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How International Integration Affects the Exports of Brazilian States

Cómo afecta la integración internacional a las exportaciones de los estados brasileños

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Abstract

This paper assesses the impacts of international integration on the export flows of Brazilian states. We use a gravity model with dummy variables for the main partner blocs and for each pair Brazilian region-partner country, to account for the specificities of particular trade relations. Variables capturing regional openness and competitiveness are also included. We estimate a pooled cross-section model, with data for 24 countries, 27 states, and 4 years. After controlling for size and distance, trade with Mercosur and the EU is more intense than with the rest of the world. States accounting for larger shares of interregional trade tend to trade less internationally, while the opposite holds for those that are more competitive. The results also indicate that sectoral specificities play a role in explaining state's exports, as in the case of agriculture.

Keywords: Regional Economics; International Trade; Gravity Model; Mercosur; Economic Integration.

Resumen

Este trabajo busca determinar los impactos de la integración internacional en la exportación de los estados brasileños. Utilizamos un modelo gravitacional con variables *dummy* para los bloques principales de comercio y para cada región brasileña. Variables que capturan la apertura y la competitividad regionales también se incluyen. Estimamos un modelo de *pooled cross-section*, con datos para 24 países, 27 estados, y 4 años. Controlando para el tamaño y la distancia, el comercio con MERCOSUR y la UE es más intenso que con el resto del mundo. Los estados brasileños que abarcan partes más grandes del comercio interregional total tienden a negociar menos internacionalmente, mientras que lo contrario se sostiene para los que sean más competitivos. Los resultados también indican que las especificidades sectoriales desempeñan un papel en explicar las exportaciones del estado, como en el caso de la agricultura.

Palabras clave: Economía regional; Comercio internacional; Modelo gravitacional; Mercosur; Integración económica.

JEL Classification: R15, F15.

1. Introduction[1]

How does international economic integration affect regions of countries involved? As relative prices change in these countries, they increasingly specialize in the production of goods in which they have a comparative advantage; regions within these countries which concentrate a large share of the booming or contracting sectors are more than proportionally affected by economic integration. It is thus expected that economic integration affects different regions within a country in a different way. The literature on the impacts of economic integration among countries on their regions lists computable general equilibrium (CGE), input-output models and gravity models. The latter isolates the effects of income and distance on trade flows, highlighting the net effects of other variables. Such effects are much easier to estimate with a gravity model, given its lower data requirements in comparison to CGE and IO models[2].

The objective of this article is to evaluate the impacts of international economic integration on the export ability of different states in Brazil. We deal with the export flows of 27 Brazilian states to 24 countries[3], in four different

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[2] Sá Porto (2002b), p. 31.

[3] These countries account for about 85 per cent of the country's total trade. The countries are: France, Germany, Italy, United Kingdom, Netherlands, Belgium, Spain (European Union); United States, Mexico, Canada (NAFTA); Argentina, Paraguay, Uruguay (Mercosur); Chile, Colombia, Venezuela, China, Japan, South Korea, Russia, Switzerland, Nigeria, Saudi Arabia and Algeria. The Brazilian states are: São Paulo, Rio de Janeiro, Minas Gerais, Espírito Santo (Southeast Region); Paraná, Santa Catarina, Rio Grande do Sul (South Region); Goiás, Mato Grosso, Mato Grosso do Sul, Distrito Federal (Center-West Region); Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas,

years (1990, 1994, 1998, and 2000). We use a gravity model, following previous work by Sá Porto (2002a and 2002b), Sá Porto and Canuto (2002 and 2004). We extend their models to include dummy variables for Mercosur, Nafta and the European Union (the most relevant trading blocs for Brazil, given the country's total trade). We include variables to represent the competitiveness and the openness of the state' economies. In order to check for the specificities of particular trade situations, we introduce a dummy variable for each trade pair between a Brazilian region and a country partner. Finally, we evaluate whether there are specific effects on Brazilian states' exports to partner countries that can be explained by sectoral factors, by differentiating the analysis across five different sectors.

This article seeks to shed light into the regional implications of international economic integration. This is very important in the case of Brazil, as the country is plagued with huge regional disparities, and infrastructure connecting states exhibit substantial cross-regional variation in quality and density. In this context, trade may lead to significantly different effects across regions (Behrens *et al.*, 2003; Ge, 2006). The paper contributes to the existing literature by providing empirical evidence on a developing country, almost virtually absent before, and by introducing new ways of measuring the influence of economic factors, such as the consideration of specific trade pairs, and the differentiation across sectors.

The paper is organized in four sections, including this introduction. In Section 2 we briefly review the literature on the gravity model, as well as on the regional impacts of economic integration. In Section 3 we present the econometric models and results, and the conclusions are presented in Section 4.

2. Economic Integration and Regional Development

A neoclassical view of economic theory recognizes that regions have different natural endowments and policy-created strengths. As economic integration proceeds and trade barriers fall for all participating countries, relative prices change for all sectors within regional economies. Each region will then specialize in the production of the goods that intensively use those endowments and strengths, and the industrial structure of the countries, as well as of regions within countries, will change accordingly to exploit comparative advantages. As trade barriers fall, welfare increases for the world as a whole and for countries participating in regional integration, but the theory does not tell how those effects are transmitted throughout the regions of participating countries. Trade liberalization brought by regional integration benefits the sectors (and the regions where these sectors are located) which use more intensively in the country's most abundant factors, increasing income and

Sergipe, Bahia (Northeast Region); Acre, Amapá, Amazonas, Pará, Rondônia, Roraima and Tocantins (North Region).

welfare in those sectors. A region within a country will gain from economic integration if it concentrates a large share of those gaining sectors. Moreover, trade liberalization increases the real returns of those factors specific to the country's exporting sectors. If a region concentrates a large share of those sectors, it will gain from regional integration.

The argument is further developed in the more recent New Economic Geography literature. Fujita, Krugman and Venables (1999) show that, in a relatively closed economy, firms typically have the best access to both domestically produced inputs and to domestic markets if they locate in the capital city (and its larger metropolitan area). This creates forward and backward linkages in this core economy, which lead to the agglomeration of economic activity there. As trade liberalization moves forward, those linkages become less important, as firms receive more intermediate inputs from abroad and sell a larger part of their output abroad. Thus, there is less incentive to locate (in the case of new firms) or maintain location in the country's core. Firms and consumers become more outward-oriented, and trade liberalization leads to spatial deconcentration. Congestion costs may develop in the core region and help pushing industry away from the center. But as external trade now plays the role of balancing supply and demand for each sector's products in each location, industrial specialization is facilitated and driven by intra-industry linkages. Thus, regions specialize, and clustering of particular industries in each region will occur[4].

There are also impacts of preferential trade liberalization on industrial development. Venables (2003) highlights the role of regional comparative advantage in driving asymmetric distribution of benefits in trade agreements. In the case of developing countries, the spatial inequality of production activities "is due to the natural advantages of some regions relative to others and to the presence of agglomeration forces, leading to clustering of activity"[5]. Puga and Venables (1998) stress the role of the standard new economic geography forces by analyzing the role of trade in promoting industrial development. They show how trade liberalization can change the incentives for firms to locate in developing countries. They indicate that unilateral liberalization of imports of manufacturing goods can promote industrialization, and that membership in a preferential trading arrangement can create even larger gains. They also show that South-South PTAs are sensitive to the market size of member states, while North-South PTAs offer better prospects for participating developing countries.

Different methods can be used to associate changes in international and interregional trade flows with changes in regional economic structures. One set of models is based on input-output tables, such as the interregional input-output (IRIO) model or the multiregional input-output (MRIO) model, as in

[4] Fujita, Krugman and Venables (1999) pp. 329-343.
[5] Venables (2003), p. 2.

Polenske (1980). Shift-share models are also used to estimate the regional impacts of PTAs (Kume and Piani, 1999). General equilibrium models have also been used to evaluate the economic integration impacts on the regional economies of participating countries. Barros (1997) used such a model to evaluate the impacts of Mercosur trade flows in Brazil's Northeastern region. Domingues (2002a) used a general equilibrium model to evaluate the impacts of the Free Trade Area of the Americas (FTAA) on the Brazilian economy, at both regional and sectoral levels. Brandão, Lopes and Pereira (1996) used a GTAP general equilibrium model to simulate the impacts of adopting a complete customs union in Mercosur by the year 2006 on the Brazilian economy as a whole and then on its sectors. Haddad and Azzoni (2003) used a CGE model to evaluate regional concentration of economic activity due to tariff reductions during the implementation phase (March of 1991 to December of 1994) of Mercosur. Haddad, Domingues and Perobelli (2001) used another type of general equilibrium model (EFES-IT) to evaluate the aggregate, regional and sectoral impacts in Brazil of three possible free trade arrangements: FTAA, a Free Trade Area between Mercosur and the European Union (EU), and a generalized free trade area with all Brazil's main trade partners. Finally, a GTAP general equilibrium model is also used in Domingues (2002b) to simulate the welfare impacts in Brazil, Argentina and Uruguay of two possible free trade arrangements: FTAA, and the Free Trade Area between Mercosur and the European Union.

The gravity model is another possible tool. It was proposed independently by Tinbergen (1962) and Pöyhönen (1963), and was later on improved by Linnemann (1966). Tinbergen's initial objective was to account for the factors that explained the size of trade flows between two countries, namely, the total potential supply of the exporting country, factors related to the total potential demand of the importing country, and factors imposing resistance to trade. The first two factors were basically the Gross Domestic Product (GDP) of the exporting and importing country, respectively. Later on, Linnemann included the size of the populations of both countries, in order to reflect the role of economies of scale. Natural resistance to trade includes obstacles to trade imposed by nature, such as transportation costs, transport time, etc., and those imposed by governments, such as tariffs, quantitative restrictions, exchange controls, etc. Dummy variables were also included in the model, to account for the effects of preferential trade arrangements.

The original gravity model can be written as:

$$X_{ij} = a_0 (Y_i)^{a_1} (Y_j)^{a_2} (N_i)^{a_3} (N_j)^{a_4} (Dist_{ij})^{a_5} e^{(Pref)a_6} (e_{ij}), \qquad (1)$$

where X_{ij} is the dollar value of exports from country i to country j; Y_i and Y_j are the nominal values of GDP; N_i and N_j are the population of the countries; $Dist_{ij}$ is the distance between the commercial centers of the two countries, and is used as a proxy for the trade resistance variables; Pref is a dummy variable

which equals to 1 if both countries belong to a specific preferential trade area, and zero otherwise; and e_{ij} is the error term. The coefficients a_0 through a_6 are to be econometrically estimated.

As it was originally proposed, the gravity model's main weakness was its lack of a solid theoretical microeconomic foundation. The model described in equation (1) above is not an economic model, although it is a plausible one. Many authors have contributed to building a theoretical microeconomic foundation for the gravity model, such as Anderson (1979), Bergstrand (1985 and 1989), Deardorff (1998), Anderson and van Wincoop (2003), Redding and Venables (2004) and Combes *et al*. (2004)[6]. Other authors have added other explanatory variables to the original gravity equation (relative distance, GDP deflator, exchange rates, a country's openness index, etc.), in order to increase its explanatory power. The literature on empirical tests of the gravity model to evaluate regional integration cases is large, for since the end of the 1960s many studies have sought to evaluate the effects of the European Union, such as Aitken (1973), Frankel, Stein and Wei (1995), and Kume and Piani (2000), among others[7]. Martínez-Zarzoso and Nowak-Lehmann (2003 and 2004) have studied trade between Mercosur countries and European Union countries. Empirical applications of the gravity model indicate that it explains a large part of international trade among countries[8]. It has been widely used to estimate the welfare impacts of regional integration schemes[9].

From an Econometrics point of view, the gravity model also presents problems. It has been implemented empirically in most cases using cross section data. For instance, one can pick several years in a time series and compare different cross sections, evaluating how the estimated coefficients evolve over time. Even though this method can yield a high R^2, it tends to underestimate the trade volume between pairs of countries with high volume of trade, and to overestimate it for pairs of countries with low volume of trade. This generates a heterogeneity bias, which can be overcome by removing the gravity model's assumption of a sole intercept for all trade flows between pairs of countries (Cheng and Wall 1999)[10].

[6] For a detailed literature review of the theoretical foundations of the gravity model, see Sá Porto (2002b).

[7] See Sá Porto (2002b) for a detailed review of this literature.

[8] For example, Bergstrand's (1989) generalized gravity equation explained between 40% and 80% of the variation across countries in one-digit SITC trade flows.

[9] Viner (1950) noted that, while a customs union between some (and not all) countries would create trade and thus have positive effects on welfare, trade diversion might offset these positive effects. A regional integration scheme is net creator of trade if trade creation is larger than trade diversion. These net effects from trade creation and trade diversion are known as the static effects of economic integration. In the gravity model, when a bloc is a net trade creator, the coefficient for the bloc dummy variable is positive. Note, however, that in some cases it is possible that one or more countries in a regional bloc obtain significant gains even though the bloc's net trade creation is negative (as, for instance, argues Panagariya 1999, p. 483). As in the literature, we assume that a bloc is a net trade creator when the net effect is positive.

[10] Martinez-Zarzoso and Nowak-Lehmann (2004) and Fratianni and Kang (2006) show that statistically

On the empirical side, tests of the gravity model have assessed the welfare impacts of trade arrangements on countries as a whole, but none considered how economic integration affects different regions within the countries. Indeed, few studies have tried to evaluate the regional impacts of economic integration[11]. Bröcker (1988) used a variation of the gravity model to estimate the impact of the EEC and EFTA on the regions of four countries in Northern Europe (Germany, Norway, Sweden, and Denmark). He extended the original gravity model to include other variables, such as regional supply, regional demand, and international and interregional trade flows among regions. The impacts of Mercosur in Brazil's regions was evaluated by Sá Porto (2002a). Using a gravity model expanded to include dummy variables for Mercosur and for a region in Brazil, he found that the trade bias[12] with Mercosur has increased from 3.4 in 1990 to 27.1 in 1998 in Brazil's Southern region. That is, trade between a state in the Brazilian South (a region that borders all the Mercosur countries) in 1998 was more than 27 times larger than trade with other countries. Brazil's Southeast, a region which includes the country's three largest regional economies, saw its trade bias increase from 4.7 in 1990 to 21.9 in 1998. The other regions (North, Northeast and Center-West) also presented increases in their trade biases with Mercosur, although at a much smaller scale. He concluded that Mercosur impacted differently Brazilian regions. Sá Porto and Canuto (2002) continued that study[13], including a sectoral dummy variable and extending the analysis to the year 2000, thus encompassing the change in Brazil's exchange rate regime in early 1999. They showed that Brazilian states' trade flows to Mercosur countries fell substantially in 2000, but remained higher than the trade levels that prevailed prior to the implementation of Mercosur's custom union (January 1st 1995). Sá Porto and Canuto (2004) further extended this previous study by using panel data and the three models designed by Cheng and Wall (1999) previously mentioned. They showed that the impacts of Mercosur on Brazilian states trade flows are robust, regardless of the model used.

3. Model and Results

We use a standard gravity model to explain the exports of the 27 Brazilian states, including dummy variables for the three main economic integration blocs relevant for Brazil, namely, Mercosur, Nafta and EU (European Union) and for two regional economic integration blocs that may be implemented in

and economically significant heterogeneity exists in the distance elasticity in trade gravity model. Another common problem with *cross-sections* models is the impossibility of testing for the stability of the coefficients (Soloaga and Winters, 2001).

[11] A more detailed version of this literature review of this subsection can be seen in Sá Porto (2002b).

[12] In the literature, trade bias is a measure of the net effect of trade creation and trade diversion.

[13] See also Sá Porto (2002b).

the near future, namely, the Free Trade Area of the Americas (FTAA) and the Mercosur-European Union Free Trade Area (Mercoeuro). We add time dummies and variables measuring the state's degree of openness and competitiveness. We use panel data in a pooled cross section model, but we check the for effects of heterogeneity by estimating the model also with fixed effects and first differences.

In section 3.2 we evaluate the effects of integration on Brazilian states and regions. Instead of using a dummy variable for a trade bloc and another for a region, and then evaluate its joint effect, as in Sá Porto (2002) and Sá Porto and Canuto (2002 and 2004), we use a dummy variable for a region-country pair. Thus, we have a dummy for the pair Region South and Argentina, for example, another for the pair Region South and Uruguay, and so on. Since we have twenty-four countries and five regions, we have 24 x 5 = 120 region-country dummies. We measure the specific effect that a partner country may have on a state's (which belongs to a specific region) exports flow by means of a specific dummy variable for a region-country pair. In section 3.3 we assess whether there are specific effects on Brazilian states' exports to partner countries that can be explained by sectoral factors. We do so by adding sectoral dummies for agriculture, natural resources, and three manufacturing sectors (non-durables, durables, and intermediate goods).

3.1. Main Model

The basic model to be estimated is:

$$\begin{aligned} \ln X_{ijt} = {} & \ln a_0 + a_1 \ln Y_{it} + a_2 \ln Y_{jt} + a_3 \ln N_{it} + a_4 \ln N_{jt} + a_5 \ln Dist_{ij} \\ & + a_6 Mercosur + a_7 Nafta + a_8 EU + a_9 FTAA + a_{10} MercoEuro + \\ & a_{11} Dummy94 + a_{12} Dummy98 + a_{13} Dummy02 + a_{14} Interreg \\ & + a_{15} Internat + a_{16} Compet + \log e_{ij} \end{aligned} \qquad (2)$$

where X_{ij} is the dollar value of exports from the state i to country j; Y_i is the nominal value of state i's Gross Regional Product (GRP); Y_j is the nominal value of country j's GDP; N_i is the population of state i; N_j is the population of country j; $Dist_{ij}$ is the distance between the commercial centers of the state and the country; *Mercosur*, *Nafta*, *EU*, *FTAA*, and *MercoEuro* are dummy variables equal to 1 if the country belongs to that bloc, and zero otherwise; *Dummy94*, *Dummy98*, and *Dummy02* are dummy variables equal to 1 if the export from state i to country j occurred in that specific year, and zero otherwise. Their function is to take into consideration changes that might have occurred over time, since until 1990 the Brazilian economy was quite closed to external trade, and since then the process of opening was quite fast.

The variables *Interreg, Internat and Compet* are introduced to control for the production conditions present in the state's economies. *Interreg* is

the share of each state in total interstate trade (exports and imports) in the country. *Internat* is the share of each state in total national trade (exports and imports) with other countries. It is expected that states with larger shares in interregional and international trade have specificities that allow them to profit from commercial integration. *Compet* is the degree of competitiveness of each state, given by the ratio of total exports (to other states and other countries) to the state's GDP[14]. It is expected that states with a larger share of total exports on output are more competitive[15]. By controlling for these three variables, the influence of the traditional gravity model variables and the role played by commercial blocs in explaining the state's ability to export to other countries can be better measured.

As we use trade data between Brazilian states and the country's main trade partners, we have to deal with the heterogeneity bias, for the trade between São Paulo state and the USA, for example, is substantially different from the trade between Mato Grosso state and Paraguay. To check for this problem, we estimate the model with Fixed Effects and First Differences, and compare the coefficients. The fixed effects model is robust to a possible omission of time-invariant, non-observable regressors (Johnston and DiNardo, 2001). The first differences model is also robust to the omission of time invariant variables, but the intercept does not vary across trade pairs (Cheng and Wall, 1999). We have information for four years (1990, 1994, 1998 and 2002). In order to remove the influence of trade pairs with zero or minimum and erratic trade flows, we only kept the state-country trade flows which were not null for at least two years (Table A.1, in the Appendix)[16].

The results of the three models are displayed in Table 1. The coefficients for GDP (Y_i and Y_j) and for distance ($Dist_{ij}$) have the expected signs and are significant; the coefficients for population were only significant for the exporting state; the time dummies were not significant, indicating that the process of opening-up of the Brazilian economy did not affect the influence of the variables included in the model. These results are similar to the ones obtained in other studies by the authors cited in the literature review. As for the regional integration dummies, Mercosur is significant but considerably less important than in Sá Porto and Canuto (2004), who considered flows of exports and imports. The reason for this is that Mercosur is a less important destination for Brazilian exports than for Brazilian imports. The EU coefficient is significant, which means that the EU is important for Brazilian states' exports, even after controlling for the other variables in the model. That is, in spite of the absence

[14] These three variables refer to the year 1996, and information was taken from Haddad *et al.* (2002).

[15] A large share of trade of Brazilian states is with other Brazilian states (see Perobelli, 2004).

[16] The source of the trade data is SECEX (2004). The Gross Regional Product data and the population data for the Brazilian states was provided by IBGE (2004). The GDP and the population for the countries in the sample was obtained from the STARS CD-ROM from the World Bank. Finally, the distance data was extracted from the World Atlas MPC CD-ROM.

of trade preferences between Brazil and the EU, that bloc of countries present specificities that make them important destinations for Brazilian states' exports. The Nafta coefficient is not significant, which may be an odd result at first, for NAFTA countries (specially the U.S.) are important trade partners for Brazil. This may be due to the fact that these trade flows may have specificities that cannot be explained by the variables introduced in the model so far. The FTAA coefficient is not significant either. The coefficient of the share of interregional trade variable was significant and negative, meaning that states which larger shares on Brazil's interregional trade tend to trade less internationally. The coefficient of the share of international trade (exports plus imports) was also significant and positive, indicating that states with larger shares on Brazil's international trade tend to trade more with foreign countries. The coefficient for the degree of competitiveness was significant and positive, meaning that states that are more competitive tend to trade more with Brazil's international trade partners.

Comparing the results of the three models, it can be observed that, with one exception, the signs and significance of the coefficients are the same. The values of the coefficients of the traditional gravity model variables are smaller in the FE and FD models, which is in part explained by the absence of some variables (distance, interregional, international and competitiveness) in these versions, which also causes lower R^2 values. The same analysis holds for the trade bloc dummies, with the exception of MercoEuro, which is negative and significant in two cases, and positive and significant in one. Considering these aspects, and that the fact that the pooled cross-section model allows us to analyze the role of distance and other important conditionants of trade flows within the gravity model, we proceed with this model in the remaining estimations in this paper[17].

3.2. Introducing Region-Country Pair Specificities

The objective in this section is to evaluate whether there are specific effects on Brazilian states' exports that can be explained by factors related to that specific sending region or receiving country for that specific trade flow. These factors can be manifold. Martínez-Zarzoso and Nowak-Lehmann (2003), considering countries of Mercosur and the European Union, point out to variables such as infrastructure, income differences and exchange rates; Martínez-Zarzoso and Nowak-Lehmann (2004) add sectoral differences; Ge (2006) introduce regional specialization and industry agglomeration. The introduction of such variables takes into consideration that the economies of different regions are different and so are their capability to export.

To take that into consideration, we add dummy variables for each region-country par. If, for example, a dummy $Region_i$-$Country_j$ is defined for the trade

[17] Following Cheng and Wall (2004).

between Region Southeast and Argentina, that dummy equals to 1 if the state belongs to Region Southeast (for example, São Paulo) and the country is Argentina, and 0 if that is not the case. We chose the Northeast Region as the reference region, since it is the less open of all five Brazilian regions. As a result, we have 4 x 24 = 96 of these dummies.

The general results are similar to the ones previously presented in terms of values, signs and significance of the coefficients for GDP, population, distance, time dummies, and the openness and competitiveness variables. We can thus concentrate on the analysis of the coefficients of the region-country pairs. Table 2 presents only the statistically significant coefficients. In terms of exports to Mercosur countries, the only flows significantly different from the ones of the reference region are from Region South to Paraguay, and from the North, to Argentina and Uruguay. The Center-West Region flows to Paraguay present a negative coefficient, meaning that the Center-West exports less to Paraguay than the reference region (the Northeast), controlling for the other variables in the model.

Paraguay is an interesting case to illustrate the interpretation to be given to the results. Since Paraguay is adjacent to the Brazilian Center-West and South regions, their trade flows are expected to be intense, and in fact they are. However, controlling for all the other variables in the model, an even more intense flow should be expected with the Center-West region. By the same token, the trade flow with the South region is more intense then expected, given all variables included in the model. The estimates for the coefficients for the other export flows are not significant, meaning that in these cases there are no other factors explaining exports but the ones present in the gravity model.

As for the export flows towards European countries (EU and non-EU), there are important specificities, especially from regions South, Southeast and North. The same happens with export flows from the South and the Southeast towards the NAFTA countries of Mexico and the US. Events such as partial trade liberalization agreements in some sectors (such as the automobile industry), and trade links that have been forged since colonial times (such as export of coffee and iron more to Europe) may explain some of those specificities. South American countries that are not part of Mercosur (Colombia, Venezuela and Chile) have also trade specificities with exports coming from regions South and Southeast. Russia and South Korea have trade specificities with regions South and Center-West. Finally, Japan and China have important import links left to be explained with all of the four Brazilian regions.

Table 1: Estimated Coefficients

Variable	Pooled Cross-Section	Fixed Effects	First Differences
Constant a_{0ij}	-13.70* (1.89)		-2.37* (1.43)
Y_i	0.64* (0.10)	0.41* (0.09)	0.36* (0.09)
Y_j	0.79* (0.05)	0.61* (0.03)	0.62* (0.04)
N_i	0.91* (0.11)	0.85* (0.12)	0.89* (0.12)
N_j	0.06 (0.10)	0.01 (0.13)	0.05 (0.12)
$Dist_{ij}$	- 0.72* (0.16)		
Mercosur	1.75* (0.28)	2.21* (0.25)	1.93* (0.22)
NAFTA	0.12 (0.21)	0.17 (0.16)	0.02 (0.19)
EU	1.14* (0.22)	1.05* (0.19)	0.39* (0.13)
FTAA	-0.10 (0.24)	0.01 (0.15)	- 0.07 (0.17)
MercoEuro	- 1.01* (0.28)	0.05* (0.19)	- 0.49* (0.24)
1994	0.11 (0.13)	-0.01 (0.09)	0.11 (0.11)
1998	- 0.24 (0.13)	-0.17 (0.09)	0.00 (0.10)
2002	0.15 (0.12)	0.06 (0.13)	- 0.02 (0.13)
Interregional	-5.24* (2.19)		
International	4.69* (1.87)		
Competitiveness	2.79* (0.20)		
R^2	0.57	0.44	0.40
Number of observations	1,961	1,961	1,961

* Significant at the 5% level, one-tail test. The trade pair intercepts were omitted for space reasons. X_{ij} is the dependent variable. Standard errors are given in parentheses. All variables except dummies are expressed in natural logarithms for the PCS and FE models, and in first differences for the FD model. Estimation by OLS.

TABLE 2: ESTIMATED COEFFICIENTS ESTIMATES FOR THE STATE-COUNTRY PAIR DUMMIES

		Region			
Bloc	Country	S	SE	N	CW
Mercosur	ARG	-	-	1.82	-
	URU	-	-	1.26	-
	PAR	1.46	-	-	- 1.44
Nafta	MEX	1.79	1.62	-	-
	USA	2.14	1.69	-	- 1.35
	CAN	-	-	-	- 2.13
EU	FRA	1.76	-	1.05	-
	GER	2.34	1.25	0.96	0.58
	ITA	2.24	1.61	-	-
	UKG	2.34	-	1.25	-
	NTL	3.39	1.97	1.09	4.22
	BEL	2.82	2.19	1.85	2.09
	SPA	2.39	1.06	1.05	-
Rest of South America	COL	1.11	-	-	- 2.78
	VEN	1.44	1.14	-	- 1.51
	CHL	1.39	1.32	-	- 1.65
Rest of Europe	SWI	1.11	-	-	-
	RUS	2.63	-	-	2.15
Rest of Asia	JAP	2.05	1.59	2.35	1.17
	CHI	3.67	2.54	1.61	2.18
	KOR	2.01	2.66	-	1.21
Africa/ Middle East	NIG	2.17	-	-	-
	ALG	-	-	-	-
	SAU	3.38	1.45	-	-

3.3. INTRODUCING SECTORAL SPECIFICITIES

Differently from the previous sections, we now deal with trade flows between Brazilian states and partner countries for specific sectors. The objective is to evaluate whether there are specific effects on Brazilian state's exports that can be explained by sectoral factors. On top of the regional specificities introduced in the previous section, it should be expected that some sectors are more sensitive to distance, and even to the effects of trade agreements, than others. This aspect was stressed by Martínez-Zarzoso and Nowak-Lehmann (2004) in their analysis of Mercosur countries exports to EU countries.

In order to take those aspects into consideration, we have added dummy variables for sectoral pairs. For instance, if the dummy coefficient for a specific sector is positive, it means that this sector presents particular aspects that make exports from states more intense, controlling for the other variables included in the model. We consider only five sectors: 1) Agriculture; 2) Natural

Resources; 3) Non-durable Manufacturing Goods; 4) Durable Manufacturing Goods; and 5) Intermediate Manufacturing Goods[18]. Mercoeuro was chosen as the reference bloc. We have eliminated the intercept-dummy for blocs to avoid multicolinearity problems, and the time-dummies, for they were not significant in the previous models.

The results are shown in Table 3. As in the previous subsection, we had similar results with respect to the size and significance of the coefficients of GDP, population, distance, time dummies, and openness and competitiveness variables. The table only shows the significant coefficients for the sector-bloc dummy variables. It can be seen that only 8 out of 20 coefficients were not significant, indicating that sector specificities are important in explaining export flows of Brazilian states.

Exports of Agricultural Goods are more intense to Nafta, EU and FTAA than for the reference bloc; the non-significant difference for Mercosur can be explained by the fact that the neighboring countries in this bloc are not important buyers of Brazilian agricultural goods[19]. Exports of Natural Resources and Non-Durable and Durable Manufacturing Goods are more intense to Mercosur and to NAFTA. Exports of Durable Manufacturing Goods are significantly less intense to Mercosur, NAFTA and EU, and significantly more intense to FTAA. Finally, exports of Intermediate Manufacturing Goods are more intense to FTAA.

It is interesting to note that resource-oriented sectors in general present positive signs, indicating higher intensity of trade flows as compared to the reference bloc, controlling for the other variables in the model. This is compatible with the increasing share of the country in the international trade in these sectors. In manufacturing, positive signs are only present for non-durable goods for Mercosur and Nafta, and intermediate goods for FTAA. Both are non-sophisticated sectors. The more complex durable goods sector presents mostly negative signs, what could indicate competitive problems for the country, which are not observed with non-durable or intermediate manufactured products.

Table 3: Estimated Coefficients for the Sector-Bloc Interaction Dummies*

Sector		*Bloc*			
		Mercosur	*Nafta*	*EU*	*FTAA*
Resource-Oriented	Agriculture		0.78	2.83	1.78
	Natural Resources	0.46	1.17		
Manufacturing	Non-Durable	0.85	0.85		
	Durable Goods	- 0.69	- 0.87	- 1.34	0.94
	Intermediate Goods				1.54

* MercoEuro is the reference region

[18] The Harmonized System's (HS) 99 sectors that are used in AliceWeb, Brazil's international trade database, are mapped onto these five industries.
[19] They are important sellers, though.

4. CONCLUSIONS

In this paper we presented a model that shows the aggregate impacts of international commercial integration on the export flows of Brazilian states. The model controls for income and distance effects and concentrates on the economic integration, openness, competitiveness and specificities of region-country pair effects on the Brazilian states' trading patterns. The signs and significance of the traditional gravity model variables resulted as expected. We showed that the degree of openness (share of interregional and international trade) and competitiveness of the states were important in order to explain their export patterns. We showed that states that account for larger shares of total interregional trade tend to trade less internationally, while the opposite holds for those that are more competitive. These variables added considerably explanatory power to the model.

As to the regional blocs variables, the Mercosur coefficient was significant, although less significant than in previous works, meaning that Mercosur is a less important destination for Brazilian states' exports than it is for Brazilian state's imports (albeit still important). The EU coefficient was significant, meaning that in spite of the absence of trade preferences between Brazil and the EU, it is an important destination for Brazilian states' exports. On the other hand, the MercoEuro proposed free trade area may not matter so much for Brazilian states, as shown by its negative coefficient (with changing signs across models). The Nafta and FTAA coefficients were not significant, meaning that these blocs may not be as important as a destination for Brazilian state's exports.

The results on the specific state-country trade pairs indicate that there are things left unexplained by the gravity model variables. For example, in the case of Mercosur, region-partner country specific dummies are positive and significant for the Region South and Paraguay, for Region North and Argentina, and for Region North and Uruguay. This indicates that, over and above the influence of GDP, population, economic integration bloc dummies, openness and competitiveness variables, for some specific region-country trade pairs, there are specificities that make trade more intense. We note that there are important specificities to the export flows towards European countries (EU and non-EU), especially from Region South, Southeast and North. Export flows from the South and the Southeast regions towards the Nafta countries are also important. There are also trade specificities with South American countries of Colombia, Venezuela and Chile coming from regions South and Southeast, and Russia and South Korea have trade specificities with regions South and Center-West. We showed that Japan and China, in spite of the fact that they do not belong to any trade liberalization agreement with Brazil, have trade biases with four regions.

Finally, in evaluating the specific effects on Brazilian state's exports that can be explained by sectoral factors, we found that Brazilian states flows of resource-oriented activities are particularly intense, controlling for the other

variables in the model. We have thus extended out knowledge of the factors behind the effects of international commercial integration on the export ability of Brazilian states. It is clear that the economic variables behind the gravity model are important in general, but it is also clear that it lefts aside important specificities present in international trade.

References

Aitken, N.D. (1973): "The Effect of the EEC and EFTA on European Trade: A Temporal Cross-section Analysis", *American Economic Review*, 63 (5), 881-892.

Anderson, J.E. (1979): "A Theoretical Foundation for the Gravity Equation", *American Economic Review*, 69 (1), 106-116.

Anderson, J.E. and Van Wincoop, E. (2003): "Gravity with Gravitas: A Solution to the Border Puzzle", *American Economic Review*, 93 (1).

Barros, A.R. (1997): "Os Impactos do Mercosur no Nordeste brasileiro", in: Galvão, O.J.A., Barros, A. R. and Hidalgo, A. B.: *Comércio Internacional e Mercosur: Impactos sobre o Nordeste Brasileiro*, Banco do Nordeste do Brasil, Fortaleza.

Bayoumi, T. and Eichengreen, B. (1997): "Is Regionalism Simply a Diversion? Evidence from the Evolution of the EC and EFTA", in T. Ito and A.O. Krueger, (eds.): *Regionalism versus Multilateral Trade Arrangements*, University of Chicago Press, Chicago.

Behrens, K.; Gaigné, C.; Ottaviano, G. and Thisse, J.F. (2003): *Inter-regional and International Trade: Seventy Years After Ohlin*, *CEPR Discussion Paper*, 4065.

Bergstrand, J.H. (1989): "The Generalized Gravity Equation, Monopolistic Competition, and the Factor-Proportions Theory in International Trade", *The Review of Economics and Statistics*, 71, 143-153.

Bergstrand, J.H. (1985): "The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence", *The Review of Economics and Statistics*, 67, 474-481.

Brandão, A.S.P., Lopes, M. de R. and Pereira, L.V. (1996): "Uma Análise Quantitativa dos Impactos do Mercosur sobre o Brasil", in: Brandão, A.S.P., Pereira, L.V. (eds.): *Mercosur: Perspectivas da Integração*, Editora da Fundação Getulio Vargas, Rio de Janeiro.

Bröcker, J. (1988): "Interregional Trade and Economic Integration: a Partial Equilibrium Analysis", *Regional Science and Urban Economics*, 18, 261-281.

Cheng, I.H. and Wall, H.J. (1999): "Controlling for Heterogeneity in Gravity Models of Trade", *Federal Reserve Bank of St. Louis*, Working Paper, 010B, revised in 2004. Web site: <http://research.stlouisfed.org/wp/1999/1999-010.pdf>.

Combes, P.P., Duranton, G. and Gobillon, L. (2004): "Spatial Wage Disparities: Sorting Matters!", *CEPR Discussion Paper,* 4240.

Deardorff, A.V. (1998): "Does Gravity Work in a Neoclassical World?", in Frankel, J. (ed.): *The Regionalization of the World Economy*, University of Chicago Press, Chicago.

Domingues, E. (2002a): *Dimensão Regional e Setorial da Integração na Área de Livre Comércio das Américas: Projeções em Equilíbrio Geral para a Economia Brasileira*, FEA/USP, (Ph.D. Thesis).

Domingues, E. (2002b): "Sensitivity Analysis in Applied General Equilibrium Models: An Empirical Assessment for Mercosur Free Trade Area Agreements", *Latin American Meeting of the Econometric Society (LAMES)*, São Paulo, July.

Frankel, J., Stein, E. and Wei, S.J. (1995): "Trading Blocs and the Americas: The Natural, the Unnatural and the Supernatural", *Journal of Development Economics*, 47, 61-95.

Fratianni, M., Kang, H. (2006): "Heterogeneous Distance-elasticities in Trade Gravity Models", *Economics Letters*, 90 (1), 68-71.

Fujita, M., Krugman, P. and Venables, A. (1999): *The Spatial Economy: Cities, Regions, and International Trade*, MIT Press, Cambridge, Mass.

Ge, Y. (2006): "Regional Inequality, Industry Agglomeration and Foreign Trade", *United Nations University*, UNU-WIDER, Research Paper 2006/105, September.

Haddad, E.A., Azzoni, C.R., Domingues, E.P. and Perobelli, F.S. (2002): "Contas Estaduais e Matriz Interestadual de Insumo-Produto para o Brasil," *Economia Aplicada*, 6 (4), 875-895.

Haddad, E.A., Domingues, E.P. and Perobelli, F.S. (2001): "Impactos Setoriais e Regionais da Integração", in Tironi, L.F., (ed.): *Aspectos Estratégicos da Política Comercial Brasileira*, Vol. 1, IPEA/IPRI, Brasilia.

Haddad, E.A. and Azzoni, C.R. (2003): "Localización y Liberalización: Cambios Geográficos en la Estructura Económica Brasileña", in Callicó, J., Bouchain, R., Marina, A. and González, E., (eds.): *Insumo-Produto Regional y Otras Aplicaciones,* UAM, Mexico City, 79-111.

IBGE (2004): *Contas Regionais*, CD-Rom.

Johnston, J. and Dinardo, J. (2001): *Métodos Econométricos*, McGraw Hill de Portugal, Lisboa.

Krugman, P. and Obstfeld, M. (1999): *Economia Internacional. Teoria e Política*, Makron Books do Brasil, São Paulo.

Kume, H. and Piani, G. (2000): "Fluxos Bilaterais de Comércio e Blocos Regionais: Uma Aplicação do Modelo Gravitacional", *Pesquisa e Planejamento Econômico*, 30 (1).

Kume, H. and Piani, G. (1999): "Efeitos Regionais do Mercosur: uma Análise Diferencial-estrutural para Período 1990-1995", *Economia Aplicada*, 3 (1).

Linnemann, H. (1966): *An Econometric Study of International Trade Flows*, North Holland, Amsterdam.

Martínez-Zarzoso, I. and Nowak-Lehmann, F. (2003): "Augmented Gravity Model: An Empirical Application to Mercosur-European Union Trade Flows", *Journal of Applied Economics*, VI (2), 269-294.

Martínez-Zarzoso, I. and Nowak-Lehmann, F. (2004): "Economic and Geographical Distance: Explaining Mercosur Sectoral Exports to the EU", *Open Economies Review*, 15 (3), 291-314.

Panagariya, A. (1999): "The Regionalism Debate: An Overview", *World Economy*, 22, 477-511.

Perobelli, F. (2004): *Análise Espacial das Interações Econômicas entre os Estados Brasileiros*, FEA/USP (Ph.D. Thesis).

Polenske, K.R. (1980): *The U.S. Multiregional Input-output Accounts and Model*, Lexington Books, Lexington, Mass.

Pöyhönen, P. (1963): "A Tentative Model for the Volume of Trade Between Countries", *Welwirtschaftliches Archiv*, 90 (1), 93-99.

Puga, D., Venables, A. (1998): "Trading Arrangements and Industrial Development", *World Bank Economic Review*, 12 (2), 221-249.

Redding, S.J., Venables, A.J. (2004): "Economic Geography and International Inequality", *Journal of International Economics*, 62 (1), 58-82.

Sá Porto, P.C. de (2002a): "Mercosur and Regional Development in Brazil: A Gravity Model Approach", *Revista de Estudos Econômicos*, 32 (1).

Sá Porto, P.C. de (2002b): *Os Impactos dos Fluxos de Comércio do Mercosur sobre as Regiões Brasileiras*, IE/Unicamp(Ph.D. Thesis).

Sá Porto, Paulo C. de, Canuto, O. (2002): "Mercosur: Gains From Regional Integration and Exchange Rate Regimes", *Economia Aplicada*, 6 (4).

Sá Porto, Paulo C. de, Canuto, O. (2004): "Uma Avaliação dos Impactos Regionais do Mercosur usando Dados em Painel", *Pesquisa e Planejamento Econômico*, 34 (3).

SECEX (2004): *Sistema Alice*, Ministério do Desenvolvimento, Indústria e Comércio (MDIC).

Soloaga, I., Winters, A. (2001): "Regionalism in the Nineties: What Effect on Trade?" *North American Journal of Economics and Finance*, 12, 1-29.

Tinbergen, J. (1962): *Shaping the World Economy: Suggestions for an International Economic Policy*, Twentieth Century Fund, New York.

Venables, A. (2003): "Spatial Disparities in Developing Countries: Cities, Regions and International Trade", *CEP Discussion Paper,* 0593.

Viner, J. (1950): *The Customs Union Issue*, Anderson Kramer Associates, Washington D.C.

Appendix

Table A.1: Presence of trade flows between states and trade partners, 1990, 1994, 1998 and 2000.

	ARG	CHL	FRA	GER	ITA	JAP	MEX	HOL	PAR	U.K.	URU	USA
AC	000X 00mm	0X00 0000	0000 00m0	000X 0000	0X0X 0000	000X mmmm	0X00 0000	000X 0000	0000 0000	XX0X 0m00	000X 0000	XXXX mmmm
AL	XXXX mmmm	0XX0 0mmm	XXXX mmmm	XXXX mmmm	XX0X mmmm	XXXX mmmm	0000 mmm0	00XX 0mmm	00X0 mmmm	0000 mmmm	0XXX 00mm	XXXX mmmm
AM	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXX0 mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	X0XX mmmm	XXXX m0mm	XXXX mmmm	XXXX mmmm	XXXX mmmm
AP	XXXX m0mm	XXX0 0000	XXXX 0mmm	0XXX mmmm	XXX0 mmmm	XXXX mmmm	00X0 00mm	XXX0 00m0	0XX0 0000	XXX0 m0mm	XXXX 0000	XXXX mmmm
BA	XXXX mmmm	XXXX mmmm	X0XX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	00XX m0mm	XXXX mmmm	XXXX mmmm	XXXX mmmm
CE	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	0XXX mmmm	XXXX mmmm
DF	00XX mmmm	00XX mmmm	XX0X mmmm	XX00 mmmm	0X0X mmmm	00X0 mmmm	0000 mmmm	0X0X mmmm	0XXX m0m0	0000 mmmm	0XXX 0mmm	XXXX mmmm
ES	XXXX mmmm	0XXX mmmm	0XXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	0XXX mmmm	X0XX mmmm	00XX 0mmm	XXXX mmmm	00XX mmmm	XXXX mmmm
GO	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	X0XX mmmm	XXXX mmmm	XXXX 0mmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	0XXX mmmm	XXXX mmmm
MA	XXXX mmmm	0XXX 0000	X0XX mmmm	XXXX mmmm	X0XX mmmm	XXXX mmmm	XXXX m0mm	XXXX mmmm	0XX0 0000	0XXX mmmm	0XX0 000m	XXXX mmmm
MG	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	00XX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm
MS	XXXX mmmm	000X m0mm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	00XX 000m	XXXX mmmm	XXXX mmmm	0XXX 0mmm	XXXX 00mm	XXXX mmmm
MT	X0XX mmmm	00XX 0mmm	XXXX 0mmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	00XX 00mm	XXXX mmmm	00XX 0mmm	XXXX 0mmm	XXXX mmmm	XXXX mmmm

PA	XXXX mmmm	00XX 0mmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	00XX 00m0	XXXX mmmm	00XX 00mm	XXXX mmmm
PB	XXXX mmmm	0XXX mmmm	X0XX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	X0XX mmmm	XXXX mmmm	XXXX 00mm	XXXX mmmm	XXXX mmmm	XXXX mmmm
PE	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	0XXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mm0m	XXXX mmmm	XXXX mmmm
PI	XXXX 0mmm	X0XX m0m0	XXXX mmmm	XXXX mmmm	XXXX 0mmm	XXXX mmmm	XXXX mmmm	XXXX m0mm	X0XX 0mmm	XXXX 0mmm	000X mmmm	XXXX mmmm
PR	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	0XXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm
RJ	XXXX mmmm	XXXX mmmm	0XXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm
RN	XXXX mmmm	0XXX mm0m	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX m00m	XXXX mmmm	XXXX mmmm	XXXX mmmm
RO	0XXX 0mmm	0000 0000	00XX 00mm	XXXX 0mmm	XXXX 0mmm	0XXX mmmm	XX0X 00mm	XXXX 0m0m	00X0 0000	XXXX mmmm	0XXX 00m0	XXXX mmm
RR	X000 m000	0000 0000	0000 0m00	000X 0m00	0000 0mm0	0000 mm00	0000 0000	0000 0m00	0X00 0000	0000 0000	0X00 0000	0X0X mmmm
RS	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm
SC	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm
SE	XXXX mmmm	XXXX 0mmm	0X00 mmmm	XX0X mmmm	XXXX mmmm	0X00 mmmm	X0XX 0m00	XXXX 0mmm	XXXX mmmm	XX00 mmmm	0XXX 0mmm	XXXX mmmm
SP	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX mmmm	XXXX Mmmm
TO	00X0 00mm	0000 00mm	000X 00mm	00XX 00mm	00X0 0mm0	0000 0m0m	00X0 0000	0XXX 0000	0000 0000	000X 000m	0000 00m0	00XX 0mmm

Note: X = exports are present; M = imports are present; 0 = absence of either exports or imports; first line is for exports, and the second line is for imports; first column = 1990; second column = 1994; third column = 1998; fourth column = 2002.