International trade and the Brazilian Agribusiness: a computable general equilibrium approach[1]

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Abstract

The contribution of international trade to an economy includes the levels of economic activity and employment. There are studies that show, through the multiplier, the monetary effect on economic activity or the number of jobs created for each additional unit of exports. Note that the importer process also creates jobs and develops economic activity. The main objective of this paper is to evaluate the impacts of commodity exports on the Brazilian economy. In order to reach this aim we calibrate a computable general equilibrium model opening for 110 goods and 55 sectors for the year 2008, called ORANIGBR_AGROBR. Note that the model has 39 goods that represent the Brazilian agribusiness and the vector of exports is opening to major trading partners of Brazil in terms of agriculture. We closed the model in a short-run and long run perspective. The closures enables us to simulate the different alternatives of the Brazilian economy in terms of exports related to the agribusiness and verify the impacts upon sectorial behavior and macroeconomic indicators. The validity of this study is given both by the relative importance of exports of agricultural goods to the macroeconomic results of the Brazilian economy and the nuances that are involved in the trade of agricultural goods (e.g protectionism, general trade agreements, bilateral agreements).

***Keywords*:** Brazilian agribusiness; International trade; Computable general equilibrium model.

JEL Classification: Q17; Q18; C68.

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1. Introduction

The Brazilian economy has a high dependence on commodity exports. In the previously 14 years, for example, agribusiness has contributed incisively in generating currency for the country. The exported volume growth for 2000-2013 was around 230% and the trade balance grew 468% during this period. Therefore, these growths show the importance of agribusiness to the Brazilian economy, because besides the income and employment multiplier effect, the sector has contributed strongly to the macroeconomic results of the country.

Thus, the strong performance of the agribusiness sector is evident. The sector in recent years has maintained its growth trend, with an increase of 3.9% per year in its gross domestic product (GDP) compared to 3.6% of the Brazilian economy for the period from 2000 to 2011 (BELIK, 2015). In addition, as evidenced by the author, agribusiness has been since 2007 the main responsible for the positive balance of trade.

Important issues has been made within the context of agriculture and international trade: protectionism, general trade agreements, and bilateral agreements, among others. With regard to protectionism, for example, it is important to note that when considering the elimination of trade barriers the largest controversial in international trade are linked to agricultural goods. In general, in most developed countries, the political question inherent in the agricultural sector provides, in part, their production system. Another aspect that permeates the agriculture sector, and therefore the protectionist process, is that the sector has always been considered as strategic in terms of food security, which explain why the production of many products occurs in developed countries, even under conditions of absolute disadvantage.

In order to increase and sustain agricultural income, the participation of governments in the agricultural production process and trade has grown, avoiding major price fluctuations on the international market, and develop basic self-sufficiency in production.

In Brazil, for example, the Ministry of Agriculture, Livestock and Supply (MAPA, in Portuguese) is responsible for positioning of the country in international agricultural negotiations in multilateral, regional and bilateral terms. The offensive interest of Brazil in this sector, with an aim to further trade liberalization, confronts often with the protectionism of some countries with which Mercosur[5], for example, has agreements being negotiated, such as with the European Union, Israel, India and South Africa, all in the negotiation process, however, with their agricultural sectors extremely protected by their respective governments.

[5] *Mercado Comum do Sul* (in Portuguese), which Brazil is a member since its inception in 1991.

Furthermore, Brazil has participated in negotiations with countries located in the Americas (Cuba, Chile, Colombia, Ecuador, Mexico, Peru) under agreements between Mercosur and these countries. In 2010, it was also resumed the negotiations on an agreement between Mercosur and the European Union.

Moreover, recently, South Africa market was reopened for Brazilian exports of meat (boneless beef and pork). This decision is important for the interests of Brazilian meat exporters, and confirms the effectiveness of national health controls and the quality and health of the Brazilian product, already recognized by other trading partners.

With the opening of the South African market for these products, the MAPA hopes an export of US$ 7 million per year in pork and US$ 12 million in beef. Thus, the opening of this market is considered an important opportunity to diversify the use of products in question, especially for pork, sector in which Brazilian exports are concentrated in a few markets. Furthermore, access to the South African market may lead to other markets openings as, for example, other members of the South African Customs Union (SACU).

The main aim of this paper is to evaluate the impacts of agribusiness commodities exports on the Brazilian economy. We calibrated a Computable General Equilibrium (CGE) model with 110 goods and 56 sectors for the year 2008, ORANIG_AGROBR. Note that the model has 39 agribusiness goods and an export vector opening for current and potential business partners of Brazil.

In other words, we intends to implement simulation exercises that seek to identify the impacts on the Brazilian economy of the continuity of these policies and highlight the relative importance of these markets for the Brazilian economy.

The validity of this study is given by both the relative importance of exports of agribusiness goods to the macroeconomic results of the Brazilian economy and the nuances that are involved in the trade of agricultural goods (e.g. protectionism, general trade agreements, bilateral agreements, among others).

In the literature has a large number of studies that aim to evaluate the different policy impacts on the Brazilian agricultural sector. However, important to note that most of these previously works do not have a concern to make comparative assessments of agribusiness projection scenario and Brazilian trade policy, in its various nuances. Therefore, our contribution is to identify which agreements/policies can be effective in terms of sectorial and macroeconomic gains and which can be harmful or less effective in terms of sectorial and macroeconomic gains.

Note that within the context of this work we have many others in the literature that deal with the theme agriculture and use input-output modeling and CGE. The seminal work of Guilhoto (1995), for example, aims to construct a CGE model for Planning and Analysis of Agricultural Policies (PAPA) for the Brazilian economy. Bento (1997) also calibrates a multisectoral CGE model to evaluate the Brazilian agricultural policy and more specifically the effects of external shocks of the early 1980s on the Brazilian economy. In another work, Bento (1999) evaluates the effects of the trade liberalization process and constitution of Mercosur on the Brazilian economy, with emphasis on agricultural production and agribusiness sectors. Figueiredo et al. (2010) evaluate the impact of US subsidies granted between 2002 and 2007 on the growth of Brazilian agribusiness. Recently, Gurgel (2014) estimates the impacts of trade and sectorial policies that affect the Brazilian agribusiness.

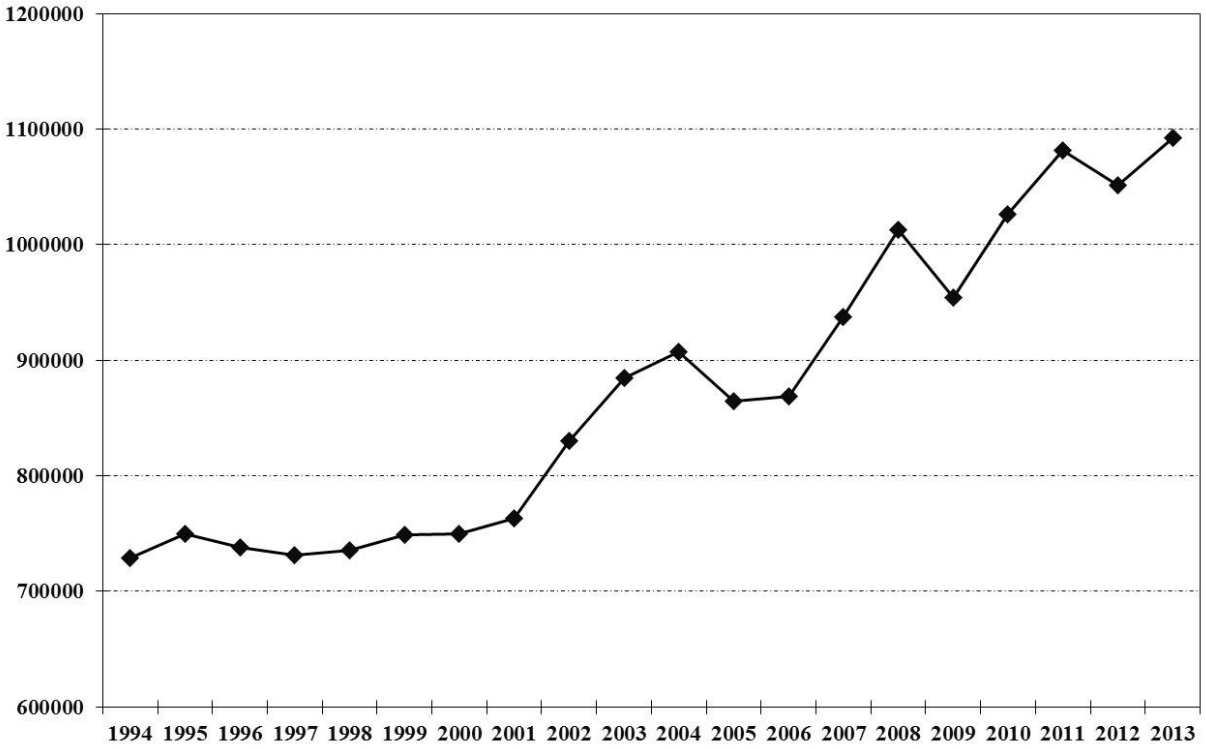
Beyond these works, it is possible to find other important contributions at the literature. Ferreira Filho (1999), Cypriano and Teixeira (2003), Gurgel and Campos (2003), Gurgel (2006), Gurgel et al (2009) evaluated the impact of trade policies on the sector. Cardoso and Teixeira (2013) investigated the effect of agricultural policy on agribusiness development in different regions of Brazil. Santos and Ferreira Filho (2007) investigated the impact of tax policy on the consumption of food and agriculture.

Besides this introduction, the paper is organized as follows: the second section is a brief contextualization of agribusiness in Brazil; the subsequent section provides a discussion of issues related to international trade and trade agreements; the fourth section provides a description of the database and the model; the fifth section presents the empirical results; and finally, the sixth concludes.

2. Agribusiness in Brazil: recent evaluation

The importance of agribusiness in Brazil can be seen, among other factors, by the recent behavior of GDP (Figure 1). The agribusiness GDP has increased over the past years and reached the amount of R$ 1,092,238 million in 2013 (constant values 2013). Furthermore, the participation of the agricultural GDP in the national GDP is around 23%, which can be considered a significant share.

Figure 1 – Agribusiness GDP (1994-2013) – R$ milhões de 2013



Source: CEPEA

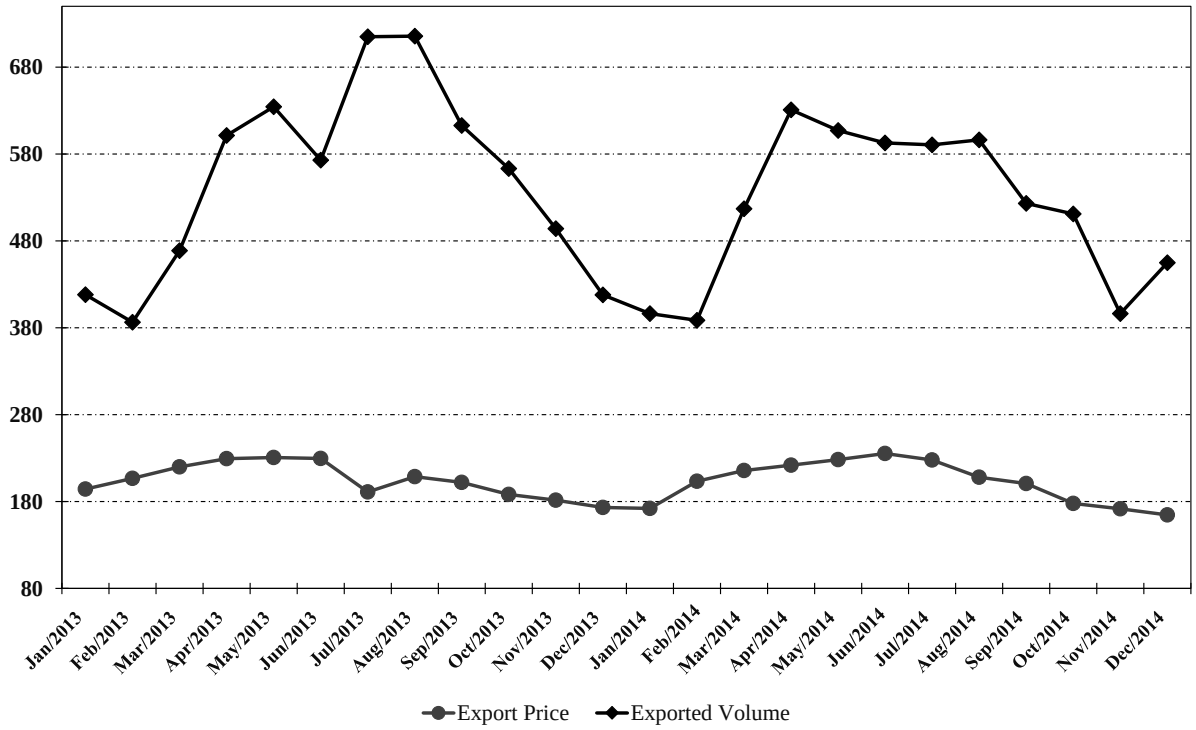
The contribution of international trade to an economy includes the levels of economic activity and employment. Some works show, through the multiplier, the monetary effect on economic activity or the number of jobs created for each additional unit of exports. Within this perspective, the agribusiness has had great importance for the Brazilian economy, it has generated employment, income and contributed to the macroeconomic stability of the country through positive balances in its trade balance.

The participation of agribusiness in the Brazilian international trade for the period from 2000 to 2014, according to Barros et al (2015), increase. The exported volume accumulated in the previously fifteen years has had an increase of 216.45%. The external prices for the same period increased by 97.42%.

The agribusiness exports of Brazil were approximately US$100 billion in 2013 and US$96.75 billion in 2014. The United States, China and the Netherlands have been, over the past few years, the main destinations for Brazilian agribusiness exports.[6]

[6] Important to note that these countries will not be analyzed in this work, because our concern is focused on potential markets. Therefore, we take into account the recent negotiations describe by MAPA.

Figure 2 – Export Price and Exported Volume 2013-2014 (2000=100)



Source: CEPEA

A short-term fluctuation analysis can be seen through the Figure 2. The variations in the exported prices are more behaved that fluctuations in the volume exported. The volume exported, in this most recent period, had a sharp drop from August 2013 to February 2014. After this period, there was a recovery. However, from April 2014 the trend is of decreasing export volume. The variation levels in export prices may partly explain such behavior; in both periods of decline in export volumes, it is possible to notice a decline of movement in prices. Figure 2 allows us to highlight the seasonal behavior of exports, i.e., increase in the first months of each year.

3. Multilateralism or Regionalism: a brief digression

In the context of trade, after the World War II was established the International Trade Organization (ITO), that is responsible for trade policy. Later, in 1947, it took place in Geneva the first round of multilateral negotiations, which culminated in the creation of the General Agreement on Tariffs and Trade (GATT). In 1993, during the Uruguay Round it was establish new rules for world trade and the World Trade Organization (WTO) was established.

Faced with the strong trade relations, the increasing integration of the world economy and internationalization policies, once considered domestic, become more evident. However, progress has not been continuous, with significant decreases over time, as for example the

negative impact on the expansion of bilateral trade treaties in Europe since the depression of the early 1870s and the Great Depression of the 1930s (WTO, 2011).

In general, the formation of multilateral or economic blocs began from the end of World War II, but only intensified with the end of the Cold War. The end of the war led countries to achieve greater independence, and thus allowed a greater trade relations, advancing to the creation of institutions such as the United Nations, the International Bank for Reconstruction and Development (IBRD), International Monetary Fund (IMF), ITO, WTO and GATT, which ended up reflecting the new international order (SILVA, 2000; WTO, 2011).

Given the context and added to the process of globalization, trade trend was the formation of economic blocs. At first time, the creation of these blocks had with aim to facilitate the trade among the member countries (e.g. through the reduction or exemption of taxes and/or tariffs), however, also had as intention to develop and achieve a higher growth of their economies together.

Despite the creation of a postwar multilateral trading system, bilateral or regional approaches of trade agreements have not lost their space, which led to tension between multilateralism and regionalism (WTO, 2011).

The first wave of regionalism in the late 1950s and 1960s led to the creation in 1957 of the European Economic Community (EEC) and later in 1960 the European Free Trade Association (EFTA). Besides Europe in the mid-1980s the wave of regionalism reached other continents, such as the Americas, Asia and Africa (SILVA, 2000; WTO, 2011).

So it was possible to see the formation of economic/trade blocs and the use of preferences trade agreements (PTA) has been occurring since the past decades, involving different participants and countries with different levels of economic development (SILVA, 2000; WTO, 2011).

Given the growing regionalism in the 1980s, and the proliferation of PTAs, there are important issues on the coherence, compatibility and potential conflict between multilateral and regional approaches regarding aspects of cooperation. According to the WTO the follow issues raised in this debate: regionalism signals a weakening of international commitment to open trade? Regionalism foreshadows a return to a more fragmented trading system? (WTO, 2011).

Within this context, it had that a number of bilateral agreements were consolidated into multilateral agreements, such as the successive growth of the EU, the consolidation of bilateral pacts within the Central European Free Trade Agreement (CEFTA) and the conclusion of the Agreement preferential trade between Mercosur and the Latin American Integration Association (ALADI). However, there was also a trend toward bilateral agreements between

regions, particularly among developing countries. And the consequence of this trend is an increase in fragmentation of trade relations.

According to Silva (2000) the formation of regional blocs can create or divert trade, culminating often in conflicts between member countries and non-member countries. Countries that are "excluded" in these agreements argue that PTAs increase trade between member countries, however, decrease with non-member countries.

In terms of effects, according to the authors, in the short term, it is possible to have an efficiency given the expertise of the member countries in products with comparative advantage. In the long run, the benefits may be even greater for authors, because the increased of the competition, economies of scale, stimulating investment and more efficient use of resources. Additionally, participation in PTA can be a condition for having access market in larger blocks.

4. Methodology and Database

4.1. Computable General Equilibrium

The neoclassical approach takes into Walras (1874) the theoretical framework of the general equilibrium. Leon Walras economist of the XIX century sought to understand how all markets were interconnected. More specifically, the author aims to investigate the existence of a set of prices from the relationship between the amount of products produced and the quantity of products exchanged in an economy. The solution of this equilibrium took into consideration both the existence of competitive markets as to the existence of the process called "tâtonnement"[7]. Despite the effort Walras failed to ensure in a comprehensive manner the theoretical basis of general equilibrium. Only in the mid-1950s, after the contributions of Kenneth Arrow, Gerard Debreu and others, the model could be formalized[8].

Since then numerous studies have started to look for empirical application of general equilibrium. Shoven and Whalley (1992) define this search as an attempt to convert the abstract structure of the Walrasian general equilibrium in realistic models (applied to real economies). The work of Leif Johansen (1960) and Herbert Eli Scarf (1967a; 1973) are pioneers in the search for computational solution for these models. Approaches used by these authors inspired two

[7] The idea behind this process is that of a "Walrasian auctioneer" announcing an initial vector of prices for the agents to determine how much will offer and demand of goods. The auctioneer, after the choices of agents, acts in a corrective form, raising and lowering the price in the presence of excess demand and excess supply, respectively. It must be said that, based on that idea, transactions only occur effectively when prices are set correctly.

[8] The formalization of the basic model of Walras happened by the advance in discussions of existence, uniqueness and stability of general equilibrium.

schools, the Norwegian / Australian - inspired by the Johansen approach (1960) - and American - inspired by Scarf approach (1967a; 1973).

The Johansen CGE model (1960) was built to investigate multi-sectoral aspects of the Norwegian economy and eventually served as the basis for the development of several other models. Among them, the ORANI model whose theoretical framework found in Dixon et al (1982) and its 'generic' version ORANI-G whose theoretical framework is in Horridge (2006). The models derived from Johansen (1960) have linearized equations, the solution of this equations are given in growth rates and have different variety of closure.

In general, the ORANI-G model (Horridge, 2006) equations derive from the optimization problems (by producers and consumers) and market equilibrium conditions. Consumers are endowed with preferences and each one seeks to maximize its utility being subject to a budget constraint. Producers face with a production function with no increasing returns to scale, and each one seeks to minimize its cost function through a combination of its inputs. Each input, in turn, can be imported or domestic origin (substitution occurs via price). The factors of production are remunerated by their marginal rate of productivity. The sectoral exports are positively influenced by exogenous expansion of international income and negatively impacted by domestic production costs. Private consumption is determined residually and occurs the adjustment the savings to investment, the latter being fixed exogenously.

4.2. ORANIG_AGROBR's Structure

The computable general equilibrium model - ORANI is a model developed for the Australian economy and its first version dates back to 1970. The model has been widely used in the Australian economy as a policy evaluation tool (Dixon, et al, 1997).

The model equations set reproduces the circular flow of income under which the economy is in equilibrium. The model consists of equations that are organized in blocks. They describe the behavior of economic agents, such as: a) demand for products for inputs and factors; b) production of goods and services; c) household demand; d) investment demand; e) government spending; f) foreign trade - exports and imports f) equilibrium conditions.

The neoclassical structure is present in the model through market equilibrium structure from a behavior in which agents try to be rational and optimize their objective functions; markets work in perfectly competitive structure. Thus, the behavior of households is based on a utility maximization framework building on the choice of a great basket given the budget

constraint. The household consumption basket is achieved through a well composed, from the perspective of the good of origin (imported and domestic). Such a decision is modeled by a CES function - Constant Elasticity of Substitution.

The ORANI-G_AGROBR model allows each industry produces several goods. To this end may use local or imported inputs and primary inputs - capital and labor. The production function is the Leontief type and the final output is formed by compounds goods and primary factors. The composite goods consists of domestic and imported inputs, the elasticity of substitution is the Armington type, and its production function is described by a CES function. However, the primary composite factor is defined from a CES function, with the variable capital and labor. The functional structure is the same for both sectors. Moreover, the parameters and the proportion of goods and factors may be different.

To better understand the process it is possible to imagine that the producer chooses the amount of composite good and the primary factor; then the ratio of imported and domestic that will form the composite good; and, finally, the ratio of capital and labor that will become the primary factor.

4.3. Database

To achieve the objectives proposed herein, will be used a Computable General Equilibrium model for Brazil based on the theoretical framework of ORANI-G model. A theoretical structure of the database can be seen in Figure 3. In other words, the figure brings the structure of input-output matrix to serve as a basis for CGE model. It realizes that the model of the theoretical framework must include demand equations for the six users, determining price equations of goods and factors, market equilibrium equations (Market clearing equations) and definitions of taxes on the goods.

The column headings in the main part of the figure identifies the following applicants: i) domestic producers divided into I industries (sectors); ii) Investor divided into I industries; iii) Households; iv) Exports; v) Government; and vi) Changes in Inventories.

Note that the 'basic flows' and 'taxes' have dimension C x S, *i.e* the value of production and taxes are represented to the "C" goods that can be of domestic origin or imported ("S"). The 'margins' have dimension C x S x M. The 'labor' is given to the types of occupation. 'Capital', 'land' 'taxes on production' and 'other costs' have a dimension.

Figure 3 – The ORANI-G Flows Database

		Absorption Matrix					
		1	2	3	4	5	6
	Size	← I →	← I →	← 1 →	← 1 →	← D →	← 1 →
Basic Flows	↑ CxS ↓	BAS 1	BAS 2	BAS 3	BAS 4	BAS 5	BAS 6
Margins	↑ CxSxM ↓	MAR 1	MAR 2	MAR 3	MAR 4	MAR 5	MAR 6
Taxes	↑ CxS ↓	TAX 1	TAX 2	TAX 3	TAX 4	TAX 5	TAX 6
Labour	↑ O ↓	LABR					
Capital	↑ 1 ↓	CPTL					
Land	↑ 1 ↓	LAND					
Production Taxes	↑ 1 ↓	PTX					
Other Costs	↑ 1 ↓	OCTS					

C – Number of Commodities (110)
I - Number of Industries (56)
O - Number of Ocuppation Types (1)
M - Number of Commodities used as Margins (2)
S - Domestic and Imported (2)
D - Number of External Regions (11)

	Joint Production
Size	← I →
↑ 1 ↓	MAKE

	Import Duty
Size	← 1 →
↑ C ↓	V0TAR

Source: Author's own elaboration

The ORANI-G_AGROBR model used in this work is calibrated for 2008, using the information from the input-output matrix estimated by the Regional and Urban Economics Lab at the University of São Paulo (NEREUS). Are considered 56 sectors, 110 products, 2 margins (transport and trade), two primary factors (capital and labor) and 5 agents (investment, households, exports, and government stocks). The vector of exports is open to 11 destinations: South Africa; Chile; Colombia; Cuba; Ecuador; Mexico; Peru; Mercosur; European Union; SACU; Rest of World.

Brazilian exports for the year 2008 (NCM SH 8) were collected through Aliceweb system of the Foreign Trade Secretariat (Secex) of the Ministry of Development, Industry and Foreign Trade (MDIC). The 7411 exports of goods were matched with 110 products of input-output matrix. This alignment was based on statistical classifications of the National Classification Commission (CONCLA/IBGE). For the non-tradable products adopted the average percentage of Brazilian exports for each country, not resulting in loss in the analysis, given the few significant values for these products.

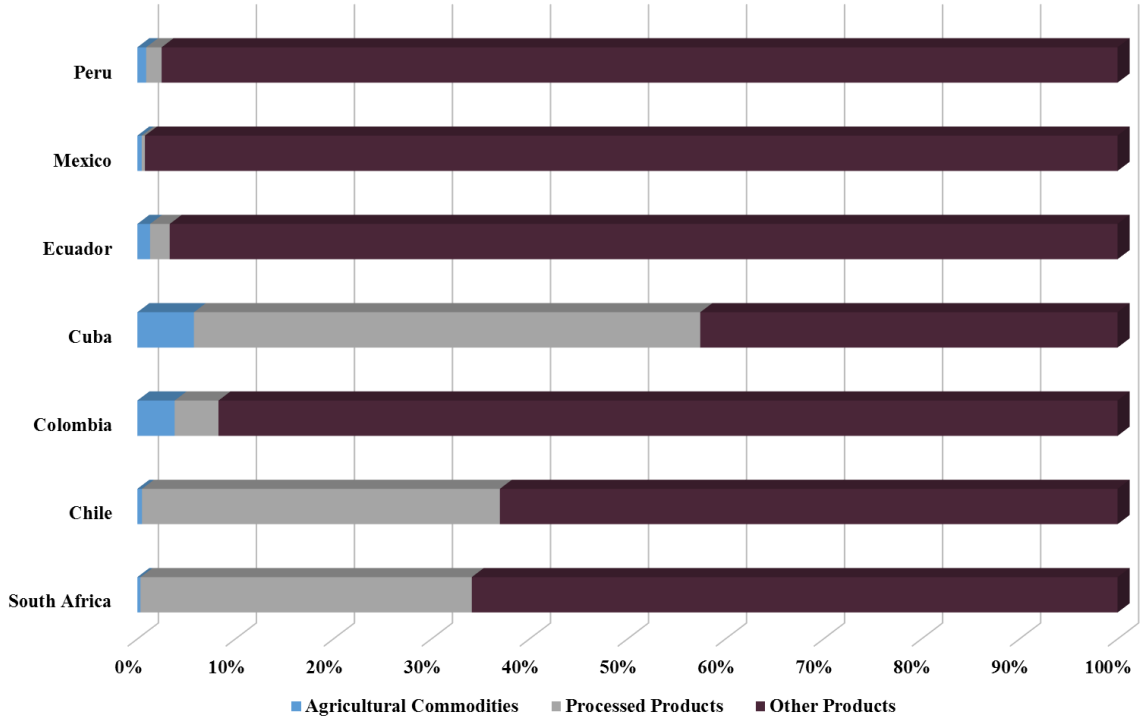
4.4. Descriptive

In the second part of this section we present a brief description of the Brazilian exports. We will bring our attention to the composition of the Brazilian exports and to the destination. In this paper, we divide the destination of the Brazilian exports into seven countries and four regions. In order to show the importance of agriculture and agriculture-processed goods we grouped the exportable goods in three goods: agriculture commodities, processed agriculture goods and other products.

Figure 4 and 5 shows the distribution of the Brazilian exports by goods and destination. From Figure 4 we verify that the main destination of the Brazilian exports of agriculture commodities and processed agriculture goods is Cuba, Chile and South Africa, respectively. Despite the proximity, the exports of agriculture commodities and processed agriculture goods to Colombia, Peru, Mexico and Ecuador has a share less than 10%.

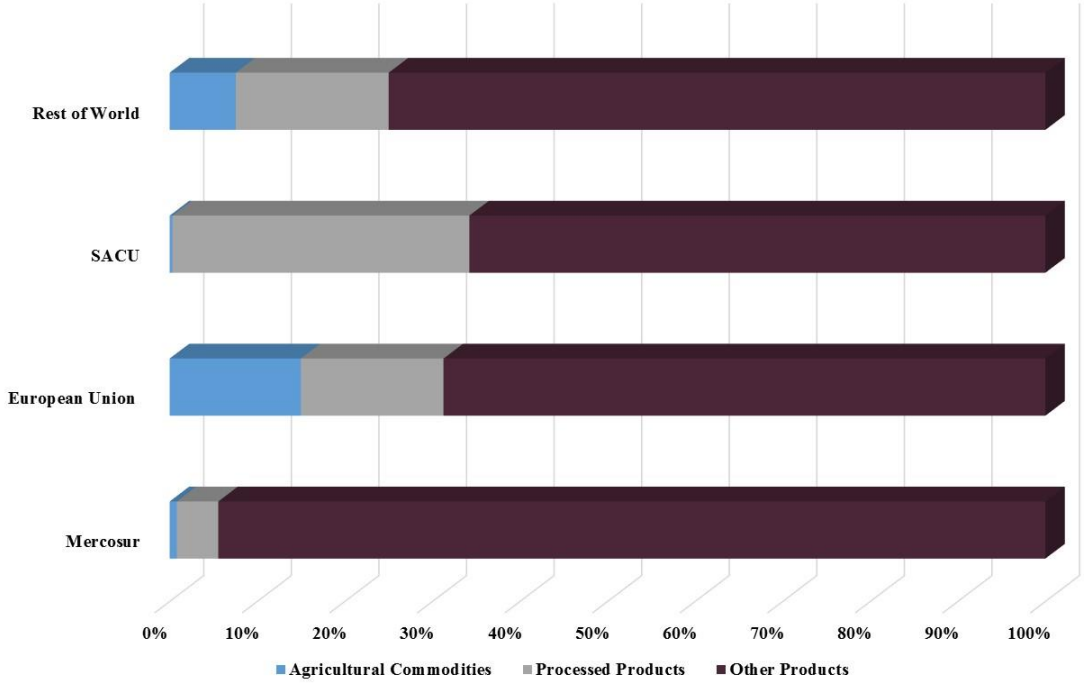
Figure 5 presents the same information but for different destinations. We observe that the main destination is South Africa Customer Union (SACU), followed by European Union.

Figure 4 – Share of Agricultural Commodities, Processed Goods and other Goods by Country



Source: MDIC

Figure 5 - Share of Agricultural Commodities, Processed Goods and other Goods by blocs



Source: MDIC

4.5. Closure

The number of endogenous variables are 2273156 and the number of exogenous variables are 109316. The short run closure maintain the capital stocks fixed. The idea is that capital stocks take some time to install and is not affected in a short time. The exogenous variables covers all technical change variables, which are usually exogenous as in ORANIG_AGROBR. There are several input-augmenting technical change variables for individual or grouped inputs, i.e. labor-augmenting technical change (a1lab), capital-augmenting technical change (a1cap), land-augmenting technical change (a1land), and also combined input technical changes, i.e.primary-factor-augmenting technical change (a1prim) and all-input-augmenting technical change (a1tot; a2tot).

In case of all technical change variable (a1; a1mar; a1oct; a1_s; a2; a2mar; a2_s; a3; a3mar; a4mar; a5mar), the negative shock means that the technology improved in terms of the particular input, so less of the input is needed to obtain the same amount of output than before (the whole isoquant shifts).

Tariff terms, ad valorem and sales tax terms, export tax terms, technological and taste change terms, shift variables, and number of households are assumed to be exogenous. The number of households (q) and their consumption preferences (a3_s) The tax rates both indirect (on labour, land, capital, goods and production) and direct (local and national income tax) [delPTXRATE f0tax_s f1tax_csi f2tax_csi f3tax_cs f5tax_cs t0imp f4tax_trad f4tax_ntrad f1oct]. Those variables are considered policy tools, thus naturally they are set as exogenous. All the shifters are considered exogenous. In the labor market we have wage shifters [f1lab_io; f1lab_o; f1lab]. There are shifters at export equations [f4p; f4q; f4p_ntrad; f4q_ntrad].

On the demand side, all components of real gross national expenditure, namely household consumption [x3tot], private investment [x2tot_i], government expenditure [x5tot] and inventories [fx6], are exogenous. Changes in the GDP in simulations, on the expenditure side, are adjusted using the balance of trade as the swing variable. Thus, export and import volumes can be endogenously determined. As the small country assumption is adopted in simulations, import prices are fixed, implying the inability of Brazilian demand to change world market prices. The nominal exchange rate is the numeraire, which is also exogenous. On the supply side capital [x1cap]; land [x1lnd] and wages [realwage] are exogenous.

5. Result Analysis

In order to evaluate the impacts of commodity exports on the Brazilian economy we will implement 20 simulation exercises. We will increase in 10% the quantity of exports for all the Brazilian exports destination considered in this paper. We will divide the shock, which means the increase in the quantity of exports in two. First, we will implement an exercise for the agriculture commodities and second we will expand the exports of processed agriculture goods.

For both exercise we will make a comparison into two groups. The first comparison will be among the seven countries and the second comparison will be among three trade blocs. For doing this we will have the opportunity to go deeply in the two different strategies of the Brazilian trade. We consider these simulations as a proxy for the increase in the trade relations between Brazil and the external trade partners. These exercises will enable us to verify which is the impact upon macroeconomic variables and sectorial variables due to an increase in the Brazilian exports.

The countries considered in the analysis of this paper are not the main Brazilian partners, but the literature considered than as potential new markets. Some of them are not distant from Brazil and are located at South America. This kind of alternative is key for the role played by the Brazilian economy at the continent. The analysis of the South Africa is also an investigation of a potential market.

5.1. Simulation Adjustment

The shocks implemented in this model consists in a shift in the demand curve for exports, which means an increase in the trade flows in the direction of the external sector. This can be due to an increase in the income in the external partners, for instance. This increase in the external income leads to an increase in the demand for Brazilian exports, by hypothesis of 10%. The shift in the demand curve affects the internal allocation of production (*i.e* intermediate consumption and internal absorption) and the internal product (GDP).

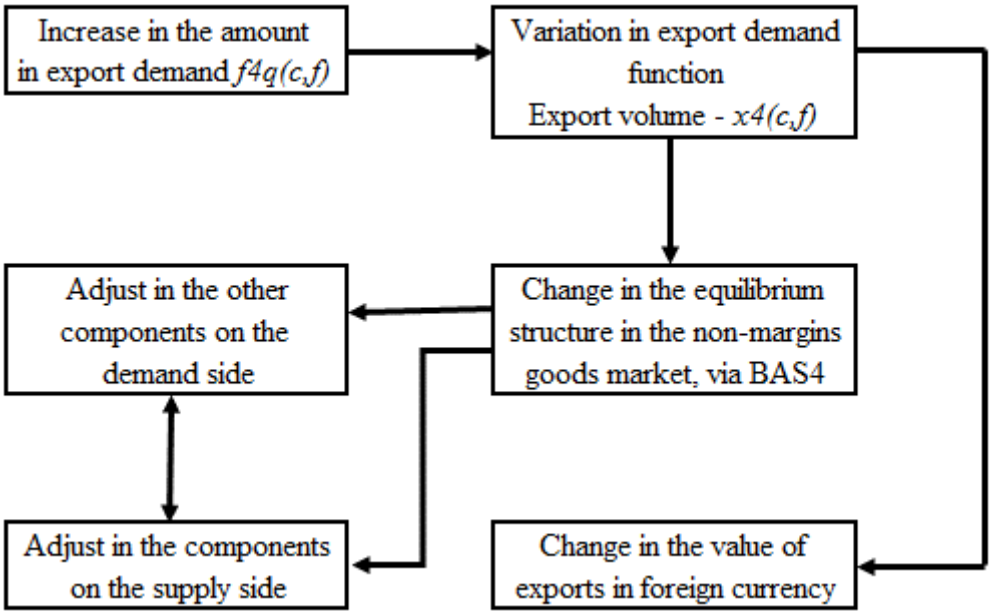
The equation (1) represent the external demand by domestic goods. Thus, the simulation implemented in this paper is an increase of 10% in the shift term, for quantities, on exports demand curve *f4q(c,f),* where *f4q* is the shift term, *c* is commodities and *f* is the foreign destination.

$$x4(c,f) - f4q(c,f) = -\mathbf{ABS}[EXP\_ELAST(c)]*[p4(c,f) - phi - f4p(c,f)] \quad (1)$$

We describe the immediate consequences in the following way:

a) Impact upon the demand curve of exports – *x4(c,f)*, which means variation in the export volumes. It is important to highlight that the magnitude of the variation in the export volume depend on the prices of exportable goods [*p4f(c,f)*] and on the export demand elasticity [*EXP_ELAST(c)*]; the price of exportable goods are affected by the internal costs of production, that depend of the relative prices of factors and production inputs.
b) The variation in the exports volume - *x4(c,f)* has a direct impact upon the supply and demand equilibrium in the market of non-margins goods.
c) Adjustment in the market of non-margins goods by the supply side. The adjustment can be explained in the following way: the shift on the demand curve for exports can be understood as an increase in the preference to sell the goods in a foreign market instead of sell the goods for internal market. However, this reallocation on sales can suffer a restriction because of supply constraints. In other words, because of the production capacity and because of the increase in the costs of production (in the short-run closure investment is fixed). Thus, the adjustment can occur in consumption, investment (only in the long-run) and government expenditure (internal absorption). Thus, the adjustment at intermediate consumption can be positive or negative.
d) Another direct impact of the variation in the exports volume *x4(c,f)* is the changes in prices, in foreign currency, of the exportable goods.

Figure 6 – Adjustment Mechanism – Main causal relations



5.2. Macroeconomic results

We will analyze the following variables: a) real GDP; b) real inventories; c) export volume index; d) import volume index; e) the ratio between nominal balance of trade and nominal GDP; f) Terms of trade; g) Aggregate employment and h) consumer price index. This analysis enables us to observe the impacts of a shift in export demand curve for the 10 foreign destinations. Thus, table 1 show the result for an increase of 10% in the quantity of agriculture commodities exports for seven foreign destinations (ZAF – South Africa; CHL – Chile; COL – Colombia; CUB – Cuba; ECU – Ecuador; MEX – Mexico; PER – Peru). Table 1B show the same results but for Mercocur and European Union.

Table 1. Brazil: Short-run effects in Selected Macroeconomic Variables (% variation)

	Increase in the quantity of agriculture commodities export *f4q(c,f)* for:						
Variables	**ZAF**	**CHL**	**COL**	**CUB**	**ECU**	**MEX**	**PER**
Real GDP	-0,000015	-0,000081	-0,000240	-0,000029	-0,000040	-0,000091	-0,000062
Inventories	-0,000034	0,000581	0,001919	-0,000040	0,000344	-0,000185	0,000532
Export volume	-0,000002	-0,000128	-0,000198	0,000013	-0,000062	0,000261	-0,000105
Import volume	0,000103	0,000526	0,001756	0,000223	0,000264	0,000925	0,000402
Trade balance	0,000000	0,000001	0,000002	0,000001	0,000000	0,000002	0,000000
Terms of trade	0,000238	0,001407	0,003596	0,000953	0,000571	0,002144	0,000853
Employment	-0,000026	-0,000144	-0,000427	-0,000053	-0,000070	-0,000173	-0,000109
Consumer Price	0,000236	0,001242	0,004237	0,000531	0,000642	0,002200	0,000980

Table 1A. Brazil: Short-run effects in Selected Macroeconomic Variables (% variation)

	Increase in the quantity of agriculture commodities export *f4q(c,f)* for:	
Variables	**Mercosur**	**European Union**
Real GDP	-0,000378	-0,012370
Inventories	0,000833	0,047950
Export volume	-0,000072	-0,008258
Import volume	0,002810	0,087976
Trade balance	0,000006	0,000239
Terms of trade	0,006994	0,273107
Employment	-0,000690	-0,021396
Consumer Price	0,006880	0,211062

We observe, in the short-run, a very interesting result for the increase in the quantity of agriculture commodities exports. The variation on GDP is negative for all simulations. This is due to the negative variation on inventories and exports and on the positive impact on imports. These shocks leads to a decrease in employment and an increase in the consumer price index. The results are in part related to the closure. All the adjustment on GDP by expenditure side is made on inventories; exports and imports because we consider household and government consumption and investment as exogenous. The exogeneity of household consumption leads to an increase in price index.

This result is not a surprise. If we look at the data base the total exports of agriculture commodities for the seven countries is 0.12% of the total Brazilian exports and for Mercosur and European Union is 3,3%. Therefore, the expansion of those exports leads to a reallocation of resources (See Figure 6) that results in a negative variation of GDP. The allocation is not positive for the GDP result.

If we observe the results for the second shock – an increase of 10% for export of processed agriculture goods we have a better result, in terms of percentage change in GDP. Table 2 and 2A present the results and we observe that there is a positive variation for GDP in all simulations. This result is in part due to the positive variation in exports and its variation above the variation in imports. This leads to a positive result for trade balance and in the terms of trade. Looking at base data the scenario change. The shares increase. The share of total exports of agriculture-processed goods to the seven countries in the total Brazilian exports is 1.8%, the share of total exports of agriculture-processed goods to Mercosur and European Union is 4.3%. These shares are very important for the explanation of the results. If the base data are too small,

even a huge increase do not lead to positive variations. We would like to call the attention for the positive variation in the employment.

Table 2. Brazil: Short-run effects in Selected Macroeconomic Variables (% variation)

	Increase in the quantity of agriculture-processed goods export *f4q(c,f)* for:						
Variables	**ZAF**	**CHL**	**COL**	**CUB**	**ECU**	**MEX**	**PER**
Real GDP	0,000612	0,003342	0,000105	0,000186	0,000017	0,000049	0,000032
Inventories	-0,000344	-0,001850	0,000013	-0,000021	-0,000051	-0,000003	-0,000018
Export volume	0,009913	0,048690	0,002100	0,003759	0,000477	0,000996	0,000673
Import volume	0,005477	0,024416	0,001353	0,002434	0,000353	0,000645	0,000443
Trade balance	0,000027	0,000144	0,000005	0,000010	0,000001	0,000002	0,000001
Terms of trade	0,015682	0,081643	0,002917	0,005785	0,000576	0,001126	0,000810
Employment	0,001044	0,005976	0,000140	0,000293	0,000013	0,000070	0,000051
Consumer Price	0,012134	0,054536	0,002547	0,005369	0,000727	0,001235	0,000877

We observe a heterogeneous result. In terms of GDP, we verify that the increase in the exports for South Africa, Chile and Cuba has the greatest impact upon GDP. Looking at trade balance and employment the main positive variation is for Chile.

Table 2A. Brazil: Short-run effects in Selected Macroeconomic Variables (% variation)

	Increase in the quantity of agriculture-processed goods export *f4q(c,f)* for:	
Variables	**Mercosur**	**European Union**
Real GDP	0,000870	0,008674
Inventories	-0,003275	0,007078
Export volume	0,025211	0,136182
Import volume	0,018812	0,074482
Trade balance	0,000051	0,000369
Terms of trade	0,030921	0,209624
Employment	0,000444	0,015334
Consumer Price	0,036439	0,144948

Observing Table 2A we verify that the percentage variation for all macroeconomic variables is bigger on the simulations for European Union than the Mercosur simulations. In monetary terms the export values are R$356.494.60 and R$395.082,40 (millions) for Mercosur and European Union simulation, respectively. This leads to a difference in the volume of exports of around 11% depending on the foreign destination. This difference in favor to European Union also occurs in terms of employment. There is an increase of 14756 employments when the shock is at European Union exports. For Mercosur there is an increase of only 427 employments.

5.2 Sectorial results

The first analysis that we made is on exports. The idea is the following: we have the impact on exports of each region after the shocks. Thus, when we make a comparison upon the results we will have an idea of trade bias. We construct this indicator as the difference between the variation on exports for the country we are increasing the exports and the other countries in our model.

On table 3, we have the results for the first shock. For all the countries, we have a decrease in the total volume of exports. We have and increase in the volume of exports in the country that we are inputting a 10% increase of the exports, but this increase is not capable to compensate the decrease of the exports to the other destination. Thus, in the end the increase in the exports of agriculture commodities do not give a positive impact as a whole. The analysis of the results for each country show that the highest impact is for Colombia, followed by Mexico and Chile. The table 3A shows the results for trade blocks. We observe the relative importance of European Union when compared to Mercosur. The percentage difference is around 1100% between Mercosur and European Union. The direction of exports to European Union compensate the decrease in the exports of the other foreign destinations. This result shows the importance of the European Union market for Brazil as an exporter of agriculture commodities.

Table 3. Export volumes (in R$ 1.000.000)

	Increase in the quantity of agriculture commodities export *f4q(c,f)* for:						
Exports	**ZAF**	**CHL**	**COL**	**CUB**	**ECU**	**MEX**	**PER**
1 ZAF	**97,333**	-3,782	-11,996	-1,745	-1,873	-6,044	-2,853
2 CHL	-2,517	**566,284**	-48,244	-7,149	-7,637	-23,242	-11,646
3 COL	-0,845	-6,416	**1385,611**	-1,798	-3,458	-8,388	-5,297
4 CUB	-0,363	-2,168	-3,714	**419,192**	-0,628	-3,417	-0,894
5 ECU	-0,396	-2,356	-7,854	-0,864	**215,156**	-3,606	-1,855
6 MEX	-4,981	-26,520	-87,186	-12,753	-13,167	**1067,444**	-20,009
7 PER	-0,728	-4,278	-14,541	-1,554	-2,223	-6,771	**318,877**
8 MERCOSUR	-7,613	-38,602	-122,024	-19,301	-18,515	-67,339	-28,129
9 EU	-34,967	-229,161	-433,148	-210,874	-71,388	-335,592	-102,835
10 ROW	-49,827	-289,445	-766,440	-188,298	-120,369	-447,510	-180,833
Increase	97,333	566,284	1385,611	419,192	215,156	1067,444	318,877
Decrease	-102,238	-602,726	-1495,147	-444,335	-239,257	-901,909	-354,351
Difference	-4,9045	-36,4416	-109,5365	-25,1432	-24,1007	165,5348	-35,4731

Table 3A. Export volumes (in R$ 1.000.000)

	Increase in the quantity of agriculture commodities export *f4q(c,f)* for:	
Exports	**Mercosur**	**European Union**
1 ZAF	-20,327	-642,604
2 CHL	-80,810	-2536,518
3 COL	-28,503	-821,262
4 CUB	-10,747	-350,255
5 ECU	-11,644	-349,188
6 MEX	-145,703	-4511,470
7 PER	-21,597	-649,151
8 MERCOSUR	**2618,735**	-6370,680
9 EU	-1050,160	**76060,660**
10 ROW	-1462,712	-62440,143
Increase	2618,735	76060,660
Decrease	-2832,204	-78671,273
Difference	-213,4697	-2610,6125

Table 4 shows the results for the 10% increase in exports of the agriculture-processed goods. The first point to be highlighted is the main difference from the first shock. We observe that the decrease of exports on the other destination is less than the increase of exports in the destination that suffers the shock. This shows that the bias of trade is in favor to the country that is receiving the shock. The result for Chile call our attention. It is around five times the result for the second most important country, which is South Africa. Cuba appears as the third highest impact. In the comparison between Mercosur and European Union we observe the relative importance of the second group.

Table 4. Export volumes (in R$ 1000000)

	Increase in the quantity of agriculture-processed goods export *f4q(c,f)* for:						
Exports	**ZAF**	**CHL**	**COL**	**CUB**	**ECU**	**MEX**	**PER**
1 ZAF	**8653,696**	-675,984	-7,959	-15,413	-1,757	-2,905	-2,387
2 CHL	-697,795	**40618,484**	-21,629	-43,112	-6,037	-11,132	-7,075
3 COL	-44,607	-192,873	**1757,506**	-21,205	-2,528	-4,433	-3,173
4 CUB	-10,653	-30,990	-4,337	**3259,432**	-0,567	-0,848	-0,723
5 ECU	-20,262	-90,754	-4,420	-8,887	**391,932**	-2,226	-1,493
6 MEX	-254,986	-1143,820	-57,277	-111,804	-15,358	**819,878**	-18,706
7 PER	-39,476	-175,332	-8,424	-17,235	-2,325	-4,139	**549,140**
8 MERCOSUR	-386,375	-1761,490	-84,245	-162,628	-24,376	-43,856	-28,272
9 EU	-986,959	-4250,987	-307,052	-635,299	-54,249	-111,711	-78,504
10 ROW	-3106,070	-14424,078	-589,899	-1164,310	-125,034	-236,818	-175,421
Increase	8653,696	40618,484	1757,506	3259,432	391,932	819,878	549,140
Decrease	-5547,183	-22746,308	-1085,242	-2179,892	-232,230	-418,068	-315,754
Difference	3106,5135	17872,1762	672,2640	1079,5393	159,7023	401,8107	233,3857

Table 4A. Export volumes (in R$ 1000000)

	Increase in the quantity of agriculture-processed goods export *f4q(c,f)* for:	
Exports	**Mercosur**	**European Union**
1 ZAF	-105,581	-448,611
2 CHL	-438,757	-1490,296
3 COL	-128,240	-633,730
4 CUB	-26,671	-335,537
5 ECU	-61,803	-251,126
6 MEX	-768,451	-3116,613
7 PER	-116,131	-489,745
8 MERCOSUR	**18416,066**	-4798,589
9 EU	-2752,376	**96768,515**
10 ROW	-6574,925	-37614,164
Increase	18416,066	96768,515
Decrease	-10972,935	-49178,411
Difference	7443,1305	47590,1039

6. Final Remarks

This paper brings new evidence on impacts of international trade, specifically, exports upon the Brazilian economy. The strategy adopt was shed light to new potential markets for agriculture exports and bring new results for these new potential markets and for traditional markets (Mercosur and European Union).

The analysis was made for agriculture commodities and processed agriculture goods. The difference between the results are very interesting. They show directly the multiplier capacity of the processed agriculture good exports and indirectly the multiplier capacity of agriculture commodities.

The size of the impacts of these potential trade partners when compared with the traditional ones is small, but the most important thing here is not the size, but the movement in the macroeconomic variables and in the trade results.

The results for export volumes for processed agriculture goods shows that there is a bias of trade in favor to the country that is receiving the shock. From these results, we can ranking the countries in terms of its relative importance. Thus, we observe that Chile, from this perspective, is the most important market for the processed agriculture goods, the second most important market is South Africa. It is important to highlight the dimension of the difference between the results for Chile and South Africa.

The analysis for the two trade blocks show the relative importance of European Union for the Brazilian agriculture sector. The result for European Union shed light to the importance of the continuity of agreements between Brazil and European Union. On the other hand, the result for Mercosur call our attention to the necessity of strengthen the incentives to increase the relative importance of Mercosur in order to take advantage of comparative advantages that Brazil has, like distance and previous agreements.

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