Welfare gains from changing partners in a trade bloc.

The case of MERCOSUR

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Abstract

This paper applies the new heterogeneous firm CGE model of Caliendo and Parro (2009) to determine what the Ricardian gains are from changing partners for members of a trade bloc. We focus on the MERCOSUR case, using a model with 48 sectors and 5 countries. Motivated by recent policy discussions, we quantify Uruguay's trade and welfare effects from signing a Free Trade Agreement with the United States and leaving MERCOSUR. We find positive welfare effects for Uruguay from bilaterally reducing tariffs with the United States. Most of the gains come from having access to lower-cost intermediate inputs for production. We then consider the policy experiment of bilaterally eliminating tariffs between all members of MERCOSUR and the United States. We find that Uruguay has the largest gains, while Argentina and Brazil do not benefit much. This paper also illustrates how new models are a promising tool for the analysis of trade.

1. Introduction

This paper uses the Caliendo and Parro (2009) heterogeneous firm, multi-country - multi-sector quantitative general equilibrium model for trade policy analysis in order to determine what the Ricardian welfare gains are from changing partners for members of a trade bloc. Consider a group of countries that form a custom union. These countries enjoy free trade in goods among members and will apply a common external tariff to non-member countries. Suppose now that a large developed country that does not belong to the trade bloc offers to sign a Free Trade Agreement (FTA) with one of the member countries. Should the country not sign the agreement? Should the country sign the agreement and therefore leave the bloc? Should the bloc sign the agreement? These are some of the questions that will be addressed here.

We focus on the case of the Mercado Comun del Sur (henceforth MERCOSUR). MERCOSUR is a custom union formed by four countries: Argentina, Brazil, Uruguay and Paraguay. In the year 2006, Uruguay faced the decision of whether or not to sign an FTA with the United States. This presented an evident trade-off for Uruguay. On the one side, the United States would lower the tariffs it applied to Uruguay. On the other side, Uruguay would have to leave MERCOSUR, and therefore Argentina, Brazil and Paraguay would increase the tariffs they applied to Uruguay to the external common tariff level. However, since Uruguay would not belong to MERCOSUR anymore, it would have the option of modifying the tariff policy it applied to the Rest of the World. In this paper we show how to apply the quantitative model developed in Caliendo and Parro (2009) to quantify and decompose the welfare effects for Uruguay of leaving MERCOSUR and signing an FTA with the United States. We also use the model to quantify the trade and welfare effects of other counterfactual scenarios such as MERCOSUR, as a bloc, signing an FTA with the United States.

More generally, the empirical application presented in this paper sheds light on the welfare effects of custom unions. Viner (1950) was the first to address theoretically the issue of welfare gains of Custom Unions, introducing the concepts of trade creation and

trade diversion. Bhagwati, Krishna and Panagariya (1999) present a synthesis of theoretical research on this topic since Viner's work. Empirical literature on the welfare effects of Custom Unions and Regional Trade agreements is much more scarce. Magee (2008) studies the intra-bloc and extra-bloc trade effects of different Custom Unions, Regional Trade Agreements and Free Trade Agreements using a dynamic gravity equation controlling for country pair, importer-year, and exporter-year fixed effects. He finds that Customs Unions generate the largest long-run increase in intra-bloc trade on average. Preferential trading arrangements, on the other hand, lead to much smaller increases in trade flows. Ghosh and Yamarik (2004) study the intra-bloc trade effect of twelve Regional Trade Agreements, concluding that they have increased intra-bloc trade. Yeats (1997) concludes that MERCOSUR trade flows have not changed according the comparative advantages of its members. Most of the empirical literature uses a gravity-type model to evaluate the ex-post trade effects of different trade agreements. The model developed in Caliendo and Parro (2009) allows quantification of ex-ante welfare effects. This paper provides an example of an ex-ante evaluation of trade policy questions.

The most popular tools for trade policy evaluation are the computable general equilibrium (CGE/AGE) models. These are multi-sector general equilibrium models and can be employed to evaluate ex-ante changes in trade policy. Examples of these models are the Michigan Brown-Deardorff-Stern model and the Purdue GTAP model (see Hertel 1997)[2]. We contribute to this area of research by providing a new model for tariff policy evaluation which uses the new trade literature on heterogeneous firms.

The paper is organized as follows: section 2 describes the Caliendo and Parro (2009) model, and section 3 briefly describes the history and characteristics of MERCOSUR. The data used to perform the empirical exercises are described in section 4, and section 5 explains the empirical exercises we perform and shows the results. Finally, section 6 presents the main conclusions.

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[2] Gilbert and Wahl (2002), and the works cited therein, present a description of the basic structure of CGE models.

2. A quantitative model for trade policy analysis

Caliendo and Parro (2009) are the first to develop a multi-sector and multi-country Ricardian model for counterfactual trade policy analysis. They generalize the Eaton and Kortum (2002) Ricardian model by adding multiple sectors and countries and incorporating trade in intermediate goods and the interaction across tradable and non-tradable sectors observed in the input-output tables. Some of the key advantages of their approach are that it brings new insights on the effects of tariff changes (from the micro founded Ricardian explanation of the reasons why heterogeneous firms trade in the model), there are low computational requirements to solve for the equilibrium variables and a low data requirement to evaluate the general equilibrium effects of tariff policy (only one elasticity has to be estimated) and it is an open-source and flexible tool to evaluate any type of tariff concessions. In this section we briefly describe the production structure of the model. For a more detailed description of the structure of the model and the way to solve for the equilibrium we refer the reader to Caliendo and Parro (2009).

The model is a general equilibrium model with multiple countries. Each country has multiple sectors. Within each sector, intermediate goods are produced using labor and a composite intermediate good. The composite intermediate good can be thought of as an aggregate (bundle) of intermediate inputs. Sectors are interconnected according to the input-output structure of the economy. Therefore, a composite intermediate good of a given sector can be used to produce intermediate goods not only in its own sector but also in every other sector. For instance, machinery is used not only to produce machinery, but also to produce cars, textiles, etc. Also, each composite good is used to produce not only intermediate goods but also final goods. Similar to the models of Eaton and Kortum (2002) and Alvarez and Lucas (2007), intermediate goods within each sector are produced with a stochastic efficiency level coming from a Frechet distribution. Making the model more general than those in Eaton and Kortum (2002) and Alvarez and Lucas (2007), this probabilistic distribution is assumed to be sector-specific. Households derive utility from consuming final goods and income is given by labor income, lump-sum

transfers from the Government due to tariff revenues and income coming from the country-level trade deficit.

There are two types of sectors: tradable and non-tradable. Within each tradable sector, intermediate goods are also tradable. Each tradable good is subject to two types of trade costs: an iceberg-type cost as in Dornbush, Fisher and Samuelson (1977), and an ad valorem flat-rate tariff applied over unit prices. The model allows for endogenous sectoral trade deficit, but deficits at the country level are exogenous.

Figure 1 considers an example of a two-tradable-sector economy. $Q^j_n(i)$ is the production of intermediate variety i in sector j and country n. The primary input in the economy is labor (L_n) and this is used in both sectors (arrows going into the production of varieties). In order to produce this variety, producers demand labor (L^j_n) and composite intermediate goods (q^j_n) from both sectors. Intermediate varieties can be exported or sold locally. Intermediate varieties either from these local producers or imported from another country are the only input for the production of the composite intermediate goods in this economy, as represented in the figure. Producers of the composite intermediate goods will demand intermediate varieties from the lowest-cost supplier in the world (subject to trade costs), which in some cases could be local. Households derive utility from the consumption of final goods which are produced with composite intermediates and no value added.

Changes in trade policy have general equilibrium effects in this economy. For instance, if the cost of importing intermediate varieties into sector 1 increases, this will affect the input cost of the production of the composite intermediate goods in sector 1. These goods are inputs for the production of final goods and for the production of intermediate varieties in sector 2 (input-output tables will determine how important this interconnection is); therefore, this cost increase will impact the price of final goods and intermediate varieties in other sectors. Some of these goods will lose their cost advantage and stop exporting to the rest of the world. This will also impact the price of the composite intermediate good in sector 2. Note that in an integrated world, these changes

in prices also affect prices in other countries. If intermediate varieties exported increase in price this will affect the cost of production of goods in all countries that import them. Note that in this model changes in trade policy have effects on the intensive as well as the extensive margin. Changes in trade policy can increase or reduce the amount of goods imported from abroad (intensive margin) but they can also change the lowest-cost supplier of particular goods (change in the extensive margin). All of these channels are contemplated in this model.

Using the case of MERCOSUR, which is described in the next section, we will present several policy experiments as an example of the applicability of the model.

Production Structure
2 tradable sector example

Labor (L_n)

Intermediate Variety i $Q_n^1(i)$

Intermediate Variety i $Q_n^2(i)$

Varieties Exported

Varieties Exported

Composite intermediate good 1 q_n^1

Composite intermediate good 2 q_n^2

Varieties Imported

Varieties Imported

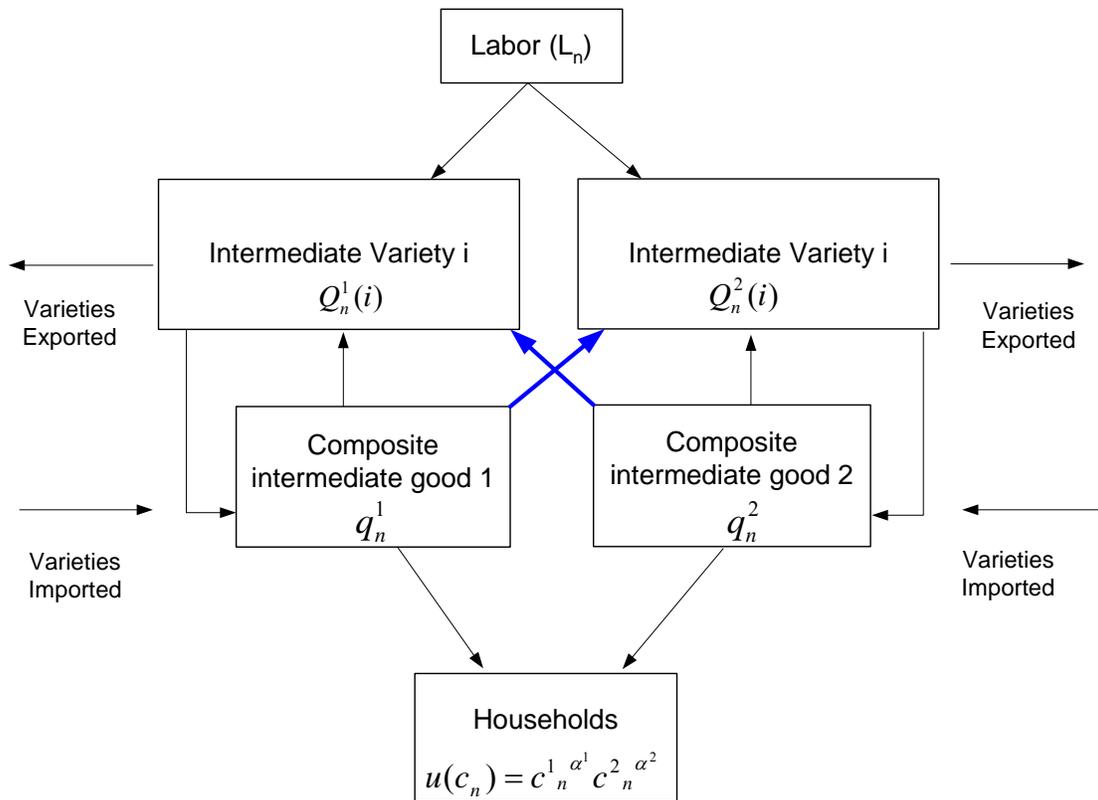Households $u(c_n) = c_n^{1\,\alpha^1} c_n^{2\,\alpha^2}$

Figure 1: Production structure in Caliendo and Parro (2009).

3. MERCOSUR: Characteristics and trade policy

MERCOSUR: Historical Background

In 1960, Argentina, Brazil, Chile, Mexico, Paraguay, Peru and Uruguay (joined by Colombia and Ecuador one year later) signed the Treaty of Montevideo, which created the "Asociación Latinoamericana de Libre Comercio" (ALALC, Latin-American Association of Free Trade) with a strong commitment between the members to create a Free Trade Area of the South within a time frame of 12 years. This time frame was later extended to the year 1980, but, given the national policies that each member implemented during the '70s, which gave more preference to national development projects, and the political and military instability of the countries as well as the economic and political rivalry that arose between Argentina and Brazil, the ALALC lacked support to achieve its original goals. That is why, after two decades of existence, the ALALC was abolished and a second Treaty of Montevideo was signed. In this treaty the "Asociación Latinoamericana de Integración" (ALADI, Latin-American Integration Association) was created, which had the same goals as ALALC, but without imposing any concrete compromise between the members to create a Free Trade Area.

In the middle of the 1980s Argentina was returning to a democratic political system, and surprisingly, in 1985, after years of political and economic confrontation, the new presidents of Argentina and Brazil signed the "Declaración de Iguazú" (Declaration of Iguazú), in which they manifested their will to accelerate the process of bilateral integration. This was formally established in 1986 when the "Programa de Integración y Cooperación Económica Argentina-Brazil" (PICE, Argentina-Brazil Economic and Integration Cooperation Program) was signed. It consisted of 24 protocols involving topics from capital goods to economic and social planning. This was a real success for both economies, as manifested by the increasing flow of trade between them, which fomented in 1988 a new treaty of integration, cooperation and development that fixed a

time frame of ten years to eliminate all barriers of trade between the two countries. Finally, in 1990 both countries signed the Buenos Aires Act, in which they compromised to reach a bilateral integration by December 31, 1994. Paraguay and Uruguay, both countries geographically situated between Argentina and Brazil, felt the need to be incorporated in this integration (following a domino effect, we believe). The initial step their government took was to hold a meeting with the presidents of Argentina and Brazil in order to express their will to create a multilateral agreement among the four countries.

The 26 of March of 1991, with the treaty of Asuncion, Argentina, Brazil, Paraguay and Uruguay formalized the creation of a common market between the countries, as it is wrote in the article 1 of the treaty, involving the free flow of capital goods, services and productive factors by eliminating all tariffs between members and imposing a unique external tariff. They also compromised to coordinate their macroeconomic policies involving: international trade, agriculture, industry, currency, transportation and communications in order to ensure adequate conditions for competitiveness between the members. So far, more than ten years later, MERCOSUR has only achieved the creation of a custom union with some exceptions. This is a real example of the difficulty involved in the creation of a custom union. We will try to describe briefly the process that was necessary to unify the common external tariffs and to eliminate the interregional tariffs.

Interregional tariffs

In the treaty of Asuncion, articles 5 and 6 established the procedure by which the interregional tariffs of the members must be reduced. It was a progressive, linear and automatic method starting in 1991 in order to reach the zero tariffs level by January 1, 1995. The first reduction was in the amount of 47% and in each consecutive semester there was a further reduction of seven percent. In order to adjust to the process of integration and minimize the possible negative effects of changing the production structure of the economy, each country was allowed to present a list of exceptions to the tariff reduction. Argentina presented a list with 394 items, Brazil had 324, Paraguay 439 and Uruguay 960. These lists had to be reduced each year by twenty percent for

Argentina and Brazil, and by ten percent for the first two years and then twenty percent in each subsequent year for Paraguay and Uruguay. In the year 1995, the interregional tariffs were to drop to zero for most of the items, leaving each country with a small list of exceptions. Some of the items that are on the list of exceptions are autos and auto parts, sugar, telecommunication equipment and electronics; these exceptions have created some debate between Argentina and Brazil. This has occurred because most of these sectors or items have had very different tariff treatment by the two countries in the past. For example, Argentina has in the last decades been reducing the tariffs applied to the electronics sector in order to catch up with new technologies; Brazil, on the other hand, has protected its national sector. In this case, Argentina could expect that as a result of the custom union trade could divert from the rest of the world's superior and lower-cost technology to Brazil's inferior and higher-cost technology. This problem is also directly related to the external tariffs of the union, as we will see in the next section.

Common External Tariff

Changes in the welfare effects over the members of a custom union are very sensitive to the vector of common external tariffs that is implemented. Kemp and Wan (1976) showed that if the members of the custom union optimally established the level of the tariff vector, then the resulting outcome is that no member is worse off than before, even when one is better off than before. However, in practice it is very difficult to implement that optimal vector.

The common external tariff in MERCOSUR has been applied since 1995 to more than 80% of imported items, ranging in value from 0 to 20 percent and with 11 different levels. As in the case of the interregional tariff, each country has its own list of exceptions to the common external tariff. In the Protocol of Ouro Preto (1995), it was established that the products in the list should reach their "normal tariff level" in the year 2001 for Brazil and Argentina, and in the year 2006 for Uruguay and Paraguay. This implied an absolute convergence of the external tariffs for the two largest members of the union only 10 years after the treaty of Asuncion, a complete success. But in 1997, Brazil

and Argentina suggested that the external tariffs were transitory readjusted by a magnitude of 3%, which implied a 25% increment in the average tariff of 14%, until the year 2001. Then, because of the economic crises that affected MERCOSUR, especially its two larger members (Brazil's crisis began in 1998, and Argentina's in 2001), the convergence was further delayed by the readjustment of the external tariffs to 1997 levels. By the end of 2003 the tariffs ranged between 0 and 20% again. Also, there has been a readjustment of the target dates for the convergence of the products on the list of exceptions for Argentina and Brazil.

Some of the items that were included in the exceptions list have been a source of debate because of the different tariff structure that each country had with extra-zone countries. Electronics and telecommunication equipment had an average tariff rate of 35% in Brazil, while in the rest of the member countries they had a very low or no tariff. After long negotiations a consensus has been reached to apply an external tariff of around 16% to these products. By the year 2006, all members had to adjust and converge to this level.

These and some further issues, like the redistribution of tariff revenues and tariffs on capital goods, are among the problems that the members of MERCOSUR must solve in order to continue with the process of complete integration.

Has MERCOSUR increased trade among members?

In this section we document the evolution of trade flows for MERCOSUR members. Figures 2 to 4 show each country's annual percentage of total exports to and imports from other MERCOSUR members between 1989 and 2007[3].

As we can see from these figures, in general there has not been a substantial increase in the magnitude of trade within the MERCOSUR bloc. First, we do not observe a jump in trade flows among the members when MERCOSUR was created in 1994. Second, we

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[3] We excluded Paraguay from this analysis and from the policy experiments described below because of data constraints.

find that in general exports to other MERCOSUR countries make up less than 25% of total exports for each member (less than 15% for Brazil) and imports from other members make up less than 40% of the total (less than 10% for Brazil). Moreover, with the exception of Argentina's imports from MERCOSUR, trade flows among members are lower than when the bloc was created.

The figures suggest that there has not been a substantial increase in intra-bloc trade since the creation of MERCOSUR. This observation raises the question of what the welfare effects would be if its members left the bloc and signed an FTA with a large economy such as the United States. The next section describes the empirical counterfactual that we perform to consider this question.
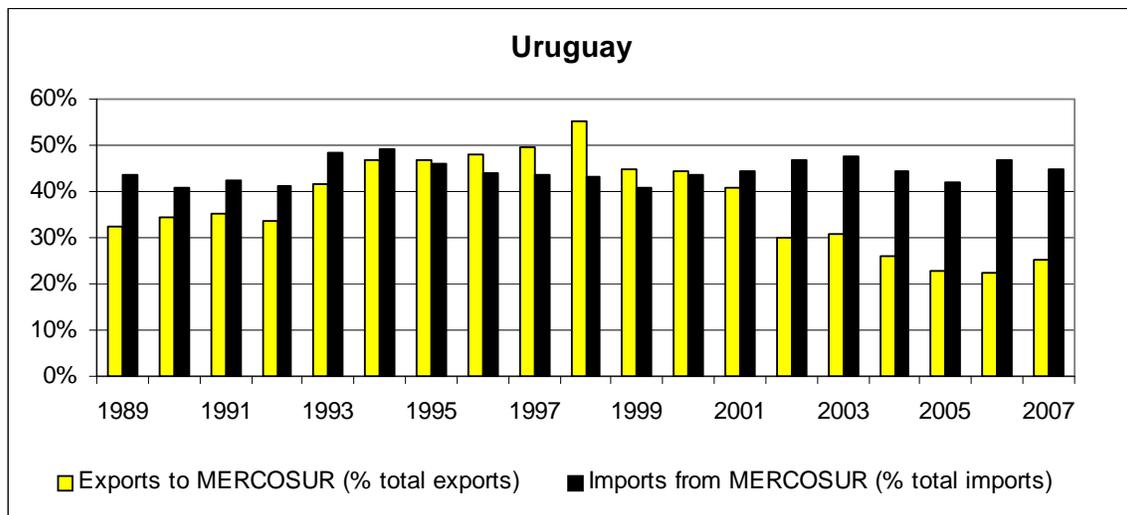

Figure 2. Intra-MERCOSUR exports and imports of Uruguay.

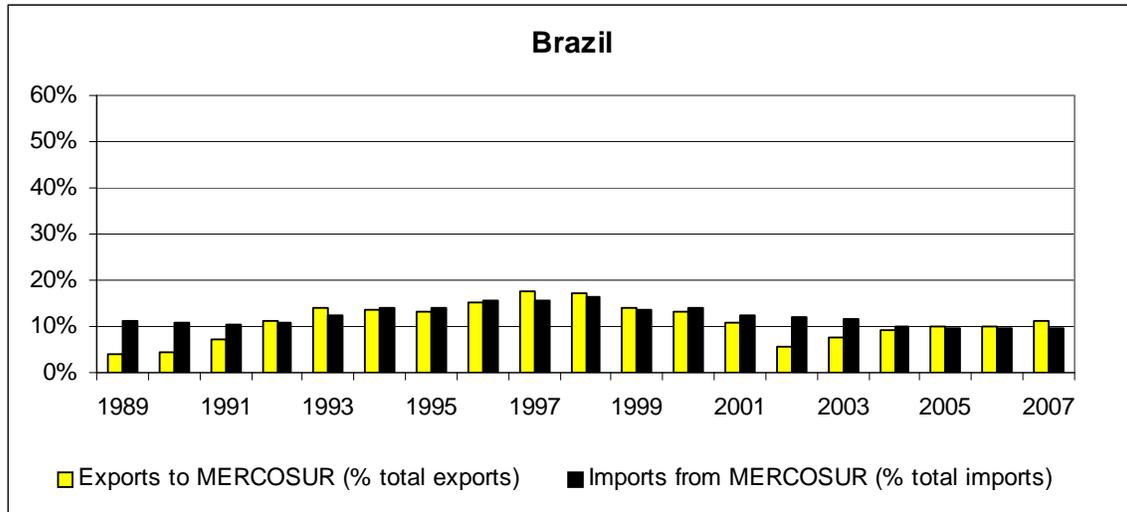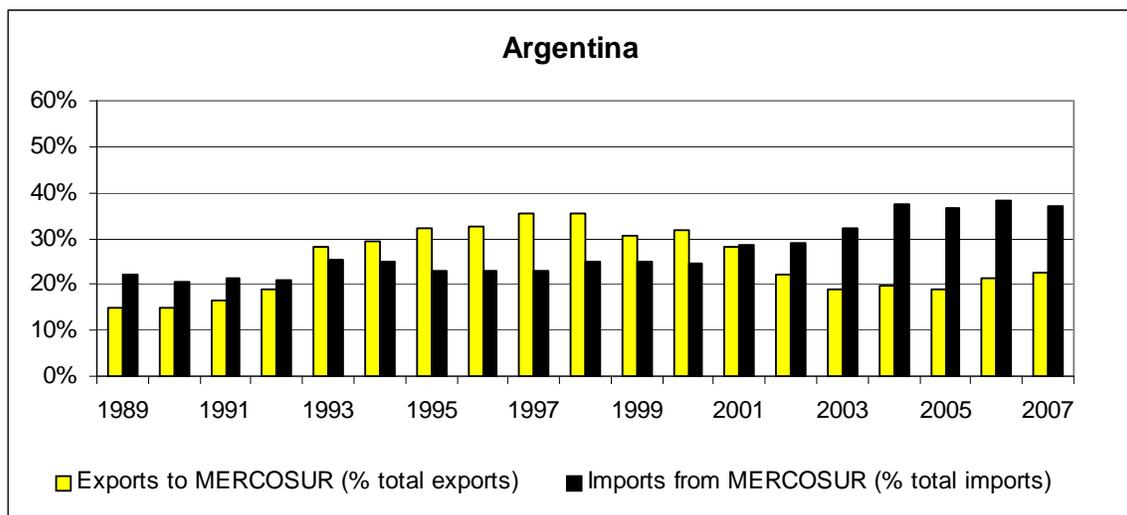Figure 3. Intra-MERCOSUR exports and imports of Brazil.

Figure 4. Intra-MERCOSUR exports and imports of Argentina.

4. Quantitative exercise: Data

One of the advantages of the model in Caliendo and Parro (2009) is the low amount of data needed in order to perform any type of policy experiment. The data needed are sectoral data on bilateral trade flows, import tariffs, value added, share of value added in

gross production, share of intermediate inputs in final production and estimates of the dispersion of productivity. We use data for Argentina, Brazil, Uruguay, the United States and the Rest of the World (ROW) for 2006 for 48 two-digit ISIC rev 3 sectors.

Trade flow data are from the UN COMTRADE dataset. Commodities are classified according to the Harmonized System 2002 (HS-02). We use a concordance table to classify the commodities according the ISIC rev 3 classification, which is how the production data are defined. Tariff data are from UNCTAD-TRAINS. Commodities are also classified according to the HS-02, thus we proceed in the same way as with trade flows to concord data to ISIC rev 3. External common tariffs are from the Ministry of Economics of Uruguay. Value added is obtained from the OECD and national agencies' input-output (I-O) tables. We construct the ROW using I-O tables for 34 countries[4]. In cases where no I-O table was available for 2006, we used a table from a previous year, updating the value added to 2006 using values from the UN Industry National Accounts dataset at the most disaggregated level we found. Share of value added in gross production is from the OECD and national agencies' I-O tables. The value for the ROW is simply the weighted average of the 34 countries we included in it. Share of intermediate inputs in final production is also obtained from the OECD and national agencies' I-O tables. The values for the ROW are constructed as a weighted average of 22 OECD countries that have I-O tables available for a common year. The sectoral dispersion of productivity was obtained from Caliendo and Parro (2009).

We use this data to calibrate the model to the year 2006 and perform the policy exercises described below[5].

5. Quantitative exercise: Counterfactual scenarios and results

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[4] These countries are Australia, Austria, Belgium, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Russia, Slovakia, South Africa, Spain, Sweden, Switzerland, Turkey, and the UK.

[5] See Caliendo and Parro (2009) for details on the calibration.

We turn now to the computational quantitative exercise where we focus on four policy experiments. Counterfactual scenario 1 examines a situation in which Uruguay leaves MERCOSUR and therefore faces the external common tariff applied by Argentina and Brazil. Counterfactual scenario 2 considers the case in which Uruguay and the United States sign an FTA. Counterfactual scenario 3 is the case in which Uruguay unilaterally reduces the tariffs it applies to the rest of the world; and finally, counterfactual scenario 4 tries to capture the effects of Uruguay signing FTAs with countries in the rest of the world. We caution the reader on the way the results of the policy experiments should be interpreted. The model will consider how variables are affected by only a change in the tariff vector. Other policy variables like changes in non-tariff barriers, quotas and capital restrictions will not be analyzed here. We do believe that these other variables are important and that they play an important role in the process of liberalization. However, we want to focus on one channel, the effect of only tariffs on the allocation of resources in a heterogeneous firm model.

Consider the case in which Uruguay leaves MERCOSUR. As a consequence, Argentina and Brazil impose the external common tariff on all goods imported from Uruguay. In this first scenario, we assume that there is no other change in the system. Table 1 summarizes the current scenario and Table 2 this first counterfactual scenario.

Table 1 Current scenario					
Importer/Exporter	Uruguay	Argentina	Brazil	United States	Rest of the World
Uruguay		0	0	ECT^j	ECT^j
Argentina	0		0	ECT^j	ECT^j
Brazil	0	0		ECT^j	ECT^j
United States	$tariff^j_{us,uy}$	$tariff^j_{us,arg}$	$tariff^j_{us,bra}$		$tariff^j_{us,row}$
Rest of the World	$tariff^j_{row,uy}$	$tariff^j_{row,arg}$	$tariff^j_{row,bra}$	$tariff^j_{row,us}$	

Note: This table describes the tariff structure presented by MERCOSUR countries. $tariff^j_{i,n}$ represents tariffs applied by country i to country n in sector j, ECT^j is the external common tariff applied by MERCOSUR members in sector j, and ARG, BRA, UY, US and ROW are Argentina, Brazil, Uruguay, the United States and the Rest of the World, respectively.

<table>
<tr><td colspan="6" align="center">Table 2
Counterfactual scenario 1</td></tr>
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Importer/Exporter	Uruguay	Argentina	Brazil	United States	Rest of the World
Uruguay		0	0	ECT^j	ECT^j
Argentina	ECT^j		0	ECT^j	ECT^j
Brazil	ECT^j	0		ECT^j	ECT^j
United States	$tariff^j_{us,uy}$	$tariff^j_{us,arg}$	$tariff^j_{us,bra}$		$tariff^j_{us,row}$
Rest of the World	$tariff^j_{row,uy}$	$tariff^j_{row,arg}$	$tariff^j_{row,bra}$	$tariff^j_{row,us}$	

Note: This table describes the tariff structure for counterfactual scenario 1. $tariff^j_{i,n}$ represents tariffs applied by country i to country n in sector j, ECT^j is the external common tariff applied by MERCOSUR members in sector j, and ARG, BRA, UY, US and ROW are Argentina, Brazil, Uruguay, the United States and the Rest of the World, respectively.

The first two columns of Table 3 present the changes in welfare and real wages under counterfactual scenario 1. Since Uruguay leaves MERCOSUR, Argentina and Brazil impose the external common tariff level to Uruguay. As a consequence, welfare and real wages decrease by 1.8% in Uruguay. The change in tariff revenue is negligible for Argentina and Brazil, and therefore there is no significant change in the equilibrium wages and prices for these countries. We then consider what the welfare effects are of Uruguay signing an FTA with the United States—counterfactual scenario 2. The FTA between Uruguay and the United States would most likely take the form of other FTAs that the United States has signed with other Latin American countries, such as Chile. Even though tariffs are not reduced to zero immediately, tariffs drop quickly over time and reach values of zero in a short period. We model a possible FTA by reducing tariffs between the United States and Uruguay to zero. One way to interpret the findings of the exercise is to consider the medium-run effects from the FTA and not the immediate short-run effects. Table 3 (Scenario 2) presents the results. The benefits to Uruguay of signing an FTA with the United States more than compensate for the welfare losses from leaving MERCOSUR (compare the results from scenarios 1 and 2). As a consequence, welfare increases by 5% and real wages by 5.3%. Having access to cheaper and more efficient intermediate inputs from the United States produces an increase in welfare even after the reduction in tariff revenues from dropping tariffs to the United States. The increase in real wages is explained by two effects. On one hand, the aggregate price index of the economy falls due to imports of cheaper intermediate inputs from the United States.

Table 3
Changes in welfare and real wages in four counterfactual scenarios

Simulated values example								
	Scenario 1: Uruguay leaves MERCOSUR		Scenario 2: Scenario 1 + FTA with US		Scenario 3: Scenario 2 + zero tariff with ROW		Scenario 4: Scenario 3 + FTA with ROW	
	Δ Welfare	Δ Real Wages	Δ Welfare	Δ Real Wages	Δ Welfare	Δ Real Wages	Δ Welfare	Δ Real Wages
Uruguay	-1.8336%	-1.8475%	4.9984%	5.2550%	4.9387%	5.9237%	6.6467%	7.6907%
Argentina	-0.0031%	-0.0147%	0.1047%	0.0855%	-0.0285%	-0.0374%	-0.0073%	-0.0177%
Brazil	0.0161%	0.0086%	0.0483%	0.0390%	-0.0051%	-0.0109%	0.0012%	-0.0049%
U.S.	0.0003%	0.0004%	-0.0053%	-0.0057%	-0.0083%	-0.0091%	-0.0044%	-0.0048%
ROW	0.0005%	0.0005%	-0.0032%	-0.0030%	0.0006%	0.0006%	-0.0018%	-0.0013%

Note: This table presents the welfare results of the four counterfactual experiments considered. Scenario 1 is the case in which Uruguay leaves MERCOSUR. Scenario 2 is the case in which Uruguay signs an FTA with the United States. Scenario 3 is the case in which Uruguay signs an FTA with the United States and unilaterally reduces its tariffs to the rest of the world. Scenario 4 is the case in which Uruguay signs FTAs with the United States and with the rest of the world. All the results are percentage changes from the initial condition.

On the other hand, nominal wages go up from the increase in the demand for labor from producers of final and intermediate goods. Producers with a comparative advantage will export more as a consequence of the reductions in cost (thanks to cheaper intermediate inputs) and of the increase in the demand for their goods from the larger U.S. market. The computational exercise shows that there is also a small increase in welfare for Argentina in this scenario. The reason is that Uruguay is now a more efficient producer in certain sectors. Therefore, Argentina can have access to cheaper intermediate inputs from Uruguay as a consequence of the FTA. This happens in sectors in which Argentina was already importing intermediate goods from Uruguay. The conclusion of the exercise is that there are positive Ricardian gains for Uruguay from signing an FTA with the United States.

We now consider another trade policy experiment. Suppose that Uruguay is considering signing an FTA with several other countries. The logic behind this exercise is that once Uruguay decides not to be a member of the MERCOSUR trading bloc anymore, it can apply any tariff concession it wants to the rest of the world. We consider first the case in which Uruguay applies zero tariffs to the rest of the world—that is, the case where Uruguay follows a unilateral liberalization process, counterfactual scenario 3. Table 3 (Scenario 3) presents the results. Uruguay's real wages increase by 5.9% and its welfare increases by a lower amount, 4.9%. In this case there is a larger decrease in tariff revenues, which explains the difference between the two measures. Notice that in this case welfare in Argentina is not affected. This is because the gains from having access to cheaper intermediate goods are countered by the loss from the fact that now Argentina cannot be the most efficient producer for Uruguay in some sectors.

Now we analyze counterfactual scenario 4, in which Uruguay leaves MERCOSUR, signs an FTA with the United States and also starts signing other FTAs with important economies in addition to following a unilateral liberalization process. This has been the integration strategy of other developing countries such as Chile. The difference from scenario 3 is that the rest of the world also decreases tariffs applied to Uruguay to the zero level. Scenario 4 in Table 3 shows the results of this policy experiment. Uruguay's

welfare increases by 6.6% and its real wages by 7.7%. Therefore, this integration strategy enhances welfare the most for Uruguay.

To further understand these results, we now evaluate the role of trade in intermediate inputs. In table 4 we repeat the four counterfactual exercises described above for the case in which only final goods are traded. In scenario 1, when Uruguay leaves MERCOSUR, welfare decreases by 1% instead of 1.8%. Since there is no trade in intermediate goods in the model, there is less trade overall. The changes in relative prices due to the increase in tariffs will only have an effect on final consumption and not on the production of goods, as was the case before. Therefore, this model predicts a lower welfare loss compared to the model in which intermediate inputs are traded.

When Uruguay starts signing FTAs, the welfare effects are almost half of those predicted by models with trade in intermediate inputs. Therefore, intermediate goods magnify the welfare gains from trade liberalization. The intuitive explanation is that having access to cheaper intermediate goods not only increases real income in Uruguay (through the effect of a reduction in prices), but also provides another channel through which firms can produce more efficiently and gain comparative advantage (through the effect of cheaper and more efficient inputs). Therefore, the key insight is that in a model with trade in intermediate inputs, tariff reductions have both a production as well as a consumption effect. However, in a model with no trade in intermediate inputs, there are only consumption gains from reductions in tariffs.

Table 4 Welfare gains for Uruguay in a model without trade in intermediate goods				
Simulated values example				
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Uruguay	-1.0261%	2.8105%	2.9577%	3.8899%
Argentina	0.0060%	0.0235%	-0.0317%	-0.0276%
Brazil	0.0114%	0.0173%	-0.0070%	-0.0059%
U.S.	0.0003%	0.0024%	0.0015%	0.0011%
ROW	0.0002%	-0.0030%	-0.0015%	-0.0018%

Note: This table presents the welfare results of the four counterfactual experiments considered. Scenario 1 is the case in which Uruguay leaves MERCOSUR. Scenario 2 is the case in which Uruguay signs an FTA with the United States. Scenario 3 is the case in which Uruguay signs an FTA with the

United States and unilaterally reduces its tariffs to the rest of the world. Scenario 4 is the case in which Uruguay signs FTAs with the United States and with the rest of the world. All the results are percentage changes from the initial condition.

In Caliendo and Parro (2009) we show that sectoral linkages also help to spread the gains from tariff reductions. The reason is that tariff reductions not only affect the sector to which the tariff is targeted, but also affect indirectly all the sectors in the economy which are related to that particular sector. Therefore, there can be a propagation as well as an amplification effect of changes in tariffs.

Table 5 shows the welfare effects under the above four scenarios when we shut down the sectoral links through the input-output table. Again, under scenario 1 welfare losses are lower for Uruguay because the magnifying effect when Argentina and Brazil impose the external common tariff is absent. When Uruguay signs an FTA with the United States and the ROW (scenarios, 2, 3 and 4) welfare gains are almost 50% lower if we do not consider the input-output interconnections.

Table 5 **Welfare gains for Uruguay** **in a model without sectoral interconnections**				
Simulated values example				
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Uruguay	-1.0875%	2.9098%	2.9802%	3.9373%
Argentina	0.0055%	0.0281%	-0.0336%	-0.0284%
Brazil	0.0128%	0.0208%	-0.0068%	-0.0052%
U.S.	0.0004%	0.0023%	0.0015%	0.0011%
ROW	0.0002%	-0.0032%	-0.0015%	-0.0018%

Note: This table presents the welfare results of the four counterfactual experiments considered. Scenario 1 is the case in which Uruguay leaves MERCOSUR. Scenario 2 is the case in which Uruguay signs an FTA with the United States. Scenario 3 is the case in which Uruguay signs an FTA with the United States and unilaterally reduces its tariffs to the rest of the world. Scenario 4 is the case in which Uruguay signs FTAs with the United States and with the rest of the world. All the results are percentage changes from the initial condition.

Figure 5 presents a summary of the welfare gains for Uruguay under different integration strategies. We can see that the optimal integration strategy for Uruguay is to leave

MERCOSUR and sign FTAs with the United States and every other important economy in the world. This strategy yields welfare gains of 6.6%, which are far larger than the losses due to the increase in tariffs by Argentina and Brazil. We can also see in the figure that the FTA with the United States makes the highest contribution to these gains.
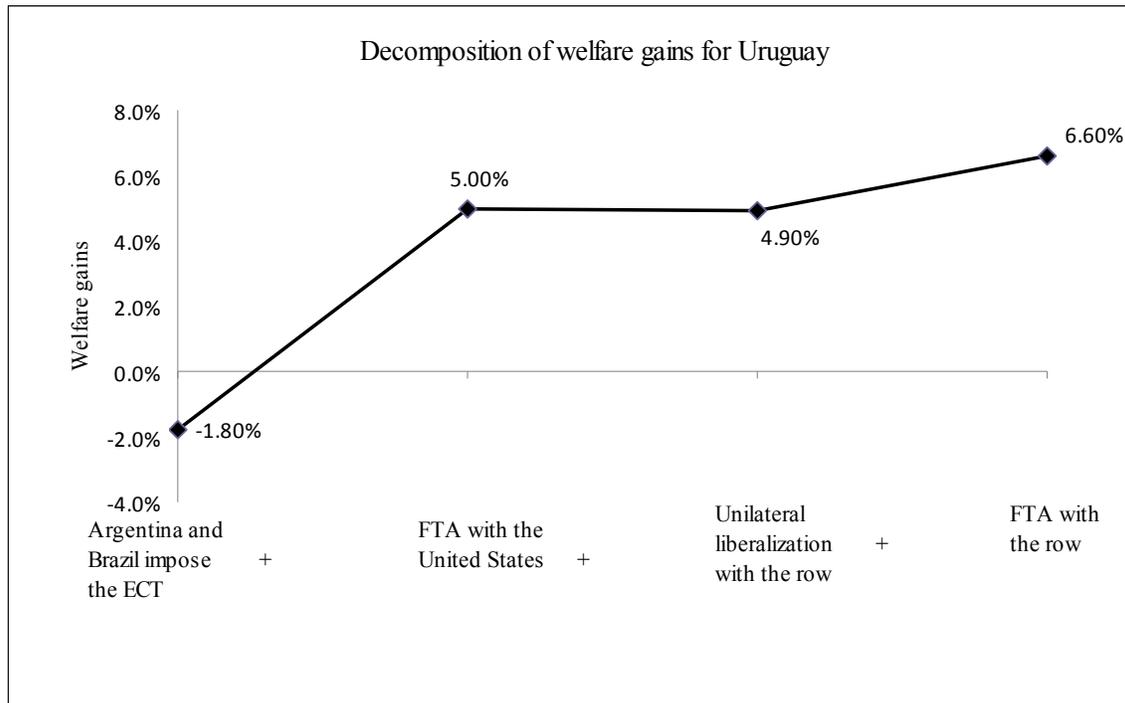

Figure 5: Welfare effects in counterfactual scenarios 1 - 4. All the results are percentage changes from the initial condition.

We now focus on the trade effects of these integration strategies. Figure 6 shows Uruguay's total trade with MERCOSUR, the United States and the rest of the world in the current scenario and in the four policy experiments. When Uruguay leaves MERCOSUR and Argentina and Brazil impose the external common tariff (scenario 1), trade with MERCOSUR decreases from 35.4% to 29.6% of total trade. On the other hand, trade with the United States increases from 8.9% to 10.1% of total trade, and with the rest of the world from 55.7% to 60.3%. Using scenario 1 as a baseline, if Uruguay also signs an FTA with the United States (scenario 2), we observe a big increase in trade with the United States, while trade with MERCOSUR decreases to 24.5% of total trade and trade with the rest of the world decreases to 46.9%. If Uruguay unilaterally lowers its

tariffs applied to the rest of the world, trade with the rest of the world increases to 54.5% of total trade while trade with MERCOSUR decreases to 16.1%. Finally, the results show that if Uruguay follows the most welfare-enhancing integration strategy, leaving MERCOSUR and signing FTAs with the United States and with the rest of the world, trade with MERCOSUR represents only 17.1% of total trade, almost a half of trade in the current scenario, while trade with the United States makes up 21.7%, almost three times as much as in the current situation. Uruguay's trade with the rest of the world is 61.2% of total trade.
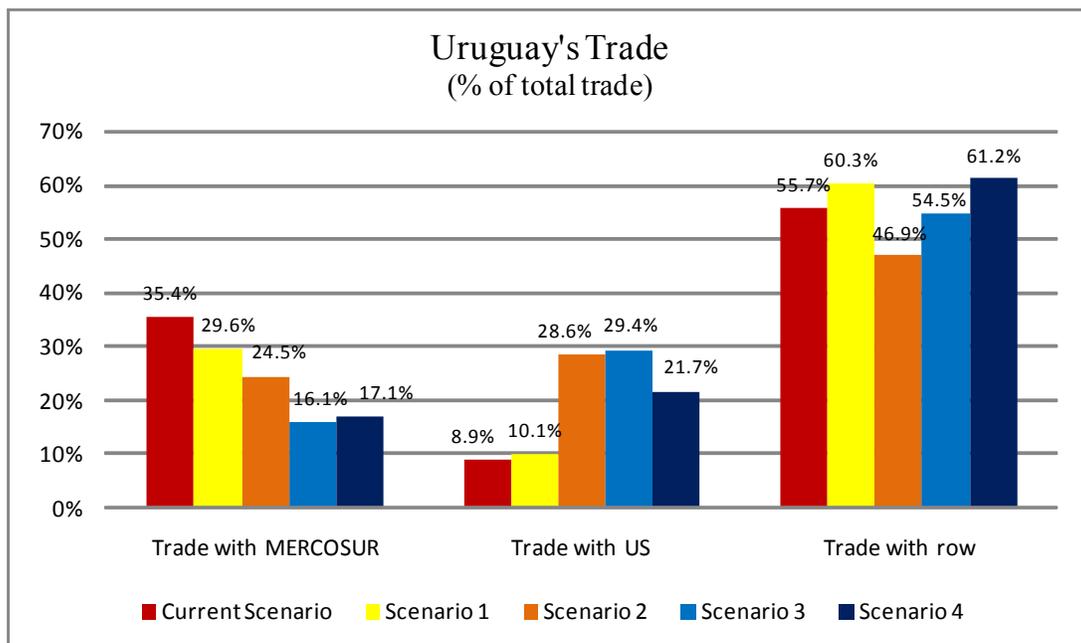

Figure 6: Trade effects for Uruguay in counterfactual scenarios 1 - 4. Scenario 1 is the case in which Uruguay leaves MERCOSUR. Scenario 2 is the case in which Uruguay signs an FTA with the United States. Scenario 3 is the case in which Uruguay signs an FTA with the United States and unilaterally reduces its tariffs to the rest of the world. Scenario 4 is the case in which Uruguay signs FTAs with the United States and with the rest of the world. All the results are percentage changes from the initial condition.

We now focus on a different type of policy experiment: what are the trade and welfare effects of MERCOSUR, as a bloc, signing an FTA with the United States? The idea is to use the model to evaluate whether a bilateral trade liberalization between all members of MERCOSUR and the United States is beneficial or not. Recall that we are only evaluating the static gains from tariff elimination.

Table 6 presents the results. The results indicate that Uruguay is the country with the most favorable effects from signing the FTA, with an increase in welfare of 5.6%, followed by the United States. Argentina and Brazil experience a reduction in welfare, while real wages increase in all countries except Brazil. There are several reasons for this result. On one hand, after the FTA is active, both Argentina and Brazil face competition from lower-cost suppliers of intermediate inputs from the United States. The simulated results show that both countries reduce their intra-trade dependence. Argentina reduces its exports to Brazil of goods in which it had a comparative advantage while Brazil reduces its exports to Argentina of goods in which it had a comparative advantage. Both of them start importing more from the United States. On the other hand, having access to lower-cost intermediate inputs allows Argentina and Brazil to increase their exports to the United States, Uruguay and the rest of the world of goods in which they continue to have a comparative advantage.

Table 6 Welfare gains for MERCOSUR from signing an FTA with the United States		
Simulated values example		
	Δ Welfare	Δ Real Wages
Uruguay	5.5760%	5.8359%
Argentina	-0.0215%	0.2794%
Brazil	-0.9564%	-0.6702%
U.S.	0.2060%	0.2358%
ROW	-0.0395%	-0.0383%

Note: Simulated values are % changes from the initial condition.

Figure 7 presents the trade effects of an FTA between MERCOSUR and the United States. We can see that intra-bloc trade decreases from 15.1% to 13.3% of total trade. As we mentioned before, this is mostly due to the reduction in trade between Brazil and Argentina. Trade between MERCOSUR members and the United States increases from 16.0% to 24.8% of total trade. Trade between MERCOSUR members and the rest of the world decreases from 68.9% to 61.9% of total trade. This decrease is due to the reduction

in total imports from the rest of the world. Both Brazil and Argentina experience an increment in total exports to the rest of the world in this scenario.
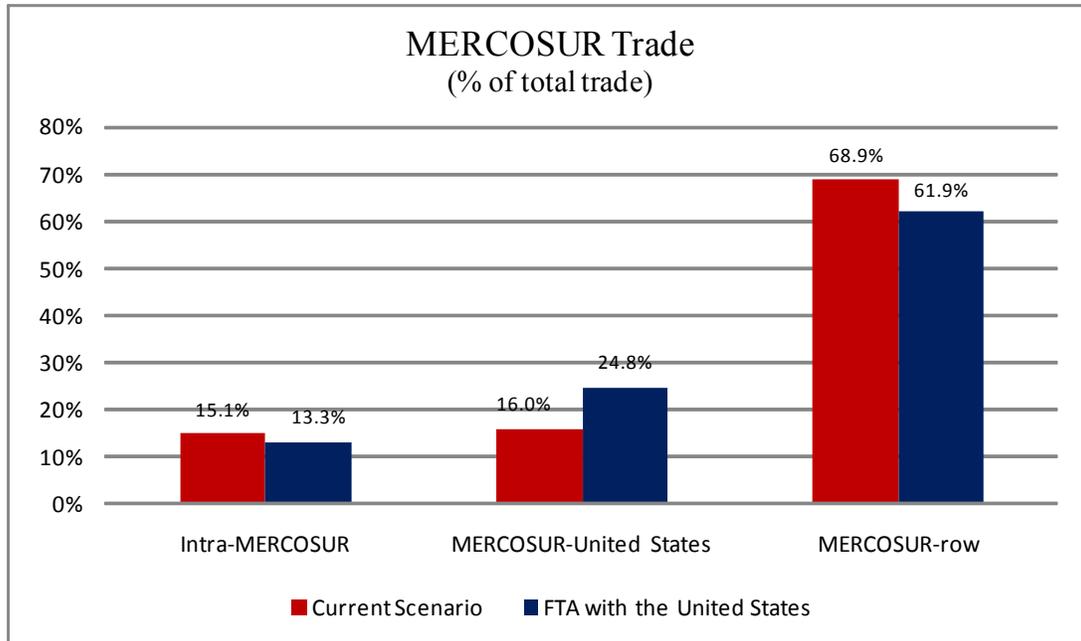

Figure 7: Trade effects for MERCOSUR of signing an FTA with the United States

6. Summary and conclusion

This paper applies a new heterogeneous firm, multi-country - multi-sector quantitative general equilibrium model for trade policy analysis to determine what the Ricardian welfare gains are from changing partners for members of a trade bloc. The policy experiment considered for the empirical application is the MERCOSUR case. We start by quantifying the welfare effects for Uruguay from leaving MERCOSUR and adopting different integration strategies with the world economy. Through the lens of this Ricardian model we find that the most welfare-enhancing integration strategy for Uruguay is to sign FTAs with all important economies in the world. Most of the benefits are due to the standard Ricardian gains from trade, allowing Uruguay to reallocate resources to sectors in which it has a comparative advantage. In this case welfare increases by 6.6% and real wages by 7.7%. Almost half of these gains are due to new access to cheaper intermediate inputs. These counterfactual exercises provide evidence

on the welfare costs of Custom Unions compared with free trade integration. Our results also indicate an important decline in trade with the other MERCOSUR members and an increase in trade with the United States and the rest of the world if Uruguay opens up to free trade.

When we compare the welfare effects of MERCOSUR signing a FTA with the United States, the results indicate that Uruguay has the largest gains, while Argentina and Brazil do not benefit much. The analysis reveals that most of the trade between Brazil and Argentina is in industries in which they do not have a comparative advantage. After reducing tariffs, both economies experience a reduction in trade with each other, an increase in imports of intermediate inputs from the United States and an expansion in exports to countries outside MERCOSUR. One of the reasons for this result that tariffs applied from the United States to Argentina and Brazil are substantially lower than the ones applied by these countries to the United States (except on agricultural products). Therefore, after signing an FTA, Argentina and Brazil do not increase their total exports to the United States much. Moreover, Argentina and Brazil experience a reduction in total expenditure due to the large reduction in tariff revenue. Both this effects makes Argentina and Brazil not gain as much as Uruguay from the reduction in tariffs as a consequence of signing the FTA. The results from our analysis should be interpreted with caution since we are only quantifying the gains from tariff changes. A more comprehensive analysis should also consider the effects of changes in non-tariff barriers, foreign direct investment and technological transfers, which are also key elements of any type of trade agreement. Nevertheless, the results illustrate how new models are a promising tool for the analysis of trade policy. More work needs to be done in this direction.

References

Alvarez, Fernando, and Robert E. Lucas, (2007), "General Equilibrium Analysis of the Eaton-Kortum Model of International Trade," Journal of Monetary Economics 54, 726--68.

Bhagwati, Jagdish; Krishna, Pravin; and Arvind Panagariya (eds.), (1999)," Trading blocs: Alternative Approaches to Analyzing Preferential Trade Agreements", The MIT Press, Cambridge, Massachusetts.

Caliendo, Lorenzo and Fernando Parro. "Estimates of the Trade and Welfare Effects of NAFTA," Working Paper, 2009.

Dekle R., Eaton J., Kortum S.,(2008) "Global Rebalancing with Gravity: Measuring the Burden of Adjustment", IMF Staff Papers 55, 511-540.

Dornbush, R., S. Fisher and P. Samuelson (1977), "Comparative Advantage, Trade and Payments in a Ricardian Model with a Continuum of Goods", American Economic Review 67, 823-839.

Eaton J. and S. Kortum (2002), "Technology, Geography and Trade", Econometrica 70, 1741-1779.

Ghosh, S. and S. Yamarik, (2004), "Does Trade Creation Measure Up? A Reexamination of the Effects of Regional Trading Arrangements", Economic Letters 82, 213-219.

J. Gilbert and T. Wahl (2002) "Applied General Equilibrium Assessments of Trade Liberalization in China" World Economy 25(5):697-731.

Hertel, Thomas, W. (1997) "Global Trade Analysis: Modeling and Applications", published by Cambridge University Press.

Kemp, M. and Wan, H. (1976), "An Elementary Proposition Concerning the Formation Of Customs Unions" Journal of International Economics 1, 95-97.

Magee, C., (2008), "New Measures of Trade Creation and Trade Diversion", Journal of International Economics 74, 349-362.

Viner, J., (1950) The Customs Union. New York.

Yeats, Alexander, (1998), "Does Mercosur's Trade Performance Raise Concerns about the Effects of Regional Trade Arrangements? ", The World Bank Economic Review 12, 1-28.