBM. In the first case, which they call *low elasticities,* values are very similar to those used in this study. In the second case, they assume a level of 15 for ESUBD and of 30 for ESUBM (both of which are around 5-6 times larger than the original values). They call these larger elasticities *central elasticities.* Results for a scenario in which Chile forms an FTA with Mercosur show very different impacts depending on the elasticities used. With *central elasticities*, trade diversion would dominate trade creation and lead to welfare

losses for Chile's economy, while with *low elasticities* a positive welfare result for Chile is obtained.

To further check the robustness of our results, we replicate the analysis of Harrison et al. (2002) and rerun our simulations with their "central elasticities" (i.e., 15 for ESUBD and 30 for ESUBM). Interestingly, contrary to the findings of Harrison et al. (2002) we still obtain that trade creation effects dominate trade diversion in signatory countries and this phenomenon is found to be more accentuated when we increase these elasticities. This provides additional support for the positive outcomes of this agreement.

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