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Empirical Evidence on the North-South Trade Flows: an Augmented Gravity Model

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Abstract

In this paper we analyse the determinants of the trade flows between Developed and Developing Countries using an augmented version of the Gravity Equation. We add two extra variables: the technological distance and the bilateral real exchange rate (RER). The former allows us to analyse the impact of the technological gap on trade structure, the latter to study the movement in the relative prices and their impact on trade pattern. We estimate a Fixed Effects Model (FEM) for different groups of countries. The sign and the numerical value of the coefficients of GDP and Population are different when we analyse separately emerging countries as importers or exporters. This result supports the assumption that determinants of trade, for the two areas (Developed vs Emerging Countries), are not the same. Moreover, as expected, the geographical and the technological *distance* appear as barriers to trade, and the positive effect on export of a devaluation of the bilateral real exchange rate is confirmed by our results.

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Introduction

In the last two decades, partly due to enhancements in statistical analysis, both empirical and theoretical articles have improved the Gravity Theory. Very different problems, such as flows of migration, FDI and trade, have been analysed making use of the Newton's Law:

$$GF_{ij} = M_i M_J \big/ \ D_{ij}^2 \qquad \text{where } i \neq \text{j} \qquad (1)$$

the *gravitational attraction* of two bodies (GF) is directly proportional to their Mass (M) and indirectly proportional to their Distance (D).

After the Second World War, the growth in the international trade flows boosted the number of empirical studies trying to analyse the determinants of the trade pattern. Timbergen [1962] and Linnemann [1966] have been the first authors to transfer the Gravity Equation (1) to the empirical analysis of international trade flows. In their first formulation, they related trade between countries to the mass of the economic system (proxied by GDP) and to the physical distance between them (as proxy of the transaction costs). Even if the formulation was parsimonious and empirically robust, initially the Gravity Analysis lacked a strong theoretical background.

It is only after the pioneering work of Anderson [1979] that many authors either have tried to lead the gravity equation to a formal economic theory (i.e. Bergstrand [1985,1989], Helpman and Krugman [1985]) or have discuss the implication of the gravity equation in a neoclassical world (Deardoff, 1995)

In this paper the Gravity equation is used to analyse the trade flows between North (11 European countries, USA and Japan) and Emerging Countries (5 south-east Asian and 6 Latin American countries) in the last two decades (from the 1980 to the 2000).

In the line of Egger [2000,2002] and Matyas [1997,1998] the analysis is carried out by a panel framework, which enable us to take into account the connection between the explanatory variables over a long period, to reduce the collinearity among them -improving the efficiency of the econometric estimatesand to identify the country (in our case the bilateral) specific effects [Green 1997].

In order to develop a more precise analysis, different panel dataset have been built. The underlying assumption is that, to clarify how different variables affect the trade pattern, developed and developing countries have to be *split*. Moreover, the flows of manufacturing and non-manufacturing goods have to be investigated separately, to highlight the impact of different explanatory variables. For instance, given a strongest price competition on these markets, a bigger effect of a variation of the real exchange rate could be expected for the non-manufacturing goods.

The analysis is therefore developed for four dataset, i.e. the combination of the manufacturing and non-manufacturing goods, and bilateral trade flows from developed (exporters) to developing (importers) countries.

The first section describes the model and explains how the real exchange rate (thereafter *rer*) and technological distance (*techdist*) have been built. Section 2 develops the correct econometric specification of the model. Section 3 reports the results for each dataset. Finally, in section 4, we draw some conclusions and provide suggestions for further analysis.

The Augmented Model

According to the above Newton's Law, *basic* Gravity equation for trade flows may be written as follows:

$$TradeFlow_{ijt} = \frac{AY_{it}Y_{jt}}{TransportCosts_{ijt}} \qquad (2)$$

where

$$Y_{it} = \frac{GDP_{it}}{Population_{it}}$$

$$Y_{jt} = \frac{GDP_{jt}}{Population_{jt}}.$$

The GDP per capita is used as proxy for the *Mass* of the two bodies (countries in our case) and transport costs are the proxy for *Distance* (A is a constant of proportionality). Although this specification is the most employed, we have preferred to analyse separately the impact of GDP and population on imports, to stress their differences. Moreover, differently from this equation, the trade flows here analysed are the *imports* of country *i*.

Even if the transport costs could be model more precisely using proxies (i.e. infrastructure, the price of fuel, physical shipping costs) the *geographical* distance among the two countries has been typically used as a proxy.

In this paper we add *rer* (bilateral real exchange rate) and *distec* (bilateral technological distance) to the standard specification to capture how the movement in the relative prices and the exchange rate affect the trade pattern and how the technological gap can influence the trade structure.

The logarithmic form for the estimated equation is as follows[2]:

$$imports_{ijt} = \beta_0 + \beta_1 imports_{ijt-1} + \beta_2 pop_{it} + \beta_3 pop_{jt} + \beta_4 gdp_{it} + \beta_5 gdp_{jt} + \beta_6 distance_{ij} + \beta_7 rer_{ji} + \beta_8 techdist_{ijt} + u_{ij} + \lambda_t + \varepsilon_{ijt} \quad (3)$$

where:

$imports_{ijt}$ the imports of the country i from the country j at the time t.

β_0 the constant

pop_{it} the population of the country i at time t

pop_{jt} the population of the country j at time t

gdp_{it} the GDP of the country i at time t

gdp_{jt} the GDP of the country j at time t

$distance_{ij}$ the geographical distance among country i and country j

rer_{ji} the bilateral real exchange rate of the export country, see below for the construction

$distec_{ijt}$ technological distance among the country i and the country j

u_{ij} fixed country-pair effects

[2] In the regressions the lagged dependent variable is introduced. It will be explained in the conclusions how this variable is problematic for the econometric investigation.

λ_t time (business cycle) effects t=1....T

ε_{ijt} normal error terms with mean zero and variance σ_ε^2.

To catch the possible differences in trade pattern among Latin American and Southeast Asian countries, we introduce a dummy variable *'la'* (equal 1 for Latin American countries, 0 otherwise).

The Real Exchange Rate

As suggested by Matyas [1997], the bilateral real exchange rate can affect trade flows. In this paper, a huge difference between Latin American and Southeast Asian countries is expected: the volatility of both exchange rate and prices in LA is likely to be the major cause of a reduction in the trade flows. As stated above, this effect will be analysed using the dummy *la.*

The real exchange rate can be defined as the ratio of the price level of the typical basket of goods and services in country 1 to country 2. Following Edwards [2000]:

$$RER_{j,i} = \frac{E_{j,i} P_i *}{P_j} \qquad (4)$$

where, *E* is the bilateral nominal exchange rate, P* a price index of the foreign country and P is a domestic price index (*i* is the importer and *j* the exporter). The SDR (the unit of account of the International Monetary Fund) has been used to achieve the bilateral nominal exchange rate[3]:

$$E_{j,i} = \frac{Currency_j}{SDR} * \frac{SDR}{Currency_i} \qquad (5)$$

The Producer Price Index[4] (PPI) of the importer has been used as proxy for traded goods prices and the Consumer Price Index of the exporter for the domestic price index.

[3] Because of lack in data, for Taiwan the USD exchange rate has been used.
[4] Depending on data availability the Wholesale Price Index has substituted the PPI.

Finally, to compare data, the variable has been convert in US dollar, by multiplying the equation (4) by the bilateral nominal exchange rate US dollar per national (Exporter) currency. Hence, our variable is:

$$RER_{i,j}^{USD} = \frac{E_{i,j}(PPI_j)}{CPI_i} E_{US,i} \qquad (6)$$

To separate the cyclical behaviour of the RER, we apply the Hodrick-Prescott filter[5]. Moreover, to catch a lagged effect of a *real* devaluation, the effect of the lagged RER has been examined.

We expect a positive sign for RER: devaluation (i.e. a rise of the variable) should imply an increase of the imports of country *i*. Moreover, as pointed out above, a larger coefficient (in absolute value) is expected in the regression investigating non-manufacturing trade flows.

The Technological Distance[6]

Differently from the Newtonian concept of *Distance*, in social sciences the *Distance* between two *Masses* may be not only geographical but also due to both cultural and historical differences and those one in the structure of the economic system. Filippini et al. [2003] have tried to explore the latter; building a variable to capture the *technological distance* to study this kind of *Distance* among Developed and Emerging countries has an effect on the trade pattern. The sign of the constructed variable may help to understand whether the *gap* reduces the flows or it may be a *flywheel* for trading [ibid.]. Hence, it can be negative or positive. As shown below, in we find a significant negative sign of coefficient, confirming that the more the countries are "technologically" close, the more they trade.

The variable *techdist* is defined as the absolute difference between the technological indicators (TI) of the two trade partners.

[5] See the classical article of Hodrick and Prescott [1981] or, for a basic analysis Ahumada and Garegnani [1999]
[6] For a more exhaustive definition and discussion on how this variable affect the trade flows see Filippini C. et al. [2003]

$$distec_{ijt} = |TI_{it} - TI_{jt}| \qquad (7)$$

The TI indicator is a simple average of three different dimensions: creation of technology, diffusion of technology and human skills.

The Balassa's Relative Comparative Advantage Index (Balassa 1965) in Medium and High Tech sectors (HMTRCA) is used as proxy for creation of technology,

$$HMTRCA_{it} = \frac{\frac{EXPmht_{it}}{EXPtot_{it}}}{\frac{EXPmht_{wt}}{EXPtot_{wt}}} \qquad (8)$$

where:

- $EXPmht_{it}$ = the medium/high-tech exports of country i at t-time.
- $EXPtot_{it}$ = the total exports of country i at t-time.
- $EXPmht_{wt}$ = the world medium/high-tech exports at t-time.
- $EXPtot_{wt}$ = the world total exports at t-time.

Diffusion of technology is computed as a simple average of electricity consumption, telephone penetration and internet users (since 1994).

And finally, the average of secondary and tertiary enrolment ratios plus the literacy rate has been employed to work out a proxy of human resources.

The following general formula (9) has been utilised to express the second and third indexes in an interval [0,1]; the maximum and minimum values are respectively the USA's and the zero:

$$Index_{it}\text{x} = \frac{Actual\ value_{it} - Minimum\ \ value_t}{Maximum\ \ value_t - Minimum\ \ value_t} \qquad (9)$$

Hence, the overall Technological Index for country i at the time t is:

$$TI_{it} = \frac{HMTRCA_{it} + Index_{it}^{diffusion} + Index_{it}^{skills}}{3} \quad . \quad (10)$$

The Econometric Specification

As Matyas [1997] pointed out, the traditional cross-section or time-series approaches are affected by a severe problem of misspecification, when used to study the Gravity Equation. Indeed, the equation (3) as a generic form of all econometric specification used to analyse the Gravity Equation [Matyas 1997]. A cross-section analysis implicitly assumes T=1 and $\lambda_t = 0$. On the other hand Time series analysis assumes $u_{ij} = 0$. This leads, as suggested by Egger [2000] and Matyas [1997], to properly specify the Gravity Equation by a triple index panel model[7] (a two way error component regression model), which does not present such a kind of restrictions [Baltagi 1995]. Table 1[8] shows that not including these effects may lead to incorrect inference.

Let us compare results reported in Table 1. Regression (1) is a simple OLS, without any time or country-pairs effects, regression (2) is a one-way error component model (where $\lambda_t = 0$ is assumed), while[9] regression (3) is our preferred specification, with both time and country-pairs effects. Differences among regression (1) and (2)-(3) are large: both the absolute value of the coefficients and the signs are different. More precisely, the signs of the exporter's GDP and Population switch (from positive to negative). Moreover, the coefficients of variables in regressions (2)-(3) are larger than those one in the regression (1), except for the lagged of imports (which is the half). Finally, the significance of some coefficients is quite different.

On the other hand the comparison of regression (2) and (3) leads to different results. With the exception of the dummy LA, the signs and the size of the coefficients are the same. However, the exporter's GDP and the geographical distance, insignificant for the regression (2), are significant for the regression (3). On the other hand, exporter's population and importer's GDP are not significant in the regression (3), even if exporter GDP is significant at 10 % of confidence level.

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[7] In our analysis it is transformed in a double-indexed model, since we use a country-pair effect.

[8] For parsimony we prefer to show this result just for the first dataset: trade flows from developed (exporters) to emerging (importers) countries. Moreover, the coefficients of both time and country-pair effects have been excluded

[9] We will discuss regression (4) below in this paragraph

Table 1- Comparison among different Specification

	(1) imports	(2) Imports	(3) Imports	(4) imports
lagimports	0.659 (0.038)**	0.317 (0.053)**	0.326 (0.053)**	0.328 (0.053)**
expgdp	0.077 (0.038)*	-0.512 (0.275)	-1.993 (0.417)**	-1.558 (0.448)**
exppop	0.021 (0.022)	-0.076 (0.035)*	-0.010 (0.046)	-0.013 (0.050)
impgdp	0.060 (0.051)	0.582 (0.166)**	0.381 (0.212)	0.344 (0.233)
imppop	-0.020 (0.014)	-0.130 (0.033)**	-0.096 (0.034)**	-0.095 (0.036)**
distance	-0.303 (0.090)**	-0.430 (0.297)	-1.951 (0.468)**	-1.520 (0.506)**
tecdist	-0.693 (0.287)*	-1.087 (0.422)**	-0.920 (0.426)*	-0.907 (0.426)*
lagrer	0.018 (0.013)	0.599 (0.150)**	0.724 (0.150)**	0.706 (0.149)**
Latin America	-0.082 (0.066)	-2.201 (1.319)	0.670 (1.594)	-0.323 (1.708)
Constant	4.398 (1.355)**	19.766 (6.474)**	66.251 (13.651)**	54.267 (14.637)**
Observations	2860	2860	2860	2860
R-squared	0.47	0.57	0.59	0.58

Robust standard errors in parentheses

* significant at 5% level; ** significant at 1% level

(1) OLS with $u_{ij} = 0$ and $\lambda_t = 0$

(2) one-way error component model: $\lambda_t = 0$

(3) two-way error component model

(4) IV using lags of the most likely endogenous independent variables

There is another problem which we have to deal with to achieve a proper specification: the not strictly exogeneity of the independent variables. It's clear, for example, that the imports and the GDP at time t are implicitly related. The existence of not strictly exogenous variables may lead to simultaneous bias. As Matyas [1997, 1998] suggests, we can by-pass this problem using the lags of the most likely endogenous independent variables as their instruments. Regression (4) shows that except from the dummy La, for which the sign of the coefficient change (even if it is not significant), IV model has the same sign and similar numerical values than model (3), suggesting that in our case simultaneous bias is not a severe problem. Hence, we will report in our analysis the regressions not instrumented.

Finally, we have to discuss how to treat the country-pairs effects has to be managing and how to work out the time-invariant variables in a fixed effect model.

Since the individual (country-pairs) effects (u_{ij}) have been included in the model, we have to decide whether they are considered as fixed or random. From an econometric point of view the problem could be solved by the Hausman test [Green 1997]. Nevertheless, this test may not be unidirectional when more regressions are run. As Hsiao [1995] and Matyas and Harris [1998] pointed out, if the statistics are not fully conclusive, the objectives of the study should be considered. Given that the purpose of this paper is to analyse the trade flows between a predetermined selections of countries [Egger 2000], the FEM seems consistent with the model. Nevertheless, it is worth noting that, "the random effect model may be preferred as it lends itself to a dynamic specification, of which the lagged dependent variable is likely to be highly significant" [Matyas and Harris 1998].

The last problem faced is how achieve the coefficients of the Time-Invariant variables (*geographical distance and* la) with the specification assumed. We can work out the coefficients either estimated an LSDV model or, as we do, using a Fixed Effect Model, with a second step estimation, retained the fixed values from the general regression and regressing (with OLS) the time-invariant variables on those one:

$$FE_{ij} = \alpha_0 + \alpha_1 LA + \alpha_2 Lndis\tan_{ij} + \varepsilon_{ij}$$

Where *FE* are the fixed effects and ε_{ij} are the white noise residuals.

The Main Results

In the econometric analysis we examine 143 trade routes among 13 *North* countries (11 European countries, USA and Japan) and 11 Emerging Countries (5 south-east Asian and 6 Latin American countries) have been recreated over a period of 21 years (1980-2000). Following the results for each dataset are discussed. It is worth to briefly discuss the expected signs. First, assuming the presence of an inertial effect, we expect a positive and significant effect of past imports. As mentioned above, GDP and Population are analysed separately, since a different dynamic of the population growth is assumed among Developed and Emerging Countries. As our primary explanatory variable for the *Mass* a positive sign for the coefficient of the GDP is expected: the larger we are the more we trade. The signs for population's coefficients may be different in developing or developed country. In Developed Countries the population is stable and is therefore not likely to affect the import/export relationship, hence we do not expect a positive effect. On the other hand, given that the developing countries are at different stage of the demographic transition, we suppose a strong influence of population on imports, the sign, however, is not clear. We may have an *import substitution effect.* Unfortunately the negative sign could also depend on the correlation among GDP and Population: given the GDP's level, the growth of the population causes a reduction in the income per capita and a consequent decrease of the imports. We may have a *market effect,* since a growing population may need more differentiated *(imported)* goods.

The Newtonian distance is performed by both geographical and technological distance. We expect a negative coefficient for both. However, while for the former a negative relation is realistic, for the latter, as stated above, the sign could be ambiguous.

Different is the assumption about the bilateral RER of the exporter country. A real devaluation for country *j* has a positive effect on imports of country *i.*

Nevertheless, we use the lagged RER: devaluation now will show its effect next year.

Finally, assuming that there has been a swap between Latina America and East Asia in the commercial relationship with the Developed Countries a negative sign of the Dummy LA is expected.

Flows From Developed (exporters) to Emerging (importers) Countries

Table 2 and Table 3 show our preferred regressions: respectively the basic and the augmented gravity. The dependent variable is imports of Emerging Countries for either manufacturing (Table 2) or non-manufacturing (Table 3) goods.

In Table 2, all variables, except for exporter's population and importer's GDP, are significant at 5%. However, the sign of some coefficients is different from expected.

Indeed, the signs of both GDP variables were expected positive, being our *mass* variable. This is true only for the importing country but not for the exporting one. The counterintuitive result may depend on the aggregation level of our data: a strong sector-based effect could be leading the negative sign. Moreover we are virtually looking at two blocks, developed versus emerging countries, excluding the possibility of the *intra-blocks* trade. Finally, there may be negative effect of the variable techdist on GDP, which compensate the *mass* positive effect of the GDP on imports, cancelling each other out.

The signs for the population variables are both negative (2.a and 2.b), even if the exporter's one is not significant. As stated above, it may indicate an import-substitution effect: the bigger the population the larger the production for the domestic market.

Both geographical and technological distances show a negative coefficient. Particularly, the latter, as pointed out above, highlights how a technological *gap* is an obstacle to trade. Moreover, its absolute value is bigger for manufactured goods (2.b) than for non-manufactured one (3.b).

For manufactured goods the real exchange rate lagged clearly affects trade flows: depreciation (for the country j) of the real exchange rate at time *t-1* implies an increase in imports of the country *i* at time t.

Table 2 From Developed to Emerging Countries – Manufactured Goods

	(2.a)	(2.b)
	imports	Imports
lagimports	-	0.330 (0.052)**
expgdp	-2.010 (0.507)**	-1.894 (0.421)**
exppop	-0.027 (0.055)	-0.009 (0.047)
impgdp	0.252 (0.198)	0.313 (0.209)
imppop	-0.157 (0.044)**	-0.104 (0.035)**
distance	-2.239 (0.183)**	-1.843 (0.181)**
tecndist	-	-1.036 (0.432)*
lagrer	-	0.492 (0.114)**
latin America	-	-0.493 (0.126)**
Constant	51.000 (11.042)**	45.237 (9.916)**
Country-Pairs Effects	143	143
Observations	3003	2860
R-squared	0.53	0.58

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

Finally, the Latin American dummy variable is negative and significant too, suggesting how the *Latinos* had lower propensity to trade with the Developed Countries than the Asians.

Table 3 From Developed to Developing Countries - Non Manufactured Goods

	(3.a)	(3.b)
	imports	**imports**
lagimports	-	0.178 (0.032)**
Expgdp	0.861 (0.140)**	0.748 (0.127)**
Exppop	-0.582 (0.068)**	-0.504 (0.068)**
Impgdp	0.533 (0.184)**	0.363 (0.201)
Imppop	-0.149 (0.034)**	-0.130 (0.030)**
Distance	-1.202 (0.081)**	-1.016 (0.067)**
Tecdist	-	-0.133 (0.424)
Lager	-	-0.021 (0.115)
latin America	-	-0.090 (0.034)**
Constant	-4.017 (4.339)	-5.611 (4.550)
Country-Pairs Effects	143	143
Observations	3003	2860
R-squared	0.56	0.57

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

Table3 (non-manufacturing) presents a roughly different story; It is worth noting, however, that imports of non-manufactured goods from developed countries are small. The sign of GDP variables are both positive, even though the one of the import country is insignificant for the augmented specification[10].

The coefficients for population (3.a and 3.b) are negative and significant. Even in this case we may assume a *substitution* effect; while the importer try to increase the productivity of the non-manufactured production, the exporter reduces its export to compensate the increase of the population.

Moreover, as for manufactured goods, the geographical distance and the technological distance have the expected sign, even though the latter is not significant. This last result is not surprising, since we believe that technological distance have a bigger effect on the manufacture.

Contrary on our expectation, moreover, the real exchange rate does have a negative (even not significant) effect (3.b). As pointed out above, the non-manufactured goods that the Emerging Countries import from the Developed one are very small. Hence, such a kind of trade may not depend on the price level.

Finally, the dummy variable for Latin America is again negative, showing the decreasing of the imports of these countries from the Developed ones.

Flows From Emerging (exporters) to Developed (importers) Countries

Table 4 and Table 5 report the results of regressions where the dependent variable is imports of, respectively, manufactured and non-manufactured goods of Developed Countries.

These two dataset are the counterpart of those reported above[11]. Even if it could be argued that the imports of the non-manufactured goods from developed countries are small (Table 3), it can be noted that in comparison with the Table 2, while the GDP's coefficients present the same sign and roughly similar absolute value (Table 2 vs. Table 4 and Table 3 vs. Table 5), those of Population are completely different. This supports the assumption that *developed and developing countries have to be split.*

[10] However, this coefficient is significant at 10% level. For parsimony, we have avoided to include the variable significant at 10%.

[11] The importers of the Table (2)-(3) are the exporters of the Table (4)-(5) and vice versa.

Table 4 from Developing to Developed - Manufactured Goods

	(4.a)	(4.b)
	imports	**imports**
lagimports	-	0.385
		(0.049)**
expgdp	0.432	-0.009
	(0.248)	(0.254)
exppop	0.137	-1.647
	(1.506)	(1.477)
impgdp	-1.527	-0.888
	(0.765)*	(0.747)
mppop	3.886	2.215
	(1.231)**	(1.183)
Distance	-0.563	-0.335
	(0.207)**	(0.145)*
tecdist	-	-1.356
		(0.506)**
lagrer	-	0.042
		(0.012)**
latin America	-	-0.888
		(0.0817)**
Constant	-34.770	16.220
	(28.617)	(28.056)
Country-Pairs Effects	143	143
Observations	3003	2840
R-squared	0.52	0.58

Robust standard errors in parentheses
*** significant at 5%; ** significant at 1%**

Table 5 From Developing to Developed Countries - Non Manufactured Goods

	(5.a)	(5.b)
	imports	**imports**
lagimports	-	0.334 (0.047)**
expgdp	-0.331 (0.219)	0.032 (0.290)
exppop	0.810 (1.162)	1.383 (1.229)
impgdp	-1.974 (0.637)**	-1.793 (0.601)**
imppop	4.016 (1.064)**	3.579 (0.989)**
distance	-0.827 (0.168)**	-0.432 (0.130)**
tecdist	-	-0.175 (0.493)
lagrer	-	-0.030 (0.014)*
latin America	-	0.183 (0.091)*
Constant	-27.730 (22.929)	-43.947 (25.973)
Country-Pairs Effects	143	143
Observations	3003	2838
R-squared	0.54	0.59

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

It is worth noting, in both Table 4 and 5, that Exporter's GDP and Population (even if they are not significant) change sign[12] when we use the second specification (4.b and 5.b). This may confirm the presence of a strong

[12] Exporter's Population does not change sign in Table 5

multicollinearity among these variables and both technological distance and rer. The coefficient of the exporter's (the emerging countries) GDP is close to zero, suggesting –as pointed out above- an offsetting effect (i.e a negative effect of *techdist* against the *mass* positive effect). On the other hand, in the *augmented* specification, the exporter's population as a huge negative effect in Table 4 and a positive one in Table 5; however we could expect a different sign when we look at the typology of goods: an increase in emerging countries population should decreases (and not increases) their export of non-manufactured goods to supply the domestic market.

Even for the developed countries, there is a very strong market size effect: a small increase of the population leads to a huge increase in imports.

The effect of lagged trade is, as always, significant and the numerical value is large in absolute level. The negative coefficients of both *distance* variables are confirmed for both the tables. Again the technological distance is not significant for the non-manufactured dataset and its absolute value is larger in Table 4 than in Table 5.

As above, surprising the rer is positive only for the manufactured goods. Finally, while for manufactured goods the Latin American dummy is still negative; in Table 5 it is positive and significant. This may suggest that during the period analysed imports of developed countries from Latin Americans has been decreasing for manufactured goods but increasing for non-manufactures: Developed Countries imports manufactured goods from Asian countries and non-manufacturing from Latin Americans.

Conclusions and Issues

In this paper we have analysed an augmented gravity model, using a triple index Fixed Effect Model to take into account the bilateral specific and time effects. Two variables have been added to the basic gravity equation used in the literature: technological distance and bilateral real exchange rate. Besides, to capture the differences between Latin America and Southeast Asia, a dummy variable have been introduced. As expected, analysing separately first the emerging countries as importers (Table 2-3) and then as exporters (Table 4-5), the sign and the size of the coefficients of GDP and Population are quite different, supporting the assumption that the determinants of trade, for the two areas (Developed vs. Emerging Countries) are not the same. Furthermore, the geographical and the technological *distance* outline barriers to trade. Finally, expected the positive effect on export of the devaluation of the bilateral real exchange rate is confirmed by data just for the manufactured goods.

In spite of the using of IV regression to look at the simultaneous bias effect, there are some econometric issues which may have affected our analyses:

a) Lagged dependent variable: from the theory we assume that imports at time *t* are highly linked with those one at time *t-1,* suggesting that introducing a lagged dependent variable, the dynamic of the relation could be explained better. However, as pointed out in Matyas and Harris [1998] the choice between static and dynamic models is not obvious, the modelling is different and a well-defined procedure does not exist.
b) FEM vs. REM: as argued above the choice between these two models may not be simple, and does not depend just on the Hausmann test result. For example, Matyas and Harris [ibid.] suggest that “for strictly more policy reasons, the random effect model may be preferred, as the effects of explanatory variables are not diminished the presence of a relatively large set of dummy variables”.
c) As Egger [2002] pointed out, while the FE (and RE consistent) model reflect short-run parameters, the Between Effects Model is nearer to long-run parameters.

Hence, the indication for further analysis is employing a dynamic model (i.e Arellano Bond model) analysing the differences respect ours; studying the *panel* stationary of the real exchange rate and last but not least examining long vs. short run parameter.

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DATA Management	
Developed Countries: Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, United Kingdom, USA, Japan	
Latin American Countries: Argentina, Brazil, Chili, Colombia, Mexico, Venezuela	
Southeast Asian Countries: Indonesia, South Korea, Philippines, Malaysia, Taiwan	
Variables	**Dataset Used**
Trade Flows	NBER 1997 and Feenstra (2001)
Distance	it is expressed in KM, downloadable from www.indo.com/distance
Real Exchange Rate	International Financial Statistics (IMF) Nominal Exchange Rate (line rf, IFS), Producer Price Index (line 63, IFS), Consumer Price Index (line 64, IFS)
Technological Distance	NBER (1997), Feenstra (2001) and World Development Index 2003
Population	World Development Index 2003
GDP	World Development Index 2003