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Effects of EU-MERCOSUR trade agreement on bilateral trade: the role of Brexit

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Abstract: This article aims to assess the impact of the EU-Mercosur Agreement on the Brazilian economy using the Computable General Model (CGE) Global Trade Analysis Project (GTAP). The study proposes two sets of simulations – one with the United Kingdom as a member of the EU and the other without being a member, according to Brexit context. There is evidence of positive effects on foreign trade and on the welfare level in Brazil, with emphasis on manufactured goods and the grains of crops. The EU consolidates its presence in global trade. The results show that Mercosur benefits Brazilian foreign trade, making it a strategic partner at the regional level. It is concluded that Brexit can reduce Brazilian gains in the EU-Mercosur agreement, being important the discussion about the creation of another agreement involving the United Kingdom.

Keywords: Policy analysis, GTAP, Brexit, Brazil, Mercosur.

1. Introduction

After almost 20 years, Mercosur concludes negotiations on a specific agreement with the European Union (EU) (Gortari, 2019; Wang, Liu, Lv, & Zhao, 2019). The agreement is signed at a time adverse to international liberalization policies. Major trading partners renegotiate agreements or adopt protectionist policies, such as the US-proposed NAFTA reform debate, the trade war with China, and Brexit in the EU. The trade agreement between the EU and Mercosur reveals challenges in the formulation of Brazilian trade policy. From an export standpoint, the main tendency is to stimulate the agro-export sector, as Brazil is currently the second-largest exporter of agricultural products for Europe (SECEX, 2020). This agreement must also spread knowledge and technologies, creating innovation and an increase in productivity (Choi, 2019).

This paper aims to evaluate the impact of the EU-Mercosur Agreement on the Brazilian economy using the Global Trade Analysis Project (GTAP) as a general equilibrium model (Booth et. al., 2015; Kawasaki, 2017; Belke & Gross, 2017). The Mercosur countries integration allowed a substantial increase in the trade flows but restricting the expansion of Brazilian trade policy as an example, bilateral agreements. Recent Brexit negotiations raise doubts about the effects of the agreement for Latin America countries. The United Kingdom has the potential to increase the size of the European market and exiting the country from the bloc can generate considerable trade distortions.

There is a market potential in the trade relationship between Mercosur and the EU that can contribute to the liberalization of Brazilian economy. Currently, the South American market is highly protected, and this agreement can be an opportunity to increase competitiveness at a global level. The specific agreement provides for the removal of tariffs in Mercosur, such as 35% on cars, 14 - 18% on car parts, 18% on chemical products, 14% for pharmaceutical products. In the general commercial framework, most of the products exported by Mercosur to the EU are from agriculture, such as soy, soy oil and coffee. In turn, most of the products exported by the EU to Mercosur are from the Petrochemical and Medicines industry. Brazil has an important destination in European countries for national manufacturing production (COMEXSTAT, 2019). Of all trade between Europe and Mercosur, more than 70% is related to Brazilian participation.

In this study, we simulate the liberalization policy with the reduction in tariff power for all tradable goods. This scenario design implies that the potential gains in competitiveness of the Brazilian economy are dependent on the current tariff structure, that is, the reduction is proportional and industry-specific, so that the positive effects depend on the input-output structure of the entire international production system. In this way, we were able to have a clearer view on the need for specific sectorial adjustments that would allow the Brazilian economy to benefit in terms of a closer link with global markets, since historically the country's commercial and industrial policy was considered closed and oriented to the large domestic market. We can summarize our contributions in three main aspects: firstly, it generates evidence to guide the debate on protectionism and multilateralism at the detailed level of sectors, allowing for long-term analysis; second, we consider the feedback effects when analyzing trade links with national economies with GTAP model, and; third, we verify the geographical reorientation of trade flows between Mercosur and the EU within Brexit. The economic effects for Brazil, in terms of bilateral trade gains, welfare level and redefinition of the main trading partners contribute to the orientation on the most efficient trade policy for the country.

This article is structured in 5 sections. The second summarizes the main trade characteristics between Mercosur and the European Union. The third details the model and the simulations applied. Section 4 presents the results and the last the final considerations.

2. Potential gains for Brazil from the EU-Mercosur agreement

The relations that already exist between both economic blocs can verify the extent of the effects expected by the agreement between Mercosur and the European Union. Together, Mercosur and the European Union represent about 25% of GDP of the world economy and a consumer market of 773 million people. The EU is Mercosur's 2nd largest trading partner, after China, and Mercosur is the EU's 8th largest extra-regional partner.

Within Mercosur, since its foundation, intra-regional trade has multiplied over 12 times, from US\$4.5 billion in 1991 to a peak of US\$57 billion in 2013. In 2019, data up to July show growth of 22.1% in Brazilian exports (US\$13 billion) and 53% in Brazil's trade balance with the bloc (US\$5.9 billion) compared to the same period in 2016 (MERCOSUR, 2019). The bloc also stands out for being the main recipient of Foreign Direct Investment (FDI) in the Latin America continent: 46% of the total for 2016 and 65% of the total for South America in the same year (UNCTAD, 2020). There was also an increase in the percentage participation of the bloc as a destination for foreign investments in the world: in the pre-crisis years (2005-2007), MERCOSUR received 2% of world investment; in 2015, it received 4.4%; and, in 2016, 3.7%. In 2018, 89% of the flows from Brazil to the other countries in the bloc were industrialized products. The growth of exports of these goods in relation to 2020 is 28.3%, almost triple the 10.4% registered in the total of Brazil in the same period.

The importance for Brazil of the EU-Mercosur agreement is verified by the intense trade with Europe. In 2018, the country recorded a trade of US\$76 billion, with a surplus of US\$7 billion, of which US\$42 billion is for exports to the EU, representing 18% of total Brazilian exports. In addition, the EU is the largest foreign investor in Mercosur, with Brazil being the largest destination for Foreign Direct Investment (FDI) in the EU countries in Latin America, corresponding to the 4th largest non-EU FDI destination. In 2017, the EU injected US\$433 billion in investments into Mercosur.

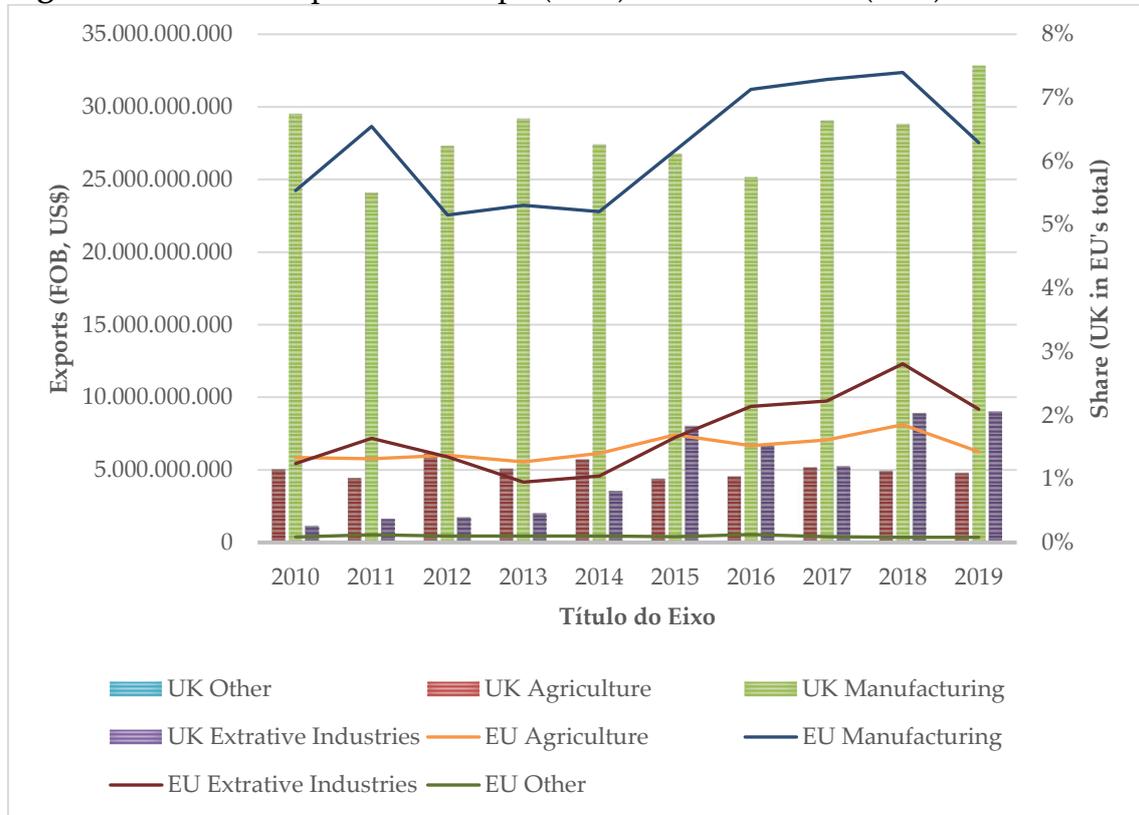
In relation to Brexit, there are risks worldwide because customs rules are changed, and potential opportunities because it allows new market spaces to be opened. In relation to Brazil, there is potential for the agricultural area, in which the country is competitive. The Brexit transition period can be an opportunity to expand the dialogue and start negotiations for new trade agreements in various sectors. According to Figure 1, among Brazilian exports to Europe, on average, 8% were destined for the UK. The UK imports about 50% of what it consumes in food and beverages, of which 60% are of European origin. If Brexit is to guide the reduction of trade flows between the EU and the UK, countries like Brazil may benefit from an eventual redirection of the origin of these imports. In 2018, about 4% of the food consumed in the United Kingdom was of South American origin.

The challenges of the European context can position Brazil in becoming competitive in sectors other than the primary ones. It is interesting to note that most exports are manufactured products. The EU-Mercosur agreement provides for the reduction of tariffs for this type of good, which may increase Brazilian (and Mercosur's) competitiveness due to the increase in the flow of manufactured goods to the European continent.

The agreement will gradually remove customs tariffs for 92% of goods exported by Mercosur to the EU and 91% of products exported from the EU to Mercosur. Import and export tariffs should be zero within ten years, and the rest of exports will have preferential access through exclusive quotas and partial tariff

reductions. Only 24% of Brazilian exports enter the European market free of tax obstacles.

Figure 1. Brazilian exports to Europe (lines) and UK's share (bars).



Source: COMEXSTAT (2020).

Although it offers significant economic benefits, the agreement does, however, provide for the promotion by countries of high standards in terms of sustainable development and protection of human rights. Both blocs committed themselves to implementing the Paris Agreement on Climate Change. According to the Paris Agreement, Brazil should reduce, by 2025, the emission of greenhouse gas by 37%, compared to the 2005 indexes, reforest 12 million hectares of the Amazon forest by 2030, and the EU should reduce domestic emissions by 40% by 2030. Regarding the protection of workers' rights, there is a ban on forced or child labor, non-discrimination in the work environment, freedom of association and the right to collective bargaining, and protecting human rights and indigenous communities.

3. Methods and data

3.1 Setting GTAP Model

To evaluate the impact of changes in multilateral policy on the Brazilian economy, we adopted the General and Computable Equilibrium (CGE) model

Global Trade Analysis Project (GTAP) version 9. GTAP integrates a series of equations that provide a complete description of economic functioning: (i) the national standard income and expenditure accounts; (ii) the breakdown of the industry by sector, which reflects inter-sector relations (intermediate products and services of domestic or foreign origin); (iii) a production function for each sector that determines the amount of capital, qualified and unskilled labor and intermediate inputs needed to produce; (iv) trade balance that models international calls for each sector of the economy (Booth et al, 2015). In this study, the model is calibrated for 57 sectors and 8 production factors from input-output matrixes from 140 countries for three years - 2004, 2007 and 2011 (Aguiar, Narayanan & McDougall, 2016). Our baseline consider eleven regions aggregations: 1 - Brazil (BRA); 2 - Argentina (ARG); 3 - Uruguay (URU); 4 - Paraguay (PAR); 5 - EU (EU); 6 – United Kingdom (GRB); 7 - United States (USA); 8 - China (CHI); 9 - Andean Community (DAC)¹; 10 - Rest of Latin America (RAL); 11 - Rest of the world (ROW).

British citizens no longer belong to the European Union as of February 1, 2020, moving on to the transition period to regulate relations between the UK and the EU. During this new phase of negotiations, UK will have to follow the rules of the bloc - to remain within the European common market – but will not have a voice in the European Parliament or any other EU institution. Thus, the second scenario - which excludes the United Kingdom (GRB²) from the European Union, the model now has twelve regions (the same above plus GRB). Regarding the sectors, we consider the nine activities included in the GTAP model.

3.2 GTAP scenarios

We are interested in analyzing the effects of the EU-Mercosur agreement on foreign trade and the level of well-being in Brazil. The modeling of the EU-Mercosur agreement has the initial shock of changing tariff barriers, which influence the level of prices and competitiveness in international trade. The shock calculation is implemented as the power of the tax, that is, $1 + \text{tax rate}$ (this has the advantage of allowing additional price-binding equations when the model is fully differentiated) (Corong, Hertel, McDougall, Tsigas, & van der Mensbrugghe, 2017). Two scenarios were simulated with changes in customs tariffs for a set of goods traded between both regions, and in one situation we assume that the UK is part of the EU, and that in the second scenario it is an independent region, as in Table 1.

¹ Colombia, Peru, Venezuela, Bolivia and Ecuador.

² The GTAP nomenclature for United Kingdom. In this paper we will use GRB or UK to describe the country.

- a) **Scenario 1:** The first simulation represents the formalization of a trade agreement between Mercosur and the EU. In this scenario, we assume that the United Kingdom (GRB) is still an EU-member. It is proposed to reduce the Mercosur import tariffs to EU countries in 75% for tradable goods, and the equivalent change to Mercosur countries by the EU.
- b) **Scenario 2:** The second scenario reflects the Brexit from the EU. In this case the UK is considered by Mercosur as a third country, non-EU and without bilateral agreements. The EU countries apply as same tariff as to non-European (non-EU) to UK and vice versa.

The proposed alternative scenarios are sector-specific and consider the current existing Mercosur tariffs that will be removed (European Union, 2019). Current rates are 35% for cars, 14 - 18% for car parts, 18% for chemicals, 14% for pharmaceuticals. The agricultural sector is the main market of Mercosur for the EU. Both scenarios foresee a 75% reduction in charged tariffs and the expected results are relative competitiveness gains for the Mercosur countries.

Table 1. Scenarios simulated

Scenarios	Exogenous shock	Origin	Destination	Industry	Change (%)
1	<i>tms</i> (power of the tax on imports)	EU ¹	BRA ARG URU PAR	Traded Commodities (TC)	-75%
			BRA ARG URU PAR	EU	Traded Commodities (TC)
2	<i>tms</i> (power of the tax on imports)	EU	BRA ARG URU PAR	Traded Commodities (TC)	-75%
			BRA ARG URU PAR	EU	Traded Commodities (TC)
	TFRV (ordinary import duty)	GRB	EU	All industries	Same of GRB to ROW
		EU	GRB	All industries	Same of EU to ROW
	RTMS (target the sector-level tariffs)	GRB	EU	All industries	Same of GRB to ROW
		EU	GRB	All industries	Same of EU to ROW

Note: 1 – In this aggregation setting, GRB is part of European Union.

Under the EU-Mercosur agreement, it is foreseen that 92% of imports from Mercosur will enter tariff-free in the EU. Similarly, 91% of imports from the EU will enter tariff-free in Mercosur. Tariffs will be partially removed for the EU in

baskets of 0, 4, 7 and 10 years and for Mercosur in baskets of 0, 4, 8, 10 and 15 years, justifying the 75% shock. Under the treaty, products such as meat, sugar, ethanol, rice, honey, and corn will have entry quotas (maximum values) into Europe. In the industrial sector, Europe will release 100% of its tariffs in 10 years and Mercosur will liberalize 91% of volume trade and tariff lines, and the scenario will consider the value of 75% (as in the scenario 1).

In addition to the shocks related to the EU-MERCOSUR trade agreement, the second scenario it is assumed that the United Kingdom (GRB) partially follows the trade agreements in force by the EU (soft Brexit). The start of the UK's negotiations with the other countries depends, ultimately, on the country's established agreements with the EU. Respecting the transitional and indefinite period of trade rules between the EU and UK, we assume an intermediate situation between "Brexit without agreement" (hard Brexit) and the complete maintenance of the agreements in force in the European Union with the other countries. In this sense, we consider that two tariff sets – for import (RTMS) and TRFV (Ordinary Import Duty) - adopted by both of these regional aggregations to the Rest of the World (ROW) are identical to those applied to bilateral trade flows between the United Kingdom (GRB) and the EU. When creating the regional aggregation³ unique to GRB region, GTAP proportionally recalculated the other corresponding parameters and tariffs.

3.3 Behavioral parameters and effects

The intensity of the effects calculated by the model depends on the behavioral parameters and the relationship between the variables in the model equations, which influence the formation of domestic prices and those practiced in international trade. In GTAP, there is allow for imperfect substitution in the presence of multiple economic activities, in which case these commodity prices are differentiated by activity industry, with differentiation governed by a substitution elasticity. The structure assumes CES production function and Armington substitution elasticity between goods by different origins. The effect size in response to exogenous shock depends on the behavioral parameters of the CGE. Table 2 shows the main GTAP substitution parameters. The first three columns show the CES coefficient between primary factors in production (ESUBVA), the Armington CES for domestic and imported allocation (ESUBD) and the Armington CES for regional allocation of imports (ESUBM). The remaining columns show the CDE (constant difference of elasticities) substitution parameters for each regional aggregation. Scenarios are built based on nationalist trade policies promoted by different countries as a reflection of changes in the world economic integration dynamics.

³ GTAPAgg software was used.

Table 2. Behavioral parameters on GTAP model

Industries	ESUBVA	ESUBD	ESUBM	CDE (constant difference of elasticities) substitution parameters										
				BRA	ARG	URU	PAR	EUA	CHI	RAL	EU	CAD	GRB	ROW
1 GrainsCrops	0,3	2,6	5,1	1,0	1,0	1,0	0,9	1,0	0,8	0,9	1,0	0,9	1,0	0,9
2 MeatLstk	0,5	3,1	7,4	0,6	0,6	0,6	0,8	0,2	0,7	0,7	0,4	0,7	0,3	0,6
3 Extraction	0,2	4,9	11,4	0,6	0,5	0,5	0,6	0,2	0,7	0,6	0,3	0,7	0,3	0,7
4 ProcFood	1,1	2,2	4,5	0,7	0,6	0,6	0,8	0,3	0,8	0,7	0,4	0,8	0,4	0,6
5 TextWapp	1,3	3,7	7,5	0,6	0,6	0,6	0,8	0,2	0,7	0,7	0,3	0,7	0,3	0,6
6 Manufaturado	1,3	3,4	7,1	0,5	0,5	0,5	0,6	0,2	0,6	0,5	0,2	0,6	0,2	0,4
7 Util_Con	1,4	2,1	4,7	0,4	0,4	0,4	0,6	0,1	0,6	0,5	0,2	0,5	0,2	0,4
8 TransComm	1,6	1,9	3,8	0,4	0,4	0,4	0,6	0,1	0,5	0,5	0,2	0,5	0,2	0,3
9 OthServices	1,3	1,9	3,8	0,4	0,4	0,4	0,6	0,2	0,5	0,5	0,2	0,5	0,2	0,3
Total	9,9	25,8	55,0	5,1	5,0	5,0	6,2	2,5	5,8	5,5	3,1	5,9	3,0	4,7

Source: GTAP model.

The specific basic price of the goods and the activity is equal to the supplier's price plus a specific ratio between tax and subsidy for the goods and the activity. Domestic supplies are allocated to the destination regions - the domestic market and all foreign destinations according to bilateral exports. Export prices are obtained by multiplying domestic prices with the export tax rate. This converts the price of the domestic offer into the price of exports, observing the price before freight and insurance are added. Given a (potentially) bilaterally variable export tax, that price is now destination specific. The free on board (FOB) price goes through two additional transformations in route to its final destination: (i) a shipping margin is added to the FOB price to generate the CIF price for imports; (ii) a bilateral tariff (TMS) is added to the latter to generate the price of imports in the domestic market by origin.

In this exercise, the simulated liberalization policy affects the exogenous variable $tms(i, r, s)$, which represents the percentage change in the power of the import tax of industry i , from region r (source) to region s (destination) (Hertel & Tsigas, 1997). Both scenarios considered that all tradable goods (ALL_TRAD_COMM) sourced in EU and destined for Mercosur are also affected with a 75% reduction in the power of the tax. This tends to affect the set of economies' prices, implying decisions made by agents between purchasing goods produced domestically or abroad. In the simulations, all tradable goods produced in the Mercosur countries now have a reduction in the import tariff for purchases made by the EU, encouraging direct trade between these regions⁴. In a simplified way, the domestic price linkage equation (which

⁴ The actual percentage change in power is calculated by $\frac{tms_1 - tms_0}{tms_0}$, where the initial tms rate in given by GTAP 9 database. In this case, the simulations were for tradable goods originating in EU countries destined for countries in the Mercosur with a 75% reduction in tms compared to the baseline in the GTAP 9 database, and vice versa.

associates domestic prices with global prices) for the industry i , region of origin and destination, can be written as:

$$pms(i, r, s) = tm(i, s) + tms(i, r, s) + pcif(i, r, s) \quad (1)$$

Shocks applied to tms generate effects on the level of prices in trade between the different regional aggregations of the system. The model assumes that the general source of import tax (tm) is exogenous, since countries do not impose a higher tariff on traded goods provided by other countries. However, the size of the effect on pms depends on the global CIF price level of the tradable commodity i that is imported from origin r to destination s , after the inclusion of transport margins, $ptrans(i, r, s)$. In specific:

$$pcif(i, r, s) = FOBSHR(i, r, s) \cdot pfob(i, r, s) + TRNSHR(i, r, s) \cdot ptrans(i, r, s) \quad (2)$$

The changing in tariffs on imports (tms) generates changes in the level of import prices ($pms(i, r, s)$ and $pim(i, s)$). The decision of domestic agents between purchasing imported products or offered nationally will reflect on the level of domestic prices. The interdependence of the model implies that the CIF world price of imports also changes, however, in a smaller proportion than the power of import taxes, tms . The relationship between FOB and CIF prices for each industry i considers the share of FOB price and transport in imports. FOB costs tend to vary in the same direction as the variation in the CIF price, which may be related to the variation in domestic prices. This dynamic implies changes in the demand for exports (from r to s):

$$qxs(i, r, s) = qim(i, s) - ESUBM(i) \cdot [pms(i, r, s) - pim(i, s)] \quad (3)$$

where $ESUBM$ is the region-generic elasticity of substitution between imported and domestic goods i (according to Table 2), $qim(i, s)$ is the aggregate imports of i in region s , and $pim(i, r, s)$ is the price market value of aggregated imports of tradable commodities i in the region s . The model considers that the prices of aggregate imports are related to the technical coefficient and the domestic price level:

$$pim(i, s) = \sum (k, REG, MSHRS(i, k, s) \cdot [pms(i, k, s) - ams(i, k, s)] \quad (4)$$

where $MSHRS(i, k, s)$ is the market share of the source s in aggregate imports of tradable commodities i in the regions valued at market prices. The variation in import preference implies changes in the effect on export sales (qxs), however, given that the variation in $pim(i, s)$ is assessed as share, the magnitude of the

variation in the aggregate import price depends on the level of change in import preference.

A national importer aggregates bilateral imports from all sources to ‘produce’ an aggregate import package at a price of imported supplies. Every economic agent - companies, families, government, and investments - accesses this common market for import packages at a common price that competes with goods supplied domestically with domestic prices. Bearing this in mind, the next section presents the main results for the Brazilian economy in relation to foreign trade and welfare level.

4. The EU-Mercosur simulations results

In this section, we present the main results of the simulations. Initially, we analyzed the impacts on foreign trade of regional and sectoral aggregates we considered in the study. Following, we highlight the effects on the Brazilian economy based on the structure of the GTAP model. From the GTAP model, we can evaluate a set of possible strategies for Brazilian trade policy. The global GCE models allow us to capture cross-sectoral linkages between countries, generating feedback effects that enable increased welfare levels. Empirical evidence from models applied to trade liberalization analysis tends to yield results that show a reduction in regional inequality in developing regions (Haddad & Azzoni, 2017). According to the competitive advantages of countries, liberalization tends to favor specialization. In this sense, for Mercosur members, the relevant role of the primary sectors for the trade balance is crucial for promoting competitiveness and for variations in international price levels.

The model theoretical mechanisms assume that the demand stimulus generated by fluctuations in intermediate prices tends to generate positive effects for the trade balance in the region. Table 3 shows the expected percentage change in value of exports of tradable commodity i from source region r using fob weights (is a linearized form of exports). In the first scenario, we simulate the EU-Mercosur agreement without Brexit. It is important to note that agricultural products are of strategic interest to the Brazilian economy, and that the agreement promotes the reduction of tariffs on key products, such as orange juice, fruits, soluble coffee, fish, crustaceans, and vegetable oils. Brazilian exporters of beef, pork and poultry, sugar, ethanol, rice, eggs, and honey will have preferential access to the European consumer market.

Table 3. Changes on value of merchandise regional exports, by commodity ($vxwfob$)

	Industry	BRA	ARG	URU	PAR	EUA	CHI	RAL	EU	CAD	ROW	GRB
Without Brexit	GrainsCrops	7.00	6.75	- 5.40	7.78	10.46	10.17	10.06	10.20	9.84	10.15	-
	MeatLstk	54.83	166.98	97.67	36.27	10.86	6.63	8.96	- 1.78	7.32	7.95	-
	Extraction	9.48	12.04	5.67	1.52	10.04	10.05	9.99	9.80	9.99	9.98	-
	ProcFood	19.78	5.74	- 5.17	14.48	10.19	9.92	10.09	9.64	9.98	9.92	-

Industry	BRA	ARG	URU	PAR	EUA	CHI	RAL	EU	CAD	ROW	GRB
TextWapp	7.19	5.47	-15.20	1.21	10.07	9.94	9.97	10.76	9.75	9.99	-
Manufactury	6.74	3.30	- 5.83	2.17	9.92	9.96	9.81	10.59	9.76	9.92	-
Util_Cons	7.02	6.94	- 5.21	8.18	10.20	10.21	10.25	9.84	10.29	10.14	-
TransComm	7.92	5.79	2.19	8.31	10.21	10.16	10.19	9.99	10.26	10.12	-
OthServices	6.94	5.28	- 4.33	7.10	10.27	10.23	10.26	9.88	10.33	10.18	-
GrainsCrops	7.53	6.63	- 3.28	7.77	10.42	10.17	10.07	10.19	9.87	10.14	9.55
MeatLstk	47.81	164.66	84.52	35.08	10.76	6.79	9.23	1.41	7.02	8.41	- 3.68
Extraction	9.62	11.93	4.36	1.79	10.02	10.03	9.99	9.79	9.99	9.98	9.99
ProcFood	18.79	5.75	- 2.71	14.25	10.21	9.94	10.11	9.67	10.00	9.95	9.42
TextWapp	7.89	5.17	-11.96	1.37	10.06	9.94	9.97	10.76	9.75	9.99	10.12
Manufactury	7.29	3.51	- 3.50	2.45	9.93	9.96	9.82	10.58	9.79	9.93	10.02
Util_Cons	7.59	6.77	- 2.86	8.14	10.20	10.21	10.25	9.83	10.29	10.15	10.15
TransComm	8.28	5.80	3.38	8.32	10.19	10.15	10.18	9.97	10.24	10.11	10.12
OthServices	7.44	5.28	- 2.17	7.11	10.24	10.20	10.23	9.84	10.30	10.15	10.15

Source: Own elaboration, based on GTAP results.

The main sectors benefited by the liberalization policy in Brazil are meat and processed foods. It is interesting to note that other Mercosur countries are also benefited, despite Brazil benefiting from greater increases in all industries, apart from meat, in which Argentina dominates in terms of increased exports. In comparison to the second scenario, it is interesting to note that gains for Mercosur are relatively lower than in the first scenario, indicating that the UK as an isolated region has the potential to capture part of the international demand in these sectors. The EU will open itself only to agricultural products from Mercosur that have administered quotas, to reduce possible negative impacts on the local subsistence agriculture. In the agri-food sector, the agreement provides for the elimination of customs tariffs for exports of EU products in Mercosur, such as chocolates (currently taxed at 20%), wines, non-alcoholic beverages and dairy products, including cheeses. The effect on meat exports is increasing and dominate other sectors.

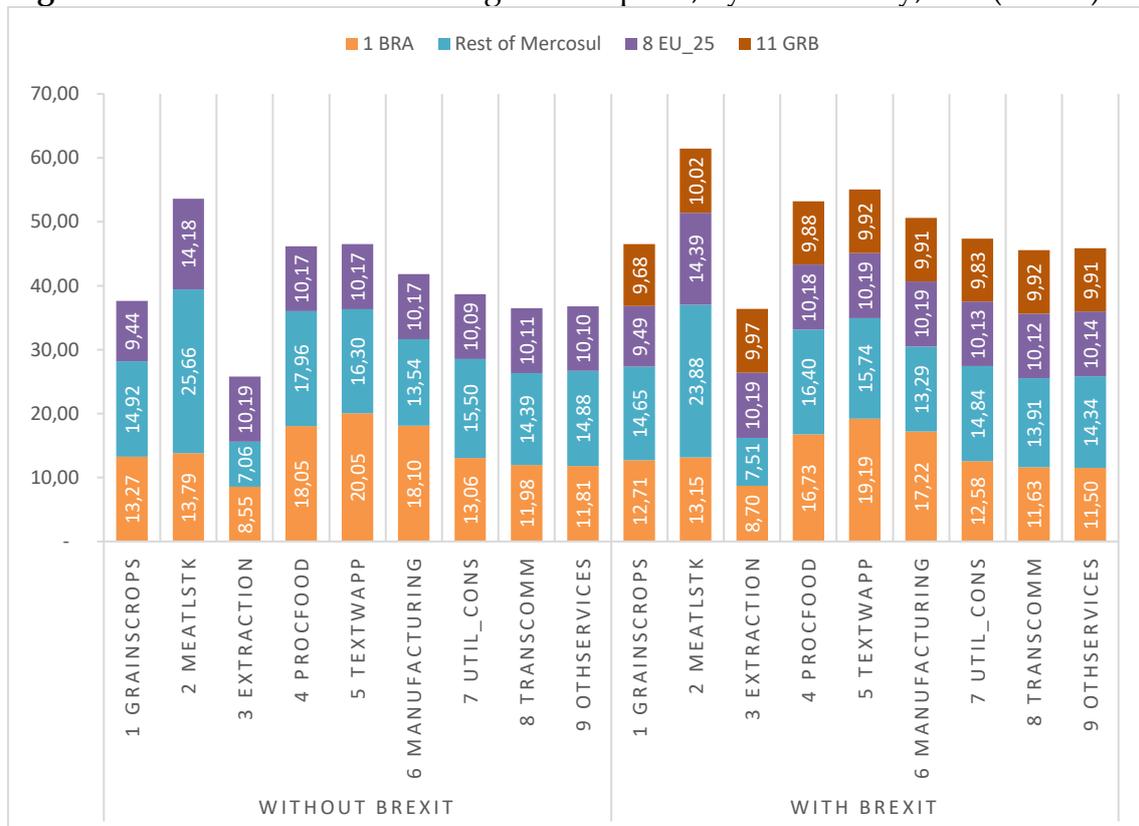
When comparing Scenario 1 with Scenario 2, we observe that the exclusion of the UK from EU generates relative losses only for the manufactured sector in Brazil. In other words, there is a smaller increase in Brazilian exports, except for Manufacturing. Regardless of Brexit, Brazilian companies benefit from the elimination of tariffs on the industrial products exports, which contributes to equalizing conditions of competition with other partners that already have free trade agreements with the EU. The second scenario illustrates the trade strategy recommended by the World Trade Organization (WTO), with UK imposing tariffs on imports from all countries, including other EU members. Exporters from developing countries would face specific rates, as would countries in the EU.

In the context of the agreement between EU-Mercosur, the reflexes of Brexit for the Brazil – UK trade relationship are, according to our simulations, initially small. We assume that the United Kingdom's recent exit from the EU, with the maintenance of parameters from the GTAP database except for import

tariffs (TRFV and TSMS). If the EU and the UK do not reach a broad agreement by the end of 2020 or if there is no extension of the transition period, both regions will now negotiate under WTO terms, meaning both sides will be subject to customs tariffs, which it applies both to British products imported into the EU and to products which go the other way. This type of situation is expected to be detrimental to both sides, even more so for the UK, which is more dependent on the EU than the other way around.

Scenario 2 assumes that third countries would maintain their current tariffs and would not retaliate against increasing export tariffs to the UK. For the other Mercosur countries (Argentina, Uruguay and Paraguay), the situation in which England is part of the EU generates greater effects in terms of exported quantity. On the other hand, in proportion to the variations in exports, England benefits more than the European Union in trade in all sectors, apart from Meat industry. On the importation side, the EU-Mercosur agreement generates an increase in world trade. The Brazilian economy is affected by the large increase in the entry of foreign-made textile and manufactured products, which has adverse effects on the domestic industry, as shown in Figure 2. These results indicate the trade opening of the Brazilian economy and the country's greater presence in international negotiations.

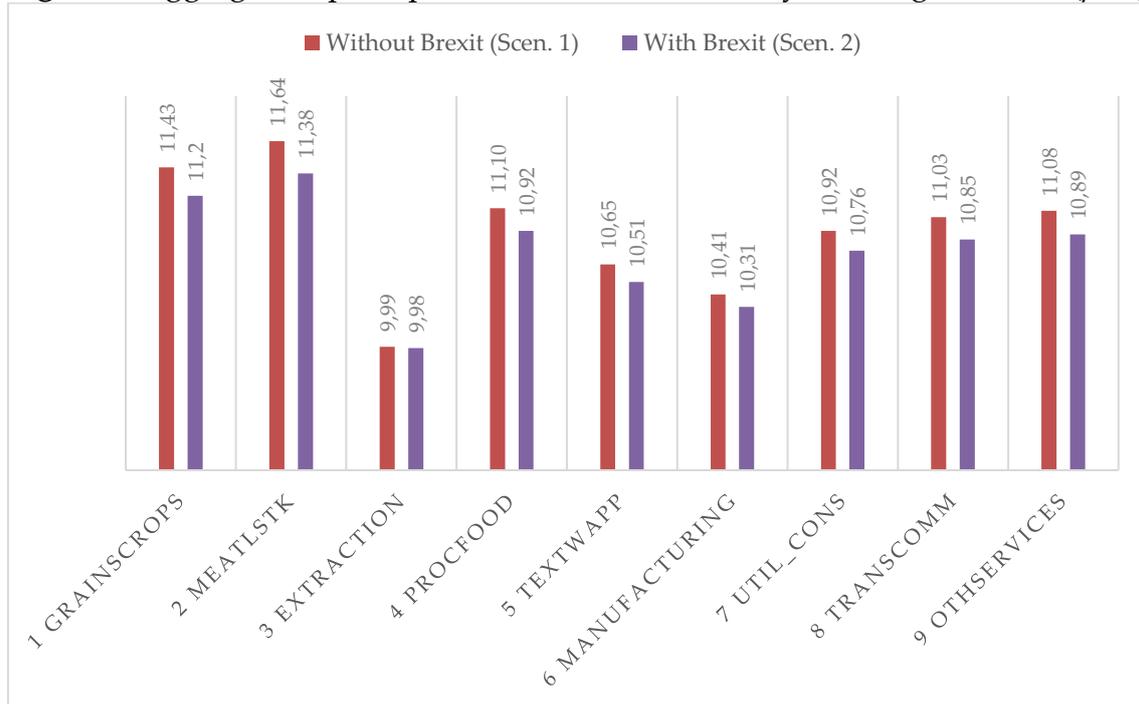
Figure 2. value of merchandise regional imports, by commodity, CIF (viwCIF)



Source: Own elaboration, based on GTAP results.

Comparing the scenarios with and without Brexit, it is interesting to note the dynamics of the variation in the prices of aggregate exports from Brazil (Figure 3). Brazil's pattern of comparative advantages over the EU's productive sectors is revealed. Export prices for Brazilian products are relatively lower in Brexit. Despite maintaining a certain proportional pattern, it is interesting to observe the sectoral heterogeneity. This variation in prices determines the increase in exports of Brazilian products.

Figure 3. Aggregate exports price index of each industry from region Brazil (pxw)



Source: Own elaboration, based on GTAP results.

Table 4 shows the effects on price and quantity levels for Brazil, the EU, and the UK. The first rows represent the goods supplied by Brazil destined to European market. The shock in the power of tariffs, $tms(i, BRA, EU)$, results in a reduction in the import price in some important sectors for the Brazilian economy, such as Livestock and Meat Products (MEATLSTK) and Processed foods (TEXTWAPP). This reduction is accompanied by relative increases in other price levels. It is important to consider that the term pms depends on the CIF price level, $pcif(i, r, s)$, and these, in turn, are related to the FOB price level, $pfob(i, r, s)$. We note that international price levels restrict further reduction in pms , and there is an increase with different intensities between industries. The price of total imports from Brazil, $pim(i, BRA)$, increases with different intensities between the different sectorial aggregations since they depend on pms . The smallest increases are for the prices of imports of manufactured, processed foods and Textiles and Clothing (TEXTWAPP), which encourages trade in these sectors destined for the EU market. The result of the variation in the price level is seen in the variations in the demand for imports from the EU for

goods supplied by Brazil, $qxs(i,r,s)$. There is a clear increase in European demand for the Livestock and Meat Products, Processed Food and Textiles and Clothing sectors, followed by minor increases in manufactured goods. In relative terms, there is a reduction in European demand in other sectors. Thus, according to the simulations, we note that the Livestock and Meat Products and Processed Foods industries would be the main beneficiaries of the trade agreement on the Brazilian side. On the European view, there is a greater flow destined to Brazil, with clear effects of liberalization. Aggregate imports from Brazil increase for all industries, except for Mining and Extraction industry. Aggregate imports from the EU increase in all sectors, indicating an increase in international trade links.

The second scenario assumes changes in tariffs between UK and other parts of the world, including EU countries. We note in Table 4 that the shock in tms generates a reduction in aggregate imports in the UK in all industries, at the same time as there is an increase in exports to Brazil. In the context of the applied simulations, the results show that the UK would open its economy and that Brazil could be a potential destination for part of British production. At the same time, it can be seen that the aggregate imports from the UK show a small reduction in all sectors, most likely due to the increased demand for domestic goods, given the new tariff structure in force in the country.

Table 4. Effects on prices and quantities in BRA, EU and GRB

Variable	GrainsCrops	MeatLstk	Extraction	ProcFood	TextWapp	Manufacturing	Util_Con	TransComm	OthServices
Scenario 1									
pfob[i.BRA.EU]	11.43	11.64	9.99	11.10	10.65	10.41	10.92	11.03	11.08
pcif[i.BRA.EU]	11.28	11.55	9.99	11.02	10.62	10.39	10.92	11.03	11.08
pms[i.BRA.EU]	10.10	-11.87	9.98	-1.44	6.29	9.69	10.92	11.03	11.08
pm[i.BRA]	11.43	11.64	9.99	11.10	10.65	10.41	10.92	11.03	11.08
pim[i.BRA]	11.06	11.43	9.91	7.73	7.75	7.48	10.11	9.99	9.99
qim[i.BRA]	1.82	1.51	-1.27	7.05	8.00	7.31	2.69	1.81	1.66
qxs[i.BRA.EU]	-1.89	318.74	-0.15	61.43	28.81	2.05	-3.77	-3.44	-3.56
pfob[i.EU.BRA]	9.69	9.59	9.98	9.92	10.01	10.02	10.03	10.02	10.05
pcif[i.EU.BRA]	9.73	9.61	9.98	9.93	10.01	10.02	10.03	10.02	10.05
pms[i.EU.BRA]	3.16	4.69	8.21	-0.43	-6.03	1.68	10.03	10.02	10.05
pm[i.EU]	9.69	9.59	9.98	9.92	10.01	10.02	10.03	10.02	10.05
pim[i.EU]	9.80	6.16	9.95	9.62	9.96	9.98	9.99	9.99	10.00
qim[i.EU]	-0.49	7.78	0.22	0.27	0.19	0.17	0.09	0.10	0.09
qxs[i.EU.BRA]	47.96	60.42	17.94	52.24	197.75	58.59	3.02	1.68	1.46
Scenario 2									
pfob[i.GRB.BRA]	9.80	9.78	9.96	9.94	9.95	9.96	9.95	9.95	9.95
pcif[i.GRB.BRA]	9.81	9.79	9.96	9.94	9.95	9.96	9.95	9.95	9.95
pms[i.GRB.BRA]	9.81	9.79	9.96	9.94	9.95	9.96	9.95	9.95	9.95
pm[i.GRB]	9.80	9.78	9.96	9.94	9.95	9.96	9.95	9.95	9.95
pim[i.GRB]	9.96	9.87	9.95	9.98	9.96	9.99	9.99	9.99	10.00
qim[i.GRB]	-0.27	-0.23	0.01	-0.10	-0.03	-0.07	-0.14	-0.07	-0.08
qxs[i.GRB.BRA]	7.03	11.48	-1.57	-1.76	-7.00	-8.03	2.96	1.64	1.52

Table 5 shows the effects of the EU-Mercosur agreement on well-being and GDP growth under different Brexit configurations. According to Roy & Mathur (2016), foreign trade theory shows that the net impact on the well-being of any regional trade agreement depends on the relative sizes of the effects of trade

creation and diversion. Trade creation arises when imported products produced more efficiently replace domestic products produced in a relatively inefficient manner, thus increasing the import demand because of the lower import prices of the partner country. Trade diversion occurs when sources of supply shift from more efficient producing third countries to less efficient producing member countries under tariff-free access granted to signatory countries.

Table 5. Equivalent variation (US\$) million and change in value of GDP (%).

Region	Scenario 1		Scenario 2	
	EV	vgdp	EV	vgdp
BRA	3361.23	10.96	2783.88	10.78
ARG	1872.55	11.77	1866.71	11.77
URU	883.38	16.66	740.68	15.57
PAR	78.68	11.09	78.09	11.1
EUA	-1350.35	9.89	-1221.15	9.9
CHI	-1402.10	9.89	-1223.78	9.9
RAL	-473.51	9.89	-427.3	9.9
EU	7525.42	10.05	7034.12	10.06
CAD	-154.38	9.87	-143.5	9.89
GRB			-2540.04	9.93
ROW	-2842.82	9.92	-302.18	9.94

Source: Own elaboration, based on GTAP results.

Tariff changes produce welfare gains for both Brazil (and other Mercosur countries) and the EU, accompanied by an increase in GDP. When simulating the tariff changes, the measure of equivalent variation of these changes in well-being is 3361.23 million dollars (US\$) for the Brazilian economy and 7525.42 million dollars for the EU. Brazil experiences a 10.96% increase in GDP, while the EU increases by 10.05%. These results indicate that greater liberalization between the trade blocs leads to a greater increase in mutual well-being. The other countries that are not signatories to the EU-Mercosur agreement show a decrease in well-being in the presence of tariff changes.

The last two columns of Table 5 show the results in the presence of Brexit (Scenario 2). In relative terms, both the gain in well-being and the variation in Brazilian GDP are lower. The change in the size of the European market, despite the maintenance of gains for the Brazilian economy, is less with Brexit. The model calculates the monetary metric equivalent of this dollar utility and is referred to as an equivalent variation (EV). In GTAP, the behavior of a representative family is characterized by a utility function that is governed by private domestic consumption, government consumption and the economy. In this way, the percentage change in the per capita utility aggregated in a region resulting from a simulation of the GTAP model represents the change in the well-being of that region, keeping the rest constant. It is important to note that the UK suffers a reduction in welfare when import tariffs are changed between the EU and Mercosur, despite the gain in terms of GDP. In both scenarios, the Mercosur

countries show gains in well-being, showing economic benefits for the bloc of the execution of this trade agreement.

If we compare the different situations in which the UK is not part of the EU, we find that, although Brazil benefits from the trade agreement promoted by Mercosur, it cannot overcome the loss of welfare from Brexit. It is interesting to note that losing well-being for the EU and the UK is mainly because of the increase in non-tariff barriers, where even an increase in non-tariff barriers results in a greater loss of well-being. A similar implication is also seen regarding the growth rates of these economic units. If we consider the case of Mercosur, we see that the trade agreement is beneficial for all countries, but not as much as in the absence's case of Brexit. These results show that the future discussion on a new bilateral agreement between the British country and the South American bloc is relevant for both Brazil and the UK.

5. Final remarks

This study assessed the economic impacts of the EU-Mercosur agreement on the Brazilian economy. After twenty years of negotiation, the agreement is broad and goes beyond tariff aspects, including regulatory issues, such as services, government procurement, trade facilitation, technical barriers, sanitary and phytosanitary measures and intellectual property. The analysis of the effects becomes more complex, however, since the agreement is signed in the middle of a rupture process by one party, with the completion of Brexit in 2020. In this context, the article simulated two scenarios: in the first, the United Kingdom is part of the EU, while in the second scenario it is considered a separate region. We simulated a non-extreme Brexit scenario, with changes in import tariffs (RMS and TMS), imposing that the same tariffs applied by the UK to the Rest of the World (ROW) under the GTAP were now also applied to trade with the EU. The same logic was adopted for the opposite direction, for trade between the EU and the UK.

The conclusions have important implications to the Brazilian economy and trade policy. The model reveals economic benefits to Mercosur and the EU countries. For Mercosur, the agreement with the EU represents the first major liberalization action in recent decades. The prevailing scenario was characterized by an isolationist trade policy without the signing of relevant agreements, thus giving new impetus to the regional bloc which seemed to be dormant in its international relations and in the internal political relevance granted by governments. The impact on the Latin America economy is considerable, as shown by the results. This indicates the importance of increasing Brazilian participation in new agreements, as well as encouraging insertion as a bilateral trading partner. The results show that Mercosur benefits Brazilian foreign trade, making it a strategic partner at the regional level. In addition, the improvement

negotiations signed by the Latin American bloc tends to generate competitiveness gains and expansion of the export agenda.

Despite the positive effects for Brazil, it is important that Brazilian policy creates mechanisms to encourage local producers, especially in the Grains and Crops sectors, to avoid losses in the long run. Some of the competition strategies adopted in the global agricultural market indicate that Brazil must also emphasize diversifying production with higher value products to access the EU and other markets. It is important that Brazilian agricultural policy prioritizes investments so that small and medium farmers can increase their competitiveness and meet the institutional and market requirements, already present and future, that will come from the agreement between MERCOSUR and the EU.

The scenarios considered the same liberalization policy between the Mercosur countries and the EU, reflected in different gains for both regions with variations in the degree of competitiveness. The general results show that European production would be more easily sold to the South American market, than the other way around. Brazil would be a net beneficiary of exports from the meat and processed foods sector; however, agriculture would require specific instruments that would benefit it in the long run. This is since the liberalization shocks do not show immediate increases in national competitiveness in relation to the Grains and Crops sector, where international competition is a risk to the national producer market.

It is important to note that the mechanisms of effects of GTAP in relation to changes in the power of tariffs are proportional, that is, it takes into account the baseline, which implies differentiated effects and a greater relative weight of the role of international prices (CIF and FOB) in the reduction of import prices and relative gains in sectoral competitiveness. Brazil is considered a closed country with several protected sectors, with high tariffs on imports. The size of the domestic market and the history of industrial policies focused on the large domestic market contribute to explain this reality.

Also is important to note that the results of GTAP simulations showed that there are differences in the Brazilian welfare gains and foreign trade when we include Brexit. This highlights the importance of Mercosur and the UK also starting negotiations for an eventual bilateral agreement, since it has given the potential for benefits to Brazil. Negotiating terms advantageous for the UK with Mercosur may represent a set of fewer protectionist actions in the agricultural area and have more offensive positions on various topics on the international trade agenda, such as transgenics and biotechnology. The actual implementation of the EU-Mercosur agreement opens space for further advances in agricultural guidelines that favor the South American market over the British one. In relation to Brexit, it is important to note that the effects are conditioned to the way it was implemented in GTAP. By assuming that the tariffs are equal to those practiced by RoW, the intensity of the effects becomes broader. However, our results of

changes in GDP and in the level of well-being indicate that, with the supposed facts, the UK would incur welfare losses, while increasing the demand for domestic production and aiming to increase exports to other parts of the world.

For future studies, it is relevant to include policy actions from other countries to generate clear prospects for relative gains from the negotiations. The EU-Mercosur agreement provides for the promotion by countries of high standards in terms of sustainable development and protection of human rights. In this sense, it is relevant for future work to include extensions to the CGE that capture the effects on greenhouse gas emissions, land use and environmental control. As well, adopting a differentiated tariff for extra-regional countries in the EU creates demands for bilateral or multilateral agreements with UK, providing an opportunity for Brazil to consolidate itself as a relevant trade partner.

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