LACEA 2001
MONTEVIDEO URUGUAY

LACEA 2001
MONTEVIDEO URUGUAY

Herman Kamil, joint with Alvaro Ons

Determinants of the Pattern of Bilateral Trade Under Regional Trade Agreements: An Application to MERCOSUR

The Pattern of Bilateral Trade under a Regional Trade Agreement: An Application to MERCOSUR's Trade Flows

Herman Kamil*
Alvaro Ons**

May 2001

*Department of Economics. University of Michigan at Ann Arbor
** Universidad de la República, Uruguay

I. Introduction

During the last 10 years, regionalism has re-emerged as a major issue in the policy agenda, as Preferential Trade Arrangements (PTA) have now become an integral and enduring aspect of the multilateral trade regime[1].

In the Southern cone of Latin America, the Common Market of the South (MERCOSUR) was created between the countries of Argentina, Brazil, Paraguay and Uruguay under the Treaty of Asuncion, signed on the 26th of March of 1991. Before 1995*,* the MERCOSUR was a free trade zone: the terms of the treaty defined a path of tariff liberalization aimed to achieve zero internal tariffs and non-tariff barriers by the end of 1994. Under the *Ouro Preto Protocol* signed in December 1994, an imperfect customs union was created: intra-block tariffs were eliminated and a Common External Tariff (CET) was instituted (there are, however, a number of exceptions to the common external tariff). This customs union is scheduled to come into full effect on January 1, 2006.

Approximately at the same time member countries began to implement discriminatory tariff preferences on intra-block trade, the pattern of aggregate trade flows of the MERCOSUR countries showed significant changes both in their volume and geographical orientation. The main stylized fact has been the increase in the share of intra-block trade in total trade of each of its members.

The goals of the project are twofold. First, to examine the determinants of bilateral trade flows in goods of the MERCOSUR countries in the period 1986-1997. By starting in 1986, the study accounts for the effects of the strong unilateral trade liberalization that future MERCOSUR members initiated around this period. Second, to quantify the effects that trade-block creation had in the observed regionalization of trade, once we control for other factors affecting intra and inter-regional trade that were also changing during the period.

An adequate instrument to attain these goals is the estimation of a gravitational equation for bilateral trade, given that it provides a systematic framework in which to study the way economic, geographical, institutional and cultural factors shape the pattern of bilateral trade in the context of regional integration[2].

The empirical implementation will consist in applying an augmented version of the gravitational equation to a data set of bilateral aggregate trade flows for 35 countries using panel data techniques, in the line of previous work like Soloaga and Winters (1999), Kruegger (1999) and Bayoumi and Eichengreen (1995)*,* among others.

A subsidiary goal of our project will be to show that many of the papers in this literature are prone to suffer from omitted variable bias, in the sense that most of them maximize

[1] 'Between 1990 and 1997, 87 PTAs were notified to the World Trade Organization (WTO), and nearly all signatories of the WTO are currently members of at least one PTA.

[2] The recent popularity of the gravity model is highlighted by Eichengreen and Irwin (1997) who call it "the workhorse of empirical studies of regional integration to the virtual exclusion of other approaches".

their degrees of freedom by working with a sample of highly heterogeneous countries, but do not control for pair-wise heterogeneity in bilateral trade relationships.

The rest of the paper is organized as follows. Section II analyzes the trade statistics of the MERCOSUR countries and highlights the change in the direction and composition of their trade flows during the period. Section III gives a brief overview of recent research adopting the gravitational equation and discusses its various specifications. Section IV discusses the estimation procedure and describes the explanatory variables used in the paper, emphasizing the specification and interpretation of the dummies capturing trade block effects. Section V presents the sources of data used. Section VI reports and comments on the main empirical findings. Section VII provides an overview of our ongoing research and Section VIII closes the study with an overall assessment of the empirical results.

II. Recent Trends in MERCOSUR Trade

Available data indicate that trade patterns of MERCOSUR member countries have changed significantly since the formation of the trade agreement. For example, Table 1 provides summary statistics on MERCOSUR countries' exports, imports and total trade. The four composite trade partners considered are: the Rest of MERCOSUR (MS), the ALADI countries (Latin American Integration Association) excluding the MERCOSUR ones (AL), European Union (EU) and United States and Canada (U-C).

Data refers to average values corresponding to four three-year non overlapping periods between 1986 and 1997. Considering three-year periods reduces the influence of any annual irregular variations in trade statistics, such as those that might accompany significant fluctuations in commodity prices. By starting in 1986, the study includes the effects of the strong unilateral liberalization that MERCOSUR countries initiated around that period, as it will be discussed below. The sample length was dictated by consistent data availability.

The figures reported in Table 1 show the increasing relative importance of MERCOSUR as a market for all four member countries. For example, in 1986-1988 less than 12% percent of Argentina's exports went to MERCOSUR countries compared with almost 35% in the period 1995-1997[3]. Although the 1986-1988 level was lower (about *5* percent), a threefold increase also occurred for Brazil's exports to MERCOSUR (almost 15% in the last period considered), while Uruguay's share of exports rose almost 22 percentage points (reaching more than *50* percent in the last averaged period).

The data in Table 1 reveal other key trends in the direction of MERCOSUR's exports over the last decade and a half: intra MERCOSUR trade became significantly more important at the expense of trade with countries in NAFTA, which remained stable or declined slightly, and of trade with Europe, which declined[4].

[3] Indeed, Argentina is the country whose structure of trade by geographic destination changed most dramatically in the nineties.

[4] Statistics on member countries' imports also reflect the major increase in the relative importance of trade between MERCOSUR members (see Ons, 1999)

Table 1

Imports and Exports of MERCOSUR Countries for Different Composite Partners (Three Year Period Averages, 1986-1997)

	Argentina			Brasil			Paraguay			Uruguay		
	IMP (in %)	EXP (in %)	Total (in %)	IMP (in %)	EXP (in %)	Total (in %)	IMP (in %)	EXP (in %)	Total (in %)	IMP (in %)	EXP (in %)	Total (in %)
1986 – 1988												
MS	19.0	11.4	14.4	6.9	4.4	5.3	42.1	41.8	42.0	41.2	29.9	34.7
AL	13.2	12.0	12.5	5.1	5.7	5.5	2.0	12.2	6.5	9.6	3.8	6.3
EU	32.1	29.7	30.7	23.4	29.7	27.5	19.4	26.8	22.6	21.6	27.8	25.2
U-C	17.7	13.4	15.1	23.5	29.2	27.1	13.0	4.5	9.2	9.1	13.3	11.6
1989 – 1991												
MS	21.2	15.6	17.4	10.9	4.6	7.0	31.4	37.3	34.1	41.6	37.9	39.5
AL	11.9	11.4	11.5	6.3	6.1	6.2	3.3	6.5	4.7	7.3	4.3	5.6
EU	27.1	31.5	30.1	22.3	33.2	29	14.4	32.8	22.6	19.6	24.3	22.2
U-C	22.0	12.9	15.7	23.6	25.2	24.5	13.8	4.3	9.6	11.3	11.0	11.1
1992 – 1994												
MS	24.6	24.9	24.8	12.7	11.7	12.1	38.6	42.4	39.8	46.0	50.2	48.0
AL	7.3	13.1	9.9	5.7	8.7	7.5	4.7	12.2	7.1	4.3	6.9	5.6
EU	27.4	29.2	28.2	25.2	29.9	28.0	12.2	30.2	17.9	19.4	19.9	19.6
U-C	22.9	11.5	17.8	25.4	22.4	23.7	13.2	6.5	11.1	10.3	8.2	9.3
1995 – 1997												
MS	24.3	34.4	29.3	14.8	14.1	14.5	47.9	58.6	51.1	44.4	50.7	47.2
AL	6.1	12.1	9.1	6.2	7.0	6.6	3.5	11.2	5.7	5.9	6.1	6.0
EU	28.6	19.5	24.1	26.7	29.2	27.9	11.4	19.6	13.8	19.8	19.3	19.6
U-C	21.5	9.3	15.4	25.3	20.7	23.2	11.7	3.7	9.3	12.0	6.9	9.7

Note: Percentages for each country in each column do not sum to 100 given that figures do not consider all trading partners.

Table 2 displays the share of each of the four composite partners (presented in the first column) in trade of the MERCOSUR countries when defined as a whole, that is, considering total imports (IMP), total exports (EXP) and total aggregate trade (TOT). For example, the fraction of total trade of the MERCOSUR countries accounted by MERCOSUR during the period 1992-1994 (18%, in the seventh column) is twice the one observed in the second half of the eighties (9%). Also, we can observe that the higher rate of increase in intra-regional trade has been more notorious for exports than for imports.

Table 2

Share in Aggregate Trade of MERCOSUR Countries for Different Composite Partners (Three Year Period Averages, 1986-1997)

	1986 – 1988			1989 - 1991			1992 – 1994			1995 – 1997		
	IMP	EXP	Total	IMP	EXP	Total	IMP	EXP	Total	IMP	EXP	Total
MS	12.1	7.2	9.0	15.0	9.2	11.4	19.4	16.8	18.0	19.7	22.4	21.0
AL	7.1	7.0	7.0	7.2	7.4	7.3	6.1	9.8	8.1	6.1	8.7	7.3
EU	25.3	29.6	28.0	22.8	32.5	28.8	25.3	29.4	27.5	26.4	25.7	26.1
U-C	21.3	25.0	23.6	22.3	21.2	21.6	23.4	19.0	21.0	23.2	16.4	20.0

The main stylized fact in the patterns of trade displayed above has been the increase in the share of intra-block trade in total trade of each of the MERCOSUR members. The reorientation of MERCOSUR's trade toward member countries over this full interval was far greater that in any other regional arrangement, including the European Union, the Association of Southeast Asian Nations and the Canadian-United States Free Trade Agreement (Yeats, 1999). A more detailed analysis of the annual trade data used in the construction of Tables 1 and 2 strongly suggest that 1992 was the year in which intratrade became significantly more important. This is consistent with the fact that in June 1991 MERCOSUR began to implement discriminatory tariff preferences on intra-trade.

It would be tempting to conclude, based on the above empirical evidence, that regionalization of trade was caused by the formal creation of the PTA. However, as suggested by Anderson and Nordheim (1993), the participation of intra-regional trade in global trade is not a good indicator of the effects of preferential or discriminatory trade policies.

First, even in the absence of formal agreements, simultaneous unilateral trade liberalization can lead to a re-orientation of trade towards the region by enhancing the geographic factors on the pattern of trade (distance, contiguity and common language), given that the stimulus to foreign sellers is non-uniform in the presence of different transport cost structures[5]. Indeed, the MERCOSUR countries carried out a deep commercial non discriminatory liberalization since the late eighties, as evident in Table 3 and 4. Table 3 shows the evolution of the arithmetical averages of tariffs for each of the member countries, as well as minimum and maximum values. Table 4 shows the decrease in the rates of coverage of non tariff trade barriers. We can observe a strong reduction in the average tariffs in the late years of 1980 (specially in the bigger members Argentina and Brazil) that continued for all countries during the nineties[6].

[5] Amjadi and Winters (1999) find that, on average, transportation margins on trade within MERCOSURand Chile are about six percentage points lower than on trade with the rest of the world.

[6] However, still there were at the end of this period high levels of protection for some goods, specially in Brazil whose maximum tariff to imports was close to 70%, more than twice of other members.

Table 3

Evolution of Tariffs in the MERCOSUR Countries for Selected Years

	1986	1988	1990	1992	1994	1996	1997
Argentina							
Average	40.4	30.8	20.9	18.0	15.4	14.3	14.1
Max.	103.5	83.5	27.5	30.0	30.0	33.0	33.0
Min.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brazil							
Average	76.0	41.5	27.4	13.7	9.7	11.4	15.0
Max.	233.0	85.0	105.0	65.0	35.0	70.0	66.0
Min.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paraguay							
Average	18.6	18.6	14.7	8.3	7.3	9.9	10.0
Max.	70.0	70.0	72.0	35.0	32.0	30.0	30.0
Min.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uruguay							
Average	29.2	26.9	27.5	16.7	13.6	9.9	10.1
Max.	50.0	45.0	40.0	24.0	20.0	30.0	27.0
Min.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 4

Degree of Coverage of Non Tariff Barriers in MERCOSUR countries for Selected Averaged Periods (in %)

	1985-1987	1991-1992
Argentina	31.9	8.0
Brazil	35.3	10.0
Paraguay	9.9	0.0
Uruguay	14.1	0.0

A second factor that could have contributed to the observed geographical pattern of trade was that unilateral liberalization of trade was carried out in a moment where aggregate output of member countries was increasing at a higher rate than the average of the rest of the world.

Thus, to meaningfully investigate the extent to which regional policy initiatives biased trade patterns, we have to control for other economic determinants. The gravity model offers a systematic framework to assess this.

III. The Gravitational Euuation and Recent Empirical Literature

The gravity model of trade predicts that the volume of trade is related to the economic size of the two countries and negatively related to the distance between them. Empirical research has found that various versions of the gravity equation well describe the variation in the volume of trade across country-pairs as well as over time (see Leamer and Levinsohn, 1995).

III.A Previous Research

The two main applications of the gravity model are assessing the regional biases in international trade and predicting potential trade flows. Gravity models were used by Hamilton and Winters (1992) to estimate trade potential of East European countries (including the former Soviet Union). Other studies have assessed the performance of regional blocks in Africa using this framework. Among such studies are those of Foroutan and Pritchett and Lyakurwa (l997)[7]. More recently, Soloaga and Winters (1999) applied a gravity model to data for 58 countries for the years 1980-1996, to quantify the effects on trade of recently created or revamped preferential trade agreements, including MERCOSUR. Ons (2000) studies specifically the determinants of aggregate trade flows for the MERCOSUR countries by applying the gravitational equation to a data set of bilateral trade flows using cross section techniques.

III.B Specification

The gravitational model can be specified in more than one way regarding its functional form, the definition of the explained variable and the variables actually included in the right hand side of the equation. The typical augmented gravitational equation relates bilateral trade to income, population (or per capita income), contiguity and distance. Thus, the values of bilateral trade between country *i* and country) in a given year is considered to be a (natural) log-linear function of the explanatory variables as in either of the following expressions:

$$\ln (TBT_{ij}) = \beta_0 + \beta_1 \ln (Y_iY_j) + \beta_2 \ln (P_iP_j) + \beta_3 \ln (DIST_{ij}) + \beta_4(CONT_{ij}) + v_{ij} \qquad (1)$$

$$\ln (EXP_{ij}) = \beta_0 + \beta_1 \ln (Y_i) + \beta_2 \ln (Y_j) + \beta_3 \ln(P_i) + \beta_4 \ln(P_j) + \beta_5 \ln (DIST_{ij}) + \beta_6(CONT_{ij}) + \varepsilon_{ij} \qquad (2)$$

where Y_i and Y_j stand for the GDP of countries *i* and respectively; P_i and P_j represent populations of countries *i* and *j* respectively; $DIST_{ij}$ is the distance between countries *i* and *j*; $CONT_{ij}$ is a dummy variable that takes the value of 1 when countries *i* and *j* have a common terrestrial border, and v_{ij} and ε_{ij} are error terms assumed to have a log-normal

[7] Oguledo and MacPhee (1994) give a survey of pre-1990 empirical results using cross section data while Frankel (1997) gives an extensive compendium of recent research adopting this framework.

distribution. In the first specification, the dependent variable is Total Bilateral Trade (TBT_{ij}) between countries *i* and *j* and thus each variable (other than distance and contiguity) is entered in product form. Finally, in equation (2), the dependent variable is Total Exports between *i* and *j* (EXP_{ij}).

Equations (1) and (2) are the standard equations used in cross section studies, which incorporate three types of determinants of trade: the supply of the exporter, the demand of the importer and the costs of doing international business. Trade between two countries is posited to increase with their economic size, as proxied by their GDP. Larger countries tend to trade more than small ones given that they have a bigger potential supply of exports and potential demand of imports.

The coefficient associated to the Population variable is expected to be negative. The idea generally stated is that with a higher population, there is less need of the country to trade to exploit the gains from specialization or economies of scale, if present. In other words, given GDP, a higher population suggests more auto-sufficiency and thus less trade, given everything else.

The variable Distance and the dummy Contiguity represent an approximation to the transport and transaction costs of carrying out international business. Thus, trade is posited to decline with physical and transaction costs, proxied by geographic distance between the partners and by whether or not they share a common border. The dummy Contiguity tries to capture the reduction of friction to trades, over and beyond distance, given that bordering countries tend to have more developed networks of communication and information (Helliwell 1997).

The most common method of handling economic distance is to measure the distance between the economic centers (assumed to be the capital cities) of the two countries. There are some problems with this operational definition, as the implicit assumptions are that overland transport costs are the same as oversea, and that all overland/oversea distances are equally costly[8]. As with distance, assuming that contiguity is equivalent in terms of its effect on trade can be problematic. Considering Argentina and Chile and Uruguay and Argentina are equivalently contiguous pairs, is difficult to abide by.

A standard way of assessing the impact of trade preferential trade agreements in the gravity model framework is by including a set of dummy variables in equations (1) or (2) (Hamilton and Winters, 1992 and Frankel and Wei, 1993). In such regressions, one set of dummy variables for each arrangement takes the value of unity when a pair of countries both participate in the same trading block. A positive significant coefficient on this dummy variable indicates that both economies trade more with one another than predicted by their per capita income, distance and geographical location. In this case, the conclusion is that the arrangement is trade creating for its members. A second set of dummy variables takes the value of unity if only one of the two countries participates in the trade arrangement in question. This variable captures the "external effect" of the grouping of trade with non members. If there is a negative coefficient on the dummy variable this is taken as evidence of trade diversion *vis a vis* the rest of the world.

[8] Another difficulty with standard measures of economic distance is the simple assumption that the capital city is a useful proxy for the economic center.

IV. Empirical Implementation of the Gravitational Equation

To carry out the estimation of the gravity equation, we pooled the data across 35 countries and averaged three years of successive, non overlapping annual figures spanning from 1986 to 1997. We could have estimated the model using the annual data themselves, but business cycle effects would have dominated the analysis. Thus, the use of period averages smoothes the effects of transient phenomena (e.g. business cycles or economic shocks) may have on a particular year. An additional advantage, in this case, is that the chosen periods are also adequate because they can be characterized from the point of view of the trade policy of the MERCOSUR country members. Description of countries considered, and sources and issues involved in the construction of the data is presented in section V.

IV.A Estimation Procedure

A pooled time series-cross section regression was estimated, of the following form:

$$1\mathrm{n}(EXP_{ij}) = \alpha_0 + \alpha_t + \beta' Z_{ijt} + \varepsilon_{ij} \qquad (3)$$

where EXP_{ij} is total exports from country i (exporter) to country j (importer) in period t and Z_{ijt} is a lxk vector of gravity variables (in log linear form) to be specified in the next section[9]. The intercept has two parts, one which is common to all years and trading partners, α_0 and one which denotes the year-specific effects common to all trading pairs, α_t. The disturbance term ε_{ij} is assumed to identically, independently and log-normally distributed with zero mean and constant variance. It is also assumed that disturbances are pair-wise uncorrelated. To prevent collinearity, we'll set the time dummy for the first (of the four averaged periods) equal to 0, meaning that the other time dummies are measured relative to it.

The double log specification above permits the coefficients to be interpreted as the elasticities, but in principle it omits country pairs for which trade is 0. This is undesirable insofar as the omitted observations contain information about why low levels of trade are observed. One solution is to express the dependent variable in levels and estimate the equation using Tobit, but the results are difficult to interpret because the constant elasticity relationship is lost.

The approach here is to preserve the double log formulation, but using a version of Ordinary Least Squares (OLS) that yields results comparable to Tobit. The dependent variable is expressed as log (1 + *Trade*). For large values of *Trade,* log (1 + *Trade*) ≈ log (*Trade*), preserving the double log relationship, while for small values log (*1* + *Trade*) ≈ *Trade,* approximating the semi log Tobit relationship. The equation can be estimated by scaled OLS.

---

[9] Note that for some variables, for example distance between trade partners, we do not include the third dimension time (t).

IV.B Dependent and Explanatory Variables used in the Empirical Estimation

The dependent variable, ($EXPP_{ij}$) is specifically the annual value of exports in millions of dollars (deflated by the US GDP deflator). Each observation of the dependent variable involves at least one of the members of the MERCOSUR trade block. Given the number of countries included in this study, the total number of observations (in the raw data set) is 3216 =12(4*3/2+32*4). The sample of countries chosen implies considering, on average across the sample, more than 80% of total foreign annual trade of each of the members in the period 1986-1997.

The explanatory variables (Z_{ij}) considered in the empirical investigation are:

Real GDP of each trading partner: Y_i and Y_j, measured in millions of dollars of 1990.

Population of each trading partner : P_i and P_j, measured in millions of people.

Distance between the two trading partners: D_{ij}. The distance is given by the segment of line that connects the most important production centers, which in the majority of the cases are given by the capitals.

Common language between trading partners: CL_{ij}. This dummy variable takes the value of 1 when trading partners share a common language. Adding this variable attempts to pick up cultural and political factors that may reduce transactions costs and encourage bilateral trade. Alternatively, we will use another definition for idiomatic similarity, known as *Common Linguistic Areas* which does not differentiate between Portuguese and Spanish as trading partners' languages. It can be argued that trade between a country whose mother language is Spanish and another where Portuguese is spoken does not constitute an obstacle as big as other language differences.

Contiguity of trading partners: $Cont_{ij}$. This dummy variable takes value 1 if countries *i* and *j* share a land border.

Degree of Remoteness of each partner (REM_i and REM_j). This variable accounts for the relative geographic positions of the partners. The hypothesis is that, after controlling for distance between *i* and *j*, the further is country *i* from all of its partners, the greater will be its imports from country *j*. For example, one might expect to see Australia and New Zealand trading more with each other than an other pair of countries separated by the same distance but with other lots of trading partners close to hand (Spain and Poland, for example). This reasoning can be applied to the MERCOSUR countries, which are far from the most important centers of production.

In the paper, we are going to test alternatively two different approximations to the economic remoteness of a country. The first measure of remoteness, named *REM* (*A*), has strong theoretical underpinnings (see Anderson, 1979) and is given by:

$$REMA_i = \sum_{j=1}^{N} \frac{D_{ij}}{Y_j}$$

This index says that the remoteness of any country i is the weighted average of the distance from all its potential trading partners, with weighting factors equal to the corresponding GDPs of each of the N partners (assuming $D_{ii} = 0$).
The second remoteness variable, *REM* (*B*), is an atheoretic definition that has been more frequently applied in the empirical literature. It states that remoteness is equal to the weighted average of the distance between the i the country and all its potential partners, where weights are given by the share of each partners' GDP in world GDP:

$$REMB_i = \sum_{j=1}^{N} \frac{Y_j D_{ij}}{Y_w}$$

where Y_w is world output. This approximation reflects the idea that the remoteness of an economy is higher, the more distant the economy is from the most important centers of production. Even when this measure is not fully derived from first principles, it may have empirical relevance especially for the MERCOSUR countries. *REM* (*B*) will be the definition of remoteness to be included in our baseline specification.

Real exchange rates: RER_i and RER_j. This variables capture the notion that bilateral trade depends upon competitiveness with respect to other countries.

Including *remoteness* and *real exchange rates* aims at capturing third country effects. This overcomes several concerns pointed out recently in the literature on cross section studies where it is generally assumed that bilateral trade depends only on economic conditions in the two countries considered. Insofar as economic variables in third countries affect trade flows between another pair of countries, gravity equations that do not include this variables suffer from omitted variable bias. For example, none of the specifications of the gravity equation considered in Ons (1999) include as explanatory variables prices or exchange rates. The inclusion of such variables, typically the real exchange rate of each country, makes sense when we work with panel data but its interpretation is difficult when working with cross section data. This is due to the fact that the values of variables can reflect variations in the index used respect to the base year, with no indication of whether a country's currency is overvalued or undervalued. Thus, using panel data techniques allows to control for changes in competitiveness, which is specially important for the countries of interest which have been prone to use the exchange rate as an anchor for stabilization or as an instrument to boost economic activity[10].

Dummy for trade between a MERCOSUR country and Netherlands: *NETH* .This variable takes the value of one when trade is between a MERCOSUR member and the Netherlands. The rationale for its inclusion is made clear in Section V.

Dummy Variables Capturing Effects of Trade Agreements. Following the tradition of gravity models, dummy variables to assess the impact of trade block formation are included. Before proceeding to specify them, some important qualifying points should be made from the outset.

[10] Only if one appeals to some concept of absolute PPP can exchange rate or price variables be interpreted m cross sectional estimates.

i)Some clarifications

a) The analysis in this paper focuses on only one aspect of MERCOSUR- its static trade effects. Many other benefits stemming from the agreement - such as political cooperation, enhanced negotiating power, better credibility for the members, economic reform programs and dynamic gains in trade - will not be considered. From this point of view, the question of desirability of regional trading arrangements concerns the extent to which a regional trade arrangement may distort trade from patterns expected on the basis of efficiency conditions and comparative advantage. In terms of the classic customs union theory, the trade off is between trade creation and trade diversion.

The crude data analyzed above are sufficient to indicate that there has been a major expansion of trade, both absolutely and as a percentage of total trade, among the MERCOSUR countries in the 1990's. An important question, however, cannot be answered on the basis of those data. That is: to what extent did the increases in trade within the MERCOSUR partners reflect trade creation and shifts of productions to location with comparative advantage, and to what extent did it reflect trade diversion and a shift from low cost producers in the rest of the world to higher cost producers of country members?

The approach to be used here is only one of several lines of attack that can be used to provide some partial insights into this question. Alternatively, one can examine trade data to ask whether there are categories in which the level of imports from the rest of the world fell as intra bloc trade increased (Krueger, 1999 and Yeats, 1999). To the extent that declines in import volumes from third countries were associated with increasing imports from MERCOSUR countries, there would be a strong presumption for trade diversion[11].

A second line of investigation could have been to analyze supplemental information on MERCOSUR countries' tariffs and non tariff barriers to determine how they might have influenced trade patterns. If preferences were highest for the most dynamic products in MERCOSUR's intra-trade (products that were shifting more rapidly towards the region), this would suggest that trade block's barriers affected the reorientation of exports. Evidence relating to this point can come from an analysis of the margins of preferences that MERCOSUR's trade barriers provide to member countries. In this sense, MERCOSUR nations have made significant tariff adjustments over the period 1989-1997, in addition to their unilateral reforms over 1989-1995.

b) One has to take into account that the estimates of bloc effects are much harder to pin down reliably that the effects of GDP or other gravity variables. In this setting, the bloc related dummy variables would not only pick up "abnormal" levels of trade that could be attributed to the PTA but all observable and unobservable respects in which this countries differ in their trade performance that are not controlled for in the gravity

[11] Yeats (1998) first raised the question of wether MERCOSUR may be a concern for non-members, since the most rapidly growing intra-MERCOSUR exports appear to be in products in which members do not have a comparative advantage. Nagarajan (1998) argues instead that intra-regional trade should be compared with extra-regional imports, not extra-regional exports, and that by focussing in the latter, Yeats may exaggerate the effects of MERCOSUR. Even in this cases, there remains questions as to wether the commodity classifications are entirely homogeneous or supplies from other countries were reduced for reasons independent of MERCOSUR.

equation[12]. Following various studies, I have tried to control for cultural, geographical and economic variables that may reduce transaction costs and encourage bilateral trade. However, cultural, historical and political factors are often difficult to observe, let alone quantify. Thus, it is important to bear in mind when analyzing the estimated coefficients, that measures of block membership could be contaminated by omitted variable bias.

Second, and related to the above issue, is the difficulty of measuring economic distance independent of the trade flows that the researcher seeks to explain. The underlying theory appeals to transaction costs to trade, and in empirical implementation it is posited that such costs should rise with distance. As emphasized by Bayoumi and Eichengreen (1995), economic and geographic distance are not the same. Insofar as economic distance is mismeasured, its effects may be loaded into the dummy variables intended to capture the effects of regionalism (Bayoumi, 1993).

c) Some of the previous assessments of trade blocks and regional arrangements utilizing this approach have failed to control for past trade patterns and relationships. That is, countries trade significantly more with one another than otherwise predicted, even before the regional arrangement in question came into effect. There are many reasons to expect the level of trade between future country members rising above normal levels before the PTA is formally commenced.

First, suppliers begin to reorient their exports in anticipation of future market openings due to the regional arrangements. In their study of the dynamics of trade reorientation experience when a country joins a regional trade block, Freund and McLaren (1999) offer evidence of strong anticipatory sunk investments made to prepare for accession. Eichengreen and Irwin (1998) have demonstrated a strong empirical effect of lagged bilateral trade on current bilateral trade after controlling for country pair characteristics, and interpreted this result as evidence of sunk, partner specific investments.

The second interpretation is known as "stepping stone" argument and could in principle explain the timing we sometimes see in the data without any recourse to anticipatory investment. Under this interpretation, whenever a major trade agreement is concluded, it has been preceded by a number of smaller ones between the parties involved, and the pre-accession reorientation of trade is simple a result of this. From another perspective, countries with a tendency to trade disproportionately with one another for historical or institutional reasons not otherwise captured by the gravity model, also have a tendency to negotiate PTA to lock in those high levels of trade. This is a particularly relevant consideration for MERCOSUR, since the Treaty was preceded by other arrangements which were less formal and less comprehensive in commodity coverage but which include many of the same countries.[13]

---

[12] Exceptions are Bayoumi and Eichengreen (1995), who estimates the gravitational equation in first differences This eliminates ommited variable bias which is due to time invariant sources of unobserved heterogeneity.

[13] For example, between 1985 and 1988, Argentina and Brazil signed 24 bilateral agreements culminating in the Treaty of Integration, Cooperation and Development signed in November 1988. This treaty was the bedrock for the formation of the MERCOSUR. See Nogues and Quintanilla (1993) for a fuller account.

ii) Specification of Trade Block Dummies

To address the issues discussed above, we extend the basic gravity model by defining a set of two dummies: one that captures intra block trade (*MS*) and a second that captures imports *by* the (now) MERCOSUR members, *from* all other countries-members and non members (*MSI*).

The first dummy represents overall block "openness" to imports, while the intra block dummy reflects the additional effect of the PTA on member's trade. By summing the intra block coefficient with that of the overall bloc imports we can get an indication of how different from normality ("normality" being defined by the gravity variables and the average behaviour of countries in the sample) are total intra bloc imports. In this model, the "traditional" trade diversion effect will be identified by a falling propensity to import from all sources coupled with an increase in the overall propensity to import from members. If the latter outweighs the former we also have "trade creation".

The pair of dummies is then multiplied by the relevant time-specific constant terms to differentiate the impact of the regional arrangement over the four periods in which the sample is divided :1986-1988 (*D1*), 1989-1991(*D2*), 1992-1994(*D3*) and 1995-1997(*D4*). Controlling for the same set of regional variables in the period 1986-1988 even when the MERCOSUR was not yet in effect, avoids the tendency of spuriously attributing to the regional agreement the effects of any non- PTA relationships that may have been at work since well before the MERCOSUR was created. Given that the chosen periods also characterize fours distinct phases in trade policy of the MERCOSUR country members, the included dummies have the following interpretation in terms of trade block effects:

Anticipation Effects: dummies corresponding to the period 1986-1998. During this period, the soon-to-be MERCOSUR economies exhibit highly distorted external sectors with a very high and dispersed tariff structure, a high degree of coverage of non-tariff barriers and a scheme of discriminatory trade preferences that biased trade towards the region.

Contemporaneous Effects dummies corresponding to the period 1988-1991. At the end of this period, countries formally create the MERCOSUR arrangement. While advancing in regional integration matters, the countries of MERCOSUR engage in a accelerated and very significant nondiscriminatory commercial liberalization that implied a reduction of the average level of import tariffs and the degree of dispersion of the tariff structure (see section II). This process is not restricted to this period, but is reinforced in later years.

Transitional Effects: dummies corresponding to the period 1992-1994. This period corresponds to the transitional phase established in the Treaty of Asunción, characterized by a reduction of policy-based barriers to mutual trade.

Long Run Effects : dummies corresponding to the period 1994-1997. In this period an imperfect customs union is implemented, characterized by a Common External Tariff for 85% of tariff lines.

V. Sources of Data and Description of Variables Used

The countries considered in this study are thirty six: ALADI countries except Cuba (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay and Venezuela), United States and Canada, countries of the European Union (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, United Kingdom) and a group of Asian countries (China, Japan, Indonesia, Malaysia, Philippines, Singapur, South Korea and Thailand).

Annual data of bilateral trade flows between each MERCOSUR member and the rest of the countries in the sample were provided by the *General Secretary of ALADI.*

Data on Gross Domestic Product (in millions of dollars) for each country was obtained from the *World Development Indicators of the World Bank* (1999).

Values are expressed in constant dollars of 1990 using the US GDP Deflator obtained from the *IMF's International Financial Statistics* (1998).

Data on population was obtained from *IMF's International Financial Statistics* (1998).

Data on distances, language and contiguity was constructed based on the information obtained from the web site: *http.//www.eiit.org/Trade.Resources/TradeData.html,* maintained by Jon Haveman.

The distance measure corresponds to the Great Circle distance between capital cities, and is expressed in thousands of kilometers.

The dummy *Common Language* has the value of 1 for 28 observations, three of which correspond to trade flows between, Argentina, Uruguay and Paraguay, 24 correspond to trade of each of the latter with the rest of ALADI except Brazil, and the remaining corresponds to trade between Brazil and Portugal. The dummy *Common Linguistic Area* takes the value of 1 when in both countries the language spoken is either Spanish or Portuguese. This variable takes the value of 1 in forty two observations, six of which correspond to trade between MERCOSUR members, twenty eight pertain to trade between each of the trade block countries and the rest of the ALADI countries, and the remaining eight correspond to trade between the former and Spain and Portugal.

The dummy *Contiguity* takes the value of one in twelve observations: five of them correspond to the adyacencies between the MERCOSUR countries, two correspond to extra-MERCOSUR contiguity of Argentina (Bolivia and Chile), four correspond to extra-MERCOSUR neighborhood of Brazil (with Bolivia, Colombia, Peru and Venezuela), and one corresponds to the contiguity between Paraguay and Bolivia.

The inclusion of the dummy for the Netherlands, *NETH,* is due to the fact that ports in this countries, specially Amsterdam and Rotterdam, operate as distribution centers both for the flow of goods originated outside the European Union and destined to some European country, and for the trade in goods from some European country exporting somewhere outside Europe. Given that information on trade volumes have been obtained in the

MERCOSUR countries, is highly likely that exports and imports towards the Netherlands are biased upwards. Thus, to control for this registration artifact we include a binary dummy that takes the value of 1 for trade between any MERCOSUR country and the Netherlands (8 observations).

The definition (B) of remoteness for each economy was calculated as the weighted average of the distance between the latter and the rest of the thirty five countries, where the weighting factors are the share of each trading partners' GDP in total GDP of the thirty six countries considered as a whole. In general terms, we can distinguish three groups of countries according to their level of remoteness: low (countries of the European Union, United States and Canada), medium (Colombia, Mexico, Venezuela, China, Japan and Republic of Korea) and high (the rest of the countries in the sample). Among the last group, MERCOSUR countries exhibit the highest level of remoteness, and Uruguay is the most remote country according to this measure.

Data to construct the *real exchange rates* was obtained from *IMF's International Financial Statistics.* We use the CPI (IFS line 64) as the measure of prices, and the index price of an American dollar, *NER* , as the nominal exchange rate (IFS line rF)[14]. The *real exchange rate* of country i (RER_i) is defined as $RER_i = CPI^{US} * NER / CPI^{i}$. The United States is treated as the base country for both prices and exchange rates. I was not able to use IMF's *real effective exchange rate measure* (which is a single measure by country that weights all trading partners' bilateral exchange rate by their share of imports) given that for many countries data does not span the full data range.

Finally, the set of dummy variables for MERCOSUR are constructed in the following way. First we define:

MS: binary dummy variable that takes the value of 1 if both trading partners belong to the agreement, 0 otherwise.
MSI: binary dummy variable that takes the value of 1 if both the importer country belongs to the agreement, 0 otherwise.

The set of two MERCOSUR dummies, capturing different trade block effects in each period, are obtained in the following multiplicative way:

Anticipation Effects : $AN = MS.D1$ and $ANI = MSI .D1$
where *D1 is* a binary time dummy that takes the value of 1 if the period is 1986-1988, 0 otherwise.
Contemporaneous Effects: $CON = MS.D2$ and $CONI = MSI .D1$
where *D2* is a time dummy that takes the value of 1 if the period is 1988-1991, 0 otherwise.
Transition Effects: $TR = MS.D3$ and $TRI = MSI .D3$
where *D3* is a time dummy that takes the value of 1 if the period is 1992-1994, 0 otherwise.
Long Run Effects: $LR = MS.D4$ and $LRI = MSI .D4$

[14] Both of these variables appear to be standard choices in the literature, although Soloaga and Winters (1999) use the GDP Deflator as a measure of prices in a similar study.

where *D4* is a time dummy that takes the value of 1 if the period is *1995-1997,* 0 otherwise[15].

VI. Empirical Results

VI.A Results for the Baseline Specification

Results for the estimation of the benchmark gravity equation are presented in Table 5 in the Appendix. The findings confirm the strong empirical fit of the gravity equation of international trade: the model is able to account for a reasonable proportion of time series-cross country variation of bilateral trade.

The elasticity of trade with respect to the basic gravity variables - income, population and distance - are consistently signed, economically large, and statistically significant. Trade increases with the level of GDP of the importer and exporter and decreases with population and distance between the partners. The estimated elasticity of exports with respect to the GDP of the exporting country is higher than the one estimated for the importer country, a typical result in the empirical literature.

Symmetrically, the evidence suggests that trade flows of MERCOSUR countries exhibit a higher sensitivity to the population of the exporter than the corresponding to the importer country. This latter result is not in line with the cross-section evidence presented in Ons (1999), who obtains a positive sign in the parameter associated with the population of the importer country.

The coefficients on remoteness, contiguity and common language are highly significant and similar in magnitude to those reported in most gravity equation estimates. In particular, evidence suggests that relative geographic positions stimulate trade of the MERCOSUR countries, a result that is consistent with the fact that trade block members exhibit the highest level of remoteness among the countries included in the sample.

The statistically significant coefficients on the real exchange rates, specially for the exporter country, suggests a role for third country effects in the determination of bilateral trade of the MERCOSUR countries.

The dummy NETH is positive and statistically significant at 1%. Its estimated value shows that the trade volumes between MERCOSUR and Netherlands are beyond those that could be explained by the determinants of trade included in the model. This suggests that the fact

[15] Another way to obtain the same specification for the set of trade block effects is to define each dummy to be 0 *before* the relevant period and 1 thereafter, and then estimate the equation in first differences. This procedure is especially suited for samples in which membership in regional arrangements does not change across the sample, since the block variables do not drop out the differenced equation.

[16] Examination of the outliers of the regression indicate that atypical values are basically associated with exports from the MERCOSUR countries.

that the Dutch ports operate as distribution centers causes the aforementioned registering problems, implying an overvaluation of goods exchanged from, and to, the Netherlands[16].

For present purposes, it is the coefficients on the dummy variables for the MERCOSUR that are of interest. Interestingly, the coefficients on MERCOSUR membership when trading partners are both members (*AN, CON, TR* and *LP*) are not significant at the 10% level for any of the four periods, while there is a reversion of the sign of the estimated coefficients in the period after the formation of MERCOSUR.

The dummy variable when the importer is a member of MERCOSUR (*ANI*) is negative and highly significant in the period 1986-1988. The same dummy variable for the period 1988-1991 (*COI*) points to strong and negative contemporaneous effects in overall propensity to import. However, what matters is less the level of these effects but their changes around the period of integration. Wald tests presented in Table 5 indicate that we cannot reject the null of no statistical differences of trade block effects with respect to the pre-integration period.

The estimated coefficients for the overall block "openness" to imports and propensity to import from members described above, suggest that in the years before the formation of MERCOSUR, the prospective members of the regional grouping traded more extensively with one another than would be predicted by their economic characteristics (incomes, per capita incomes, distance and contiguity) and the typical behaviour of countries in the sample (as captured by the gravity equation). While the data indicates strong anticipation effects, the launching of the MERCOSUR does not seem to have been accompanied by a noticeable increase in intra block trade propensities[17].

Furthermore, information displayed in the bottom right of Table *5* indicates a statistically significant *positive* trend in the overall propensity to import of MERCOSUR countries, manifested in a reversion of the estimated sign of the long run effects in overall imports from members. This results, which are consistent with the findings of Kruegger (1999) and Soloaga and Winters (1999), probably reflects the opening up of the MERCOSUR countries to the world, at the same time as they were forming the customs union among themselves. This process reduced tariffs substantially in MERCOSUR countries, from an average of 50% in 1988 to a CET average of 12% in 1995[18].

By focussing on the trade diverting and trade creating potential of the arrangement, this study differs from related analysis that focus on welfare effects. For example, Frankel, Stein and Wei (1995) introduce the notion of "natural" trading partner. They define a block as natural if moving to free trade within it raises the welfare of its members[19]. Indeed, it should be underlined that we are not making a claim to be estimating a structural

---

[17] Freund and McLaren (1998), using another parametrization based on adjustment dynamics through trade intensity indexes, find that the adjustment in MERCOSUR appears to have begun about 3 years in advance of the agreement.

[18] However, it remained the case that trade policy in Brazil was subject to vigorous debate and to frequent changes to meet short run political objectives.For example, tariffs on textiles, toys and motor vehicles in particular were increased to 70% for non-members in 1995.

[19] Strictly speaking, this definition is circular, but the basis of the welfare effect that Frankel *et* a! derive is lower transportation costs within the bloc than between it and the outside world, which is operational.

relationship; rather, we are summarizing using a convenient parametrization. Thus, the estimated parameters have no direct interpretation in terms of tastes, technology and, especially, welfare. Since Anderson (1979) it has been increasingly recognized that the gravity equation can be derived from very different structural models, including Ricardian models, Heckscher-Ohlin models and increasing returns models[20]. Since versions of all these models can generate this prediction, there is a model identification problem that makes it difficult to derive welfare implications.

VI.B Sensitivity Analysis

Alternative specifications were estimated to check the robustness of the above results. Table 6 displays regression results that include GDP per capita instead of the population variable. Table 7 tests the gravity equation using definition (A) of remoteness, while Table 8 performs the sensitivity analysis by combining the two new variables simultaneously. Finally, Table 9 modifies the baseline specification by including a broader concept of cultural similarities, the Common Linguistic Area.

The behavioral variables are correctly signed, highly significant and plausible in magnitude in all cases while the goodness of fit of the regressions remain approximately unchanged.

When the theoretical-based definition (A) of remoteness is included (Table 7), it soaks up part of the explanatory power of population, contiguity and common language, rendering statistically insignificant the variable corresponding to population of the importing partner. Furthermore, the estimated negative impact of distance in bilateral trade flows is enhanced, consistent with the way the remoteness variable is constructed. Except for this discernible change in this estimated coefficient, the redefinition of remoteness did not significantly altered the coefficients on the other variables in the model.

The inclusion of the common linguistic area instead of common language increases the positive estimated elasticity of this cultural determinant of trade, in detriment of distance and contiguity (Table 9). This results can be reasonably interpreted, given that part of the important role of neighborhood effects of Brazil in the sample – which proxies the reduction of transaction costs due to a better understanding of markets, customs and institutions -are now subsumed in the broader concept of idiomatic similarity.

VI.C Tests of Sub-sample Instability

In this section, I formally test the significance of changes in the estimated coefficients before and after block's formation. The date of formal creation of MERCOSUR and the desirability of obtaining the same number of observations in each sub-sample, suggested running two different OLS regressions for the periods 1986-199 1 and 1992-1997. Results are presented in Table 10.

First, overall results do not suggest a structural change in the relationship between trade of the MERCOSUR countries and its economic determinants, as indicated by the Chow statistic.

---

[20] See Bergstrand (1989), Deardorff (1998), Evenett and Keller (1999) and references therein.

However, there are two noticeable differences in the results obtained in each sub-period. First, the reduction in the absolute difference between the exporter and the importer's estimated elasticities with respect to remoteness. A possible explanation to this dynamic path of the estimated coefficients is based on the loss of competitiveness of the major partner, Brazil, due to the behavior of the real exchange rate following the implementation of a stabilization plan in 1994. Soon after the Plan Real was launched, Brazilian imports increased at a faster rate than exports, due to the real appreciation of the Brazilian currency, the Real. This can account for the strong inter-period increase in the estimated coefficient of importer's remoteness, which reduces the absolute value of the parameters of the other geographical factors of trade.
The most dramatic evidence of sub-sample instability is observed in the temporal behavior of real exchange rates. The effects of the real exchange rate of the importer country is not only statistically different across sub-samples at 1% level of confidence, but the sign of its effects are reversed. Indeed, in the period 1986-199 1, both real exchange rates have positive sign, and are only significant at a 5% level. In the period 1991-1997, the impact of the real exchange of the importer country in bilateral trade is strongly negative, while the real exchange of the exporter country offers no additional explanatory power. This results suggests that the trade performance of MERCOSUR countries has been influenced more by competitiveness than by trade policy during the last period of analysis.

Finally, we can observe a slight improvement in the fit of the regression in the period 1991-1997. A possible explanation of this result could be the enhanced role of the geographic determinants of trade in this period. The reduction in the level and dispersion of tariffs brought about by a general liberalization, removes the artificial obstacles to the natural determinants of trade (see Ons, 1999).

VII. Ongoing Research

This section describes further avenues of research in which we are working, and that will be shortly integrated to the body of this paper. We are basically investigating the importance of pair-wise heterogeneity and volatility of the exchange rate in understanding the determinants of bilateral trade patterns for the MERCOSUR countries, in an extended sample of trade flows that runs until 1999.

a) Pair-wise Heterogeneity and Omitted Variable Bias

As with previous literature, the gravity model appears to fit the data pretty well. However, a closer look at the predictive power of the model reveals that the high R^2 reported in the tables above does not tell the complete story. Indeed, a plot of the residuals (actual minus predicted log of exports) of the standard gravity model shows a strong positive relationship between the residual and the level of exports, that is, the model tends to underestimate the level of trade when the actual level is high, and over estimates it when the actual level is low. In fact, the correlation between the regression residuals and the log of exports is 0.53, which is statistically different from 0.

As most of previous empirical work, we have pooled data for industrial and developing countries, but the relationship between trade and economic characteristics may vary between the two groups of countries. For example, transaction costs may have different structures in countries with more or less articulated markets. Our empirical analysis indicates that the model can suffer from omitted variable bias due to country-pair heterogeneity. Except for the work of Chang and Wall (1999), this bias has not been recognized in the literature, and none of the papers in this area that estimate a pooled regression without fixed effects, provides the plot of residuals of the fitted regressions[21].

To address the problem, we adopted a two way fixed effects model in which country pair dummies are used to reflect the specific bilateral relationship between trading partners.

a) Exchange Rate Uncertainty

One of the main contentions in our research is that factors affecting trade flows in the MERCOSUR region are distinct from the ones surveyed in the literature for developed economies. Indeed, a possible determinant of bilateral trade flows is exchange rate uncertainty. If exchange rate movements are not fully anticipated, an increase in exchange rate volatility, which increases risk, will lead risk-averse agents to reduce their import/export activities and reallocate production towards domestic markets. Thus, for given expected gains from trade, the the volume of trade will be lower.

However, there is no strong evidence that trade flows are affected by exchange rate uncertainty in developed economies. On the other hand, in developing countries hedging mechanisms to dampen the exchange risk can be expected to be more imperfect and more costly, suggesting that exchange rate uncertainty could have profound effects on trade flows. Furthemore, the likely perspective of a single currency regime for the MERCOSUR makes this set of countries a natural target for this kind of study.

We test the effects of exchange rate volatility on trade using different measures and techniques, with particular attention to the simultaneous causality problem that arises when the Central Banks make an effort to stabilize their exchange rates with their main trading partners.

VIII. Conclusions

The empirical implementation in this paper consisted in applying a version of the gravitational equation to a data set of bilateral aggregate trade flows for 35 countries using time series-cross section techniques. The gravitational model was augmented to control for competitiveness and anticipation effects in trade block formation.

Evidence suggests that trade between country members was already increasing faster than predicted by their economic characteristics and the average behavior of countries in the sample, before the formal creation of MERCOSUR. When we control for the impact of gravity variables and different measures of third country effects (remoteness and

[21] Exceptions are Bayoumi and Eichengreen *(1995),* for example, who estimate the gravity equation in *first* differences. To the extent that unobserved country characteristics influencing the volume of trade are constant over time, problems relating to their measurement or omission will not bias results.

competitiveness), the launching of MERCOSUR does not seem to be accompanied by a noticeable increase in intra-block trade propensities. I did not find convincing evidence of trade diversion. The fact that the gravity equation displays observational equivalence, in the sense that different theoretical underpinnings give rise to the same reduced form equation, precludes me from drawing welfare implications.

After controlling for gravity variables, we observed a positive trend in the estimated coefficients for block members' overall imports. This increasing propensities to import suggest strong effects from general trade liberalization.

References

Adriamananjara, Shuby and Nash, John (1997) "Have trade policy reforms led to greater openness in developing countries? , *Policy Research Working Paper Series* No. 1730, World Bank.

Amjadi, Azita and Winters, L. Alan (1997) "Transport costs and "natural" integration in Mercosur , *Policy Research Working Paper Series* No. 1742, World Bank.

Anderson, James (1979) "Theoretical foundation for the gravity equation", *American Economic Review,* Vol. 69, No. 1:106-116.

Anderson, Kym and Hege Nordheim (1993): "From Imperial to Regional Trade Preferences: Its Effect on Europe's Intra- and Extra-Regional Trade"; Weltwirtschaftliches Archiv, vol 129(1), pp. 78-101.

Bayoumi, Tamim and Eichengreen, Barry (1995) "Is regionalism simply a diversion? Evidence from the evolution of the EC and the EFTA", NBER Working Paper No. 5283.

Baldwin, R. (1989) "Measuring nontariff trade policies", *NBER Working Paper* No. 2978.

Behar, Jaime (1995) "Measuring the effects of economic integration for the southern cone countries: Industry simulations of trade liberalization", *The Developing Economies,* XXXIII-1: 3-31.

Bergstrand, Jeffrey (1985) "The gravity equation in international trade: Some microeconomic foundations and empirical evidence", *Review of Economics and Statistics,* Vol. 67: 474-481.

Bergstrand, Jeffrey (1989) "The generalized gravity equation, monopolistic competition, and the factor-proportions theory in international trade", *Review of Economics and Statistics,* Vol. 71:143-153.

Chang, Wong and Winters, Alan (1998) "How regional blocks affect excluded countries: The price effects of MERCOSUR", *Development Research Group Working Paper* No. 90-98. World Bank.

Cheng, Hui and Wall, Howard (1999) "Controlling for Heterogeneity in Gravity Models of Trade", *Federal Reserve Bank of St.Louis Working Paper 99—01.*

Deardorff, Alan V. (1984) "Testing trade theories and predicting trade flows", In *Handbook of International Economics,* Vol. I, ed. Kenen and Jones, Amsterdam, Elsevier Science Publishers.

Deardorff, Alan V. (1998): "Determinants of bilateral trade: Does gravity work in a neoclassical world?", In *The Regionalization of the World Economy,* ed. Jeffrey A. Frankel, Chicago University Press.

De Rosa, Dean A. (1998) “Regional integration arrangements: static economic theory, quantitative findings, and policy guidelines”, *Policy Research Working Paper Series* No. 2007, World Bank.

Devlin, Robert and Ffrench-Davis, Ricardo (1999) “Towards an evaluation of regional integration in Latin America in the 1 990s”, *The World Economy,* Vol. 22, No. 2, 261-290.

Eichengreen, Barry and Irwin, Douglas A. (1996) “The role of history in bilateral trade flows”, *NBER Working Paper* No. 5565.

Eveneft, Simon J. and Keller, Wolfgang (1998) “On theories explaining the success of the gravity equation”, *NBER Working Paper* No. 6529.

IMF (1998) *International Financial Statistics.* Annuary. Technical Notes.

Foroutan, Faezeh and Pritchett, Lant (1992) “Intra-sub-saharan african trade: Is too little?”, *mimeo World Bank.*

Foroutan, Faezeh (1998) “Does membership in a regional preferential trade arrangement make a country more or less protectionist?”, *Policy Research Working Paper Series* No. 1898, World Bank.

Frankel, Jeffrey A (1997) *Regional Trading Blocks in the World Economic System.* Institute for International Economics. Washington D.C.

Frankel, Jeffrey A (1998) *The Regionalization of the World Economy.* University of Chicago Press, Chicago.

Frankel, Jeffrey A., Stein, Ernesto and Wei, Shang-Jin (1995) “Trading blocs and the Americas: The natural, the unnatural, and the super-natural”, *Journal of Development Economics,* Vol. 47: *61-95.*

Freund, Charles and McLaren, James (1998) “On the dynamics of trade diversion: Evidence from four trade blocs”.*Mimeo*

Garriga, Marcelo and Sanguinefti, Pablo (1994) “¿Es el Mercosur un bloque natural?: Efectos de la politica comercial y la geografia sobre el intercambio regional”; *mimeo, University Torcuato di Tella.*

Garriga, Marcelo and Sanguinetti, Pablo *(1995):* “The determinants of regional exchange in Mercosur: Geography and trade liberalization”, *University Torcuato Di Tella, Working Paper* No. 16.

Hamilton, Carl and Winters, L. Alan (1992) “Opening up international trade in Eastern Europe”, *Economic Policy,* April: 77-116.

Havrylyshyn, Oleg and Pritchett, Lant (1991) “European trade pafterns after the transition”, *Policy Research and External Affairs Working Paper Series* No. 748, World Bank.

Hummels, David (1998) “Toward a Geography of Trade Costs”*,* mimeo, University of Chicago.

Hunter, Linda and Markusen, James (1988) “Per-Capita Income As Determinant of Trade”, In *Empirical Methods for International Trade,* ed. Feenstra, R. C., MIT Press, Cambridge, Massachusetts.

Krueger, Anne (1999) “Trade creation and trade diversion under NAFTA”, *Baldwin Conference paper.*

Learner, Edward E. and Levinsohn, James (1994) “International trade theory: The evidence”, *NBER Working Paper* No. 4940.

Linnemann, Hans (1966) “An econometric study of international trade flows”, North-Holland, Amsterdam.

Lyakurwa, W., McKay,A., Ng’eno, N. and W. Kennes (1997) “Regional Integration in Sub-Sharan Africa: A Review of Experiences and Issues,” in A. Qyejide, I. Elbadawi, and P. Collier (Eds.), *Regional Integration and Trade Liberalization in Sub- Saha ran Africa: Framework, Issues and Methodological Perspectives* Vol. 1: 210-255.

Nogues, Julio and Quintanilla, Rosalinda (1993) “Latin Americas integration and the multilateral tradyning system”, in De Melo, Jaime and Panagariya, Arvind, eds., *New Dimensions in Regional Integration.* Cambridge: Cambridge University Press.

Ons, Alvaro (1999) “Los determinantes de los flujos de comercio de los países del MERCOSUR: una aplicación de la ecuación gravitacional del comercio bilateral”, *mimeo.*

Porta, Fernando (2000) “Una propuesta metodológica para la estimación del impacto de las preferencias comerciales sobre el comercio intraregional”, mimeo.

Sanso, Martin, Cuairan, Robert and F. Sanz (1993) “Bilateral trade flows, the gravity equation and functional form”, *Review of Economics and Statistics* 75:266-275.

Soloaga, Isidro and Winters, L. Alan (1999) “Regionalism in the Nineties: What effect on trade?”, *Policy Research Working Paper Series* No. 2156*,* World Bank.
Terra, Inés and Gigliotti, Adriana (1994): “Mercosur y localización de la producción:
Un modelo de geografia económica”, WP No. 7/94. Dept. of Economics of the University of Social Sciences, Uruguay.

Yeats, Alexander (1997) “Does Mercosur’s trade performance raise concerns about the effects of regional trade arrangements?”, *Policy Research Working Paper Series* No. 1729, World Bank.

TABLE 5

POOLED-CROSS SECTION OLS ESTIMATES OF GRAVITY EQUATION
Three-Year Averaged Periods (1986-1997)

Explanatory Variable		Estimated Coefficient
Constant		-52.89*** (7.19)
GDP Exporter		1.85*** (.121)
GDP Importer		1.18*** (.113)
Population Exporter		-.81*** (.144)
Population Importer		-.28** (.133)
Remoteness(B) Exporter		2.84*** (.375)
Remoteness(B) Importer		1.94*** (.386)
Real Exch. Rate Exporter		.53* (.295)
Real Exch. Rate Importer		.68*** (.285)
Contiguity		.49*** (.187)
Common Language		.64*** (.122)
Distance		-1.13*** (.124)
Dummy for Netherlands		1.42*** (.268)
Time Dummy	*D2*	.23 (.238)
	D3	-.684** (.287)
	D4	-.56 (.356)
Trade Block Dummy **Anticipation Effects**	Intrablock Trade (**AN**)	.203 (.454)
	Imports from Members(**ANI**)	-.836*** (.307)
Trade Block Dummy **Contemporaneous Effects**	Intrablock Trade (**CO**)	.163 (.359)
	Imports from Members(**COI**)	-.990*** (.226)
Trade Block Dummy **Transition Effects**	Intrablock Trade (**TR**)	-.44 (.447)
	Imports from Members(**TRI**)	-.004 (.223)
Trade Block Dummy **Long Run Effects**	Intrablock Trade (**LR**)	-.452 (.386)
	Imports from Members(**LRI**)	.371 (.273)

Information on the Regression

Dependent Variable: Exports

Number of Observations: 1072
All Non-Dummy Variables are in Logs
Robust (White Corrected) Standard Errors in Parenthesis

* rejection at significance level of 10%
** rejection at significance level of 5%
*** rejection at significance level of 1%

$\mathbf{R^2 = 0.7156}$ F(23,1048) = 159.73

Wald Test of Statistical Differences of Trade Block Effects respect to Pre-Integration

1. Intra Block Trade

Null Hypothesis	Level of Confidence Of Rejecting H_0
AN = **CO**	
AN = **TR**	*
AN = **LR**	

2. Imports of Members from ROW

Null Hypothesis	Level of Confidence Of Rejecting H_0
ANI = **COI**	
ANI = **TRI**	***
ANI = **LRI**	***

Source: Own Calculations using STATA

TABLE 6

POOLED-CROSS SECTION OLS ESTIMATES OF GRAVITY EQUATION
Three-Year Averaged Periods (1986-1997)

Explanatory Variable		Estimated Coefficient
Constant		-51.88*** (6.97)
GDP Exporter		1.03*** (.044)
GDP Importer		.89*** (.042)
GDP per capita Exporter		.80*** (.137)
GDP per capita Importer		.29** (.125)
Remoteness(B) Exporter		2.79*** (.357)
Remoteness(B) Importer		1.94*** (.384)
Real Exch. Rate Exporter		.49* (.296)
Real Exch. Rate Importer		.66*** (.287)
Contiguity		.49*** (.187)
Common Language		.65*** (.125)
Distance		-1.15*** (.127)
Dummy for Netherlands		1.42*** (.268)
Time Dummy	*D2*	.24 (.234)
	D3	-.63** (.287)
	D4	-.53 (.561)
Trade Block Dummy **Anticipation Effects**	Intrablock Trade (**AN**)	.13 (.464)
	Imports from Members(**ANI**)	-.83*** (.309)
Trade Block Dummy **Contemporaneous Effects**	Intrablock Trade (**CO**)	.13 (.449)
	Imports from Members(**COI**)	-1.00*** (.227)
Trade Block Dummy **Transition Effects**	Intrablock Trade (**TR**)	-.43 (.447)
	Imports from Members(**TRI**)	-.05 (.223)
Trade Block Dummy **Long Run Effects**	Intrablock Trade (**LR**)	-.47 (.386)
	Imports from Members(**LRI**)	.32 (.245)

Information on the Regression

Dependent Variable: Exports

Number of Observations: 1072
All Non-Dummy Variables are in Logs
Robust (White Corrected) Standard Errors in Parenthesis

* rejection at significance level of 10%
** rejection at significance level of 5%
*** rejection at significance level of 1%

R^2 = 0.7156 F(23,1048) = 159.73

Wald Test of Statistical Differences of Trade Block Effects respect to Pre-Integration

3. Intra Block Trade

Null Hypothesis	Level of Confidence Of Rejecting H_0
AN = **CO**	
AN = **TR**	
AN = **LR**	

4. Imports of Members from ROW

Null Hypothesis	Level of Confidence Of Rejecting H_0
ANI = **COI**	
ANI = **TRI**	**
ANI = **LRI**	***

Source: Own Calculations using STATA

TABLE 7

POOLED-CROSS SECTION OLS ESTIMATES OF GRAVITY EQUATION
Three-Year Averaged Periods (1986-1997)

Explanatory Variable		Estimated Coefficient
Constant		-5.80*** (.592)
GDP Exporter		1.52*** (.092)
GDP Importer		.984*** (.093)
Population Exporter		-.51*** (.123)
Population Importer		-.10 (.115)
Remoteness(A) Exporter		1.41*** (.415)
Remoteness(A) Importer		1.32*** (.431)
Real Exch. Rate Exporter		.60** (.285)
Real Exch. Rate Importer		.71*** (.285)
Contiguity		.86*** (.209)
Common Language		.97*** (.143)
Distance		-1.65*** (.272)
Dummy for Netherlands		1.17*** (.241)
Time Dummy	*D2*	.78*** (.278)
	D3	.68* (.417)
	D4	1.09 (.804)
Trade Block Dummy **Anticipation Effects**	Intrablock Trade (**AN**)	.39 (.521)
	Imports from Members(**ANI**)	-1.183*** (.311)
Trade Block Dummy **Contemporaneous Effects**	Intrablock Trade (**CO**)	.45 (.519)
	Imports from Members(**COI**)	-1.33*** (.244)
Trade Block Dummy **Transition Effects**	Intrablock Trade (**TR**)	-.06 (.498)
	Imports from Members(**TRI**)	-.39* (.223)
Trade Block Dummy **Long Run Effects**	Intrablock Trade (**LR**)	-.02 (.246)
	Imports from Members(**LRI**)	-.01 (.503)

Information on the Regression

Dependent Variable: Exports

Number of Observations: 1072
All Non-Dummy Variables are in Logs
Robust (White Corrected) Standard Errors in Parenthesis

* rejection at significance level of 10%
** rejection at significance level of 5%
*** rejection at significance level of 1%

R^2 = 0.6945 F(23,1048) = 151.58

Wald Test of Statistical Differences of Trade Block Effects respect to Pre-Integration

5. Intra Block Trade

Null Hypothesis	Level of Confidence Of Rejecting H_0
AN = **CO**	
AN = **TR**	
AN = **LR**	

6. Imports of Members from ROW

Null Hypothesis	Level of Confidence Of Rejecting H_0
ANI = **COI**	
ANI = **TRI**	***
ANI = **LRI**	***

Source: Own Calculations using STATA

TABLE 8

POOLED-CROSS SECTION OLS ESTIMATES OF GRAVITY EQUATION
Three-Year Averaged Periods (1986-1997)

Explanatory Variable		Estimated Coefficient
Constant		-5.54*** (.562)
GDP Exporter		1.01*** (.042)
GDP Importer		.87*** (.040)
GDP per capita Exporter		.52*** (.116)
GDP per capita Importer		.10** (.115)
Remoteness(A) Exporter		1.35*** (.415)
Remoteness(A) Importer		1.29*** (.431)
Real Exch. Rate Exporter		.58* (.312)
Real Exch. Rate Importer		.69*** (.295)
Contiguity		.86*** (.209)
Common Language		.97*** (.143)
Distance		-1.65*** (.272)
Dummy for Netherlands		1.21*** (.252)
Time Dummy	*D2*	.78*** (.278)
	D3	.67* (.417)
	D4	1.08 (.804)
Trade Block Dummy **Anticipation Effects**	Intrablock Trade (**AN**)	.34 (.521)
	Imports from Members(**ANI**)	-1.14*** (.271)
Trade Block Dummy **Contemporaneous Effects**	Intrablock Trade (**CO**)	.43 (.516)
	Imports from Members(**COI**)	-1.30*** (.246)
Trade Block Dummy **Transition Effects**	Intrablock Trade (**TR**)	-.06 (.496)
	Imports from Members(**TRI**)	-.39* (.223)
Trade Block Dummy **Long Run Effects**	Intrablock Trade (**LR**)	-.03 (.256)
	Imports from Members(**LRI**)	-.01 (.523)

Information on the Regression

Dependent Variable: Exports

Number of Observations: 1072
All Non-Dummy Variables are in Logs
Robust (White Corrected) Standard Errors in Parenthesis

* rejection at significance level of 10%
** rejection at significance level of 5%
*** rejection at significance level of 1%

R^2 = 0.6942 F(23,1048) = 152.02

Wald Test of Statistical Differences of Trade Block Effects respect to Pre-Integration

7. Intra Block Trade

Null Hypothesis	Level of Confidence Of Rejecting H_0
AN = **CO**	
AN = **TR**	
AN = **LR**	

8. Imports of Members from ROW

Null Hypothesis	Level of Confidence Of Rejecting H_0
ANI = **COI**	
ANI = **TRI**	***
ANI = **LRI**	***

Source: Own Calculations using STATA

TABLE 9

POOLED-CROSS SECTION OLS ESTIMATES OF GRAVITY EQUATION
Three-Year Averaged Periods (1986-1997)

Explanatory Variable		Estimated Coefficient
Constant		-53.96*** (7.33)
GDP Exporter		1.89*** (.122)
GDP Importer		1.22*** (.114)
Population Exporter		-.87*** (.146)
Population Importer		-.35** (.138)
Remoteness(B) Exporter		2.80*** (.365)
Remoteness(B) Importer		1.82*** (.389)
Real Exch. Rate Exporter		.56** (.294)
Real Exch. Rate Importer		.68*** (.285)
Contiguity		.21*** (.181)
Common Language Area		.97*** (.122)
Distance		-.95*** (.104)
Dummy for Netherlands		1.32*** (.258)
Time Dummy	*D2*	.22 (.248)
	D3	-.65** (.245)
	D4	-1.03*** (.356)
Trade Block Dummy **Anticipation Effects**	Intrablock Trade (**AN**)	.36 (.414)
	Imports from Members(**ANI**)	-.855*** (.304)
Trade Block Dummy **Contemporaneous Effects**	Intrablock Trade (**CO**)	.29 (.392)
	Imports from Members(**COI**)	-.96*** (.227)
Trade Block Dummy **Transition Effects**	Intrablock Trade (**TR**)	-.32 (.39)
	Imports from Members(**TRI**)	-.01 (.21)
Trade Block Dummy **Long Run Effects**	Intrablock Trade (**LR**)	-.32 (.426)
	Imports from Members(**LRI**)	.38 (.273)

Information on the Regression

Dependent Variable: Exports

Number of Observations: 1072
All Non-Dummy Variables are in Logs
Robust (White Corrected) Standard Errors in Parenthesis

* rejection at significance level of 10%
** rejection at significance level of 5%
*** rejection at significance level of 1%

$\mathbf{R^2 = 0.7146}$ F(23,1048) = 158.88

Wald Test of Statistical Differences of Trade Block Effects respect to Pre-Integration

9. Intra Block Trade

Null Hypothesis	Level of Confidence Of Rejecting H_0
AN = **CO**	
AN = **TR**	*
AN = **LR**	

10. Imports of Members from ROW

Null Hypothesis	Level of Confidence Of Rejecting H_0
ANI = **COI**	
ANI = **TRI**	**
ANI = **LRI**	**

Source: Own Calculations using STATA

TABLE 10

TEST OF SUB-SAMPLE INSTABILITY AROUND 1991 (FORMATION OF MERCOSUR) BASED ON POOLED-CROSS SECTION OLS ESTIMATES OF GRAVITY EQUATION

Three-Year Averaged Periods (1986-1997)

Explanatory Variable		Estimated Coefficient *Period 1986-1991*	Estimated Coefficient *Period 1992-1997*	H_0: No sub-Sample Instability
Constant		-55.54*** (11.112)	-33.52*** (10.361)	***
GDP Exporter		2.06*** (.192)	1.74*** (.16)	
GDP Importer		1.26*** (.186)	1.07*** (.144)	
Population Exporter		-1.02*** (.225)	-.71*** (.194)	
Population Importer		-.38** (.219)	-.17 (.161)	
Remoteness(B) Exporter		3.72*** (.611)	2.54*** (.475)	*
Remoteness(B) Importer		.97* (.575)	1.51*** (.463)	
Real Exch. Rate Exporter		.624** (.322)	.001 (.542)	*
Real Exch. Rate Importer		.762*** (.298)	-1.30** (.610)	***
Contiguity		.66** (.300)	.34* (.203)	
Common Language		.70*** (.20)	.54*** (.135)	
Distance		-1.14*** (.104)	-1.11*** (.174)	
TIME DUMMIES	*D2*	.15 (.165)		
	D4		-.34*** (.16)	
TRADE BLOCK DUMMIES (corresponding to exports from one MERCOSUR country to another)	Intrablock Trade (86-88)	-.30 (.505)		
	Intrablock Trade (89-91)	-.42 (.492)		
	Intrablock Trade (92-94)		-.34 (.48)	
	Intrablock Trade (95-97)		-.27 (.46)	
Information from the Regressions **Dependent variable: Exports** All Non-Dummy Variables are in Logs Asterisks denote level of Confidence of Rejection of the corresponding H_0 Robust Standard Errors in Parenthesis Number of Observations in both Regressions: 536		**Period 1986-1991** F(14,521) = 111.86 $\mathbf{R^2 = .686}$	**Period 1992-1997** F(14,521) = 147.55 $\mathbf{R^2 = .721}$	**Chow Test for Structural Change** F(17,1004) = **1.873**

Source: Own Calculations using STATA