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World Trade: The Importance of Neighbors

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Abstract

The position of countries in the world, in terms of continents, neighborhood, and so on may matter much more than we usually think when we want to determine business and economic performance, and hence trade and economic integration. In this study we want to test the hypothesis that the nations at zero distance (neighbors) to the exporting country overwhelmingly determine trade between all of them. We then test this hypothesis with the relevant data of all nations in the world and with the data of the major regions of Europe, Asia, Africa, and Americas. The econometric results based on panel data techniques (such as fixed and random effects as well as GMM) and the gravity model very clearly and robustly confirm our hypothesis that we can say with almost certainty that "tell me how many and who your neighbors and continents are and we will tell you how much you can export". Furthermore regional integration is directly and indirectly included in the empirics. Thus, we can see how countries like France and Germany, or like Portugal and Greece perform in terms of exports in Europe. Good examples of countries which have many neighbors and create their own gravity center are Germany in Europe and China in Asia.

Keywords: Gravity model; World; National exports; Neighbors; Regional integration; Panel data and techniques

GEL: F14, F15, F17, C23

Introduction

The importance of neighboring countries' trade with a particular nation has never been tested before in a rigorous way econometrically. To the knowledge of the author this importance has not even been suggested as a fundamental significant factor to international trade flows. However, some scholars [1] have included a variable in their model indicating neighboring effects; but these effects are only one variable amongst many others in the model. This paper attempts to provide some preliminary evidence to this proposition, that is, that neighbors are the main factor determining international trade; this evidence is empirical although some theoretical points will be mentioned.

Economic and business performance depends on several factors such as investment, etc. However, for these factors to exist in the way they do currently in the world primarily depends on the country's geographical position[1]. On the other hand, exports can be considered to be a good overall representation of a country's economy. A vast literature on this topic [2,3] shows that exports are very important in promoting economic growth and development. The most common approach used to explain the volume of exports is the well-known gravity model. The literature on the latter is substantial; for example see Bergstrand [4], Deardorff [5] and Feenstra et al. [6]. Theoretically and empirically there is ample evidence that the basic or extended gravity model explains the volume of total and sectoral international trade between countries.

The general formula is:

$$X_{ij}=f(G_i{}^*G_j/D_{ij}, U_{ij}, \quad (1)$$

where X_{ij} is exports from country "i" to country "j", G_i and G_j are GDP of countries "i" and "j" respectively; D_{ij} is distance between countries "i" and "j"; U_{ij} is any other factor affecting countries "i" and "j", such as cultural affinity, racial affinity, costs, and so on. For example, Rose [1] included many (about 15) extra variables (Uij): island or not, ex colony or not, GATT/WTO member or not, area in square kilometers, population, etc. (most of them in binary form). In addition, one of these variables in Rose's paper is "sharing a land border"[2], which is very relevant to our paper. This author finds this "being a neighbor" variable statistically significant in his rigorous econometric work, thus confirming the results of our paper. Given the concept of neighborhood as introduced in the next paragraph, all these extra variables are common to neighboring countries, e.g. cultural affinity, being a colony, etc. In any case, the purpose of our paper is the neighboring effect, which once established in this paper can open the way for more detailed research in the future. Finally, "e" is an error term following the usual assumptions. In this paper we will explore the distance factor in a more particular way.

Thus, we will hypothesize that neighboring countries – for which distance is practically zero or very small have a much better chance or possibility to export to each other. Hence, in formula (1) above, G_j is the addition of all neighbors' GDPs; in other words, the "country" j is an area that includes all neighbors' geographical area. In this case the distance variable D_{ij} can be considered as taking the value one (e.g. one kilometer etc.). To support our proposition, we found that in most countries, especially in Europe, the percentage of exports to neighbors is consistently through time around 55-70% (data not shown here). Consequently we can further hypothesize that the exports to the non-neighbors are linearly dependent on the exports to neighbors. In other words, we hypothesize that the higher the economic integration with neighbors, hence a larger percentage of total exports go to neighbors, the more chance that total overall exports will be boosted.

[1]Also history counts but we will not deal with this dimension in this paper.

[2]The issue of "border" may have a different meaning from that used in Rose (2004). For example, the "border effect" usually refers to the contrast between trade within a given country and trade with neighboring countries (see e.g. Vanagas, 2013). This is also why in this paper here we use the term "neighbors" in order to exclude the misunderstanding regarding "border effect", etc.

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Our proposition or hypothesis is fundamentally an empirical issue since we do not have any extensive theoretical arguments to support it (nonetheless, in the next section we will briefly present some theoretical arguments for our thesis), except that neighboring nations are usually much closer to each other in terms of many of the variables U_{ij} in formula (1) above: reduced costs, cultural and historical affinity, and so on. Thus, in Rose's specification most Uij variables take the value 1 (in the case of representing these variables with a dummy one) and hence it is not necessary to include them in our estimation process (which is based on panel data regressions). In addition, we can include a more explicit variable to represent regional integration wherever applicable. Consequently it becomes indispensable to say a few more things about regional integration.

Economic Integration Considerations

We can look for example at the EU, since this region has become the most integrated area of the world. Germany is surrounded by the biggest number of (mostly large in terms of GDP) countries along its boundaries (land or sea); it has the biggest population, and its neighbors collectively have the largest population. Table 1 shows the names and number of neighbors for several European countries and China; as we can see there, Germany stands out in this comparison for Europe and China for the world. The neighbors of each country have the following significance. First, they offer and are part of an immediate economic market depending ultimately on the population and type of these neighbors; for example, are these neighbors already economically advanced, or were they former communist countries, or are they industrialized? And so on. Thus Germany plus its surrounding countries have a total population, hence potential market, of more than 310 million people.

Second, through historical, political and cultural links, the neighbors reinforce the common market of the central country. Thus, Germany in particular has neighbors with very close such links despite many European wars[3]. Germany's position in Europe is also a central gravitational position: it is approximately at equal distance from all other European countries (their capital city can be considered as their representative point). Thus, it is obvious when we look at the map that France, or the UK, or Italy does not have this position. This geographical advantage of Germany can offer more economic spillovers, mainly because other countries which are not the center are disadvantaged by further away situated markets. Thus for example, historically, a country like Portugal or Greece certainly has not possessed the same potential power in penetrating foreign economic markets as the Czech Republic has.

It can easily be verified that the economic development of Europe since the industrial revolution has started more intensively in England at the end of the 18th century and that the following area as is delimited by the lines linking the cities of Liverpool, Paris, Lyon, Marseille, Venice, Vienna, Prague, Stockholm, Amsterdam, and York has been the main motor of manufacturing and economic development of Europe in the last 250 years. In this area, Germany is included in its totality. A similar but smaller region has been suggested by other researchers, the so called 'blue banana' that includes the southwest part of England, Belgium and Netherlands, the east and south part of France, the west part of Germany, the northern part of Italy and a small north east part of Spain [7]. As Heindenreich [8] says this 'blue banana' was already prominent in Europe from the Middle Ages.

From the theoretical viewpoint, we can refer to an important economic postulate regarding economic development, namely that of poles of growth as elaborated by scholars such as Perroux, Rostow, and others. For example, Rostow says [9]:

	Country	Population in millions	Neighbours: names	Neighbours: number	Land, sea, distances
1	Portugal	10	Spain, France	2	1 Sea, 1 land
2	Spain	40.5	Portugal, France, Italy, Ireland, UK	5	2 land, 3 sea
3	France	61	Spain, UK, Belgium, Germany, Switzerland, Italy, Netherlands, Luxemburg, Ireland	9	7 land, 2 sea
4	Ireland	4.1	UK, France, Iceland, Spain	4	4 sea
5	UK	60.5	Ireland, France, Spain, Belgium, Netherlands, Norway, Denmark, Germany, Iceland	9	9 sea
6	Belgium	10.5	Netherlands, Germany, France, Luxemburg, UK	5	4 land, 1 sea
7	Netherlands	16.5	Denmark, Germany, Belgium, Luxemburg, UK, Norway, France	7	3 land, 4 sea
8	Germany	82.4	France, UK, Belgium, Netherlands, Denmark, Sweden, Poland, Czech Republic, Austria, Switzerland, Italy, Luxemburg	12	10 land, 2 sea
9	Switzerland	7.5	France, Germany, Austria, Italy	4	4 land
10	Italy	58.1	France, Switzerland, Austria, Slovenia, Croatia, Greece, Malta, Spain, Albania, Bosnia, Montenegro, Germany	12	6 land, 6 sea
11	Austria	8.2	Switzerland, Germany, Czech Rep., Slovakia, Hungary, Slovenia, Italy, Croatia	8 total	8 land
12	China	1350	India, Nepal, Bhutan, Bangladesh, Myanmar, Thailand, Laos, Vietnam, Philippines, Japan, South Korea, North Korea, Mongolia, Kazakhstan, Kyrgistan, Tajikistan, Afghanistan, Pakistan, Uzbekistan, Russia	20	18 land, 2 sea

Notes: For Europe, since the distances by sea are relatively small, some neighbors across sea borders are included[1].

Table 1: The neighbors for some European countries and China.

[1]Sometimes, the neighbours are not exactly on the border but very close; hence perhaps it becomes a bit subjective to include some neighbours in the non-strict sense. However, since we mostly use large samples in the regressions this subjectiveness (for a small number of countries) cannot alter the results significantly (as it was checked in some cases).

[3]Europe has been the centre of numerous wars through the history. However, these wars have also reinforced common racial, cultural, political, and economic trends. For example, most neighbours of Germany are of Germanic background and language, e.g. Belgium, Netherlands, Austria, and so on.

"…In short, a modern economy is not driven forward by some sort of productivity factor operating incrementally and evenly across the board. It is driven forward by the complex direct and indirect structural impact of a limited number of rapidly expanding leading sectors within which new technologies are being efficiently absorbed and diffused. And it is this process of technological absorption that substantially generates, directly and indirectly, the economy's flow of investment via the plowback of profits for plant and equipment, enlarged public revenues for infrastructure, and enlarged private incomes for residential housing…"

The rapidly expanding leading sectors to which Rostow refers were essential to the economic development of countries such as England, Netherlands, and Germany. For example the textiles and clothing industry in England, the oil industry in Holland, and the chemical one in Germany have lead these countries to higher economic development at different points of time. Each one of the countries and sub regions included in the North-West of Europe have a long history of manufacturing performance in several sectors and groups of firms like Philips in Netherlands.

Hospers refers to three building blocks of theoretical development in order to explain the existence and changes in the growth poles in Europe. Based on the Schumpeterian premises of creative destruction, first he refers to structural change theory (mainly proposed by Fourastiè) which accounts for intersectoral changes due to technological change. Then, according to the agglomeration theory (as proposed by Perroux and Myrdal) regions (poles) are built around leading firms and industries and their spread effects or backlash effects. From this theory we have the "Matthew" effect which suggests that the rich (core) becomes richer, while the poor (periphery) becomes poorer. Hospers uses all this theoretical background to suggest that the already mentioned 'blue banana' greater region of the EU will continue to be the center of economic development in Europe.

The concentration of wealth (not only economic) in this European main core is evidence of the theoretical postulates as described briefly above. Thus, if we take the small version of this core, the 'blue banana', in 1996 40% of the EU population lived inside that 'banana' with many large and medium size cities; the regions within that 'blue banana' have higher income per capita than the rest of Europe, have a well-developed physical and telecommunications infrastructure, and they supply most of cultural and educational products such as exhibitions, conferences, universities and so on. Needless to say there are similar pockets of wealth in some other parts of Europe, but the 'blue banana' or our more extended area has the highest concentration or density of wealth and economic or social development in the EU.

From this brief theoretical background we can infer that a strong regional integration is one that propagates economic development from the center or pole towards the periphery in a consistent and positive way. Similarly, in Asia, China is becoming the huge gravity center around which Asia will be developing and hence the whole world.

Data and Empirical Results

The data are available from the well-known sources of World Bank (and IMF), or ITC (and UN). For each country in the world (144 in total) we calculated the term $G_i{}^*G_j$ where G_j is the addition of all neighbors' GDPs for country i (we call this variable $G_i{}^*G_j$ "GDP gravity"). Table 1 shows a sample of which neighbors we used for each country. Regarding the specific integration variable, for the region "Europe" the "EU" proxy for countries belonging to the European Union shows the number of years that each member nations has been in this Union; thus, in a way, this is also a trend factor that has its explanation in the membership of the integrated EU region. The same principle applies to the countries of South East Asia which belong to ASEAN (hence the proxy "ASEAN"); the countries of South America which belong to MERCOSUR (hence the proxy "MERCOSUR"); and the countries which belong to NAFTA (hence the proxy "NAFTA"). We examine the whole world and the continents. The fixed effects model results (also cross section data, the random effects and GMM panel data approaches were used generating similar results, but not all of them are included here) are shown in Table 2.

In this Table 2 we can see that consistently in all estimated samples, the explanatory variable "GDP gravity" is highly significant and its coefficient is approximately of the same magnitude in all regions except Africa and South America. This variable alone explains about 85% to 90% of the dependent variables' variance when it is regressed as the only independent variable in the model (results not shown here). In addition we can conclude that the more developed the region is the more the GDP gravity coefficient is significant and smaller (because GDP gravity is larger, and hence the "neighborhood" area is more integrated). In addition, within each broad region we examine here, there are differences from country to country according to the GDP gravity variable. Thus, as we can see in Table 3, for Germany the GDP gravity value is 13578 tens of billions of billions US$ and this country's exports are influenced by this variable about 67%; whereas, Malaysia has only 122 as GDP gravity and hence this country's exports are only influenced by 6%. Therefore we may say that the 85-90% overall impact of the GDP gravity factor is valid across the board of nations according to the magnitude of the GDP gravity factor.

In Table 2 (last column) we also calculated the fixed effect for each country in the case of Europe. Thus we can see that Greece has a negative fixed effect of 69 billion US$. This means that this country's performance is below expectations by 69 in relation to the overall results suggested by the regression (this is not a surprising result for Greece given its weak economy and mainly its peripheral position). Similarly, France's fixed effect is a negative 249 billion US$, also under performing in Europe. On the contrary, Switzerland and Sweden are over performing by 66 and 56 respectively; these two countries have significant trade relations with other countries outside Europe such as the USA, and so on. Note that a detailed analysis of each country's performance is beyond the scope of this paper.

When we add the integration variables they are also significantly positive except the NAFTA one which is significantly negative. The regions for which we have the least satisfactory results are Africa and South America, mainly because of their underdevelopment. However, we must be careful in examining the integration proxies because they also show time trends. The fixed effect of our panel data regressions, as shown in Table 2, are those obtained when these proxies are included in the estimation. The fixed effect impact when these proxies are not included in the estimation for the whole world sample is shown in Table 3 (for some countries only). There we can see more precisely that the fixed effect is as important for the ASEAN integrated sub-region as it is for the EU. Nonetheless this fixed effect might not only be due to the integration impact but also to other reasons, e.g. exporting to some major large countries like the USA, Japan, the EU, and China. For example, for Malaysia, its exports to neighbors (who are all ASEAN partners) are only about 25% of its total exports; whereas most European countries in the EU export about 60-70% of their total exports to their immediate neighbors.

	WORLD	E&S ASIA	All ASIA	EU/PE	AFR/A	C&S AM/A	All AM/A	NO/H AM/A		EUROPE		
GDP gravity	0.053	0.054	0.054	0.048	0.185	0.089	0.057	0.057		0.048		
	78.3	38.3	46.4	24.9	20.3	13.1	29.2	10.9		24.9		
ASEAN	4.89	4.88	4.88									
	9.5	5.1	6.2									
EU	3.61			4.11						4.11		
	10.5			11.1						11.1		
MER/SUR	0.82					0.42	0.78					
	1.33					2.9	1.7		Austria	35.1	Luxemburg	-178
NAFTA	-8.17						-10.21	-10.11		3.9		-8.6
	-9.3						-8.3	-3.1	Azer/jan	3.7	Netherlands	-26
										0.4		-1.3
Constant	-4.73	-22.92	-7.57	-18.34	2.52	6.35	10.46	28.05	Belarus	9.8	Norway	38
	-2.7	-2.3	-1.4	-4.6	14.9	11.6	4.4	0.8		1.1		4.3
									Belgium	-81	Poland	30
Number of observations	1973	325	482	670	471	302	350	48		-4.1		3.4
									Bulgaria	5.9	Portugal	-85
Number of countries	144	23	36	44	42	19	22	3		0.7		-6.6
									Croatia	7.8	Romania	13
R-sq within	0.806	0.833	0.832	0.677	0.49	0.523	0.864	0.87		0.9		1.5
									Czech R.	37.9	Russian F.	-141
R-sq between	0.89	0.922	0.911	0.891	0.297	0.571	0.97	1		4.4		-9.8
									Denmark	-79	Serbia	1.5
R-sq overall	0.878	0.889	0.883	0.87	0.355	0.589	0.965	0.972		-5.9		0.2
									Estonia	-1.2	Slovak Republic	20
										-0.1		2.3
									Finland	19.3	Slovenia	5.8
										2.1		0.7
									France	-249	Spain	-65
										-12		-5.3
									Germany	-19	Sweden	56
										-0.9		6.2
									Greece	-69	Switzer/nd	66
										-5.9		7.4
									Hungary	39.1	Turkey	51
										4.5		5.9
									Ireland	-39	Ukraine	18
										-2.9		2.1
									Italy	-165	United Kingdom	-61
										-8.9		-3.8
									Latvia	-2.4		
										-0.3	cons	0.7
									Lithuania	2.8		0.1
										0.3		

Notes: For each variable shown in the first column, the first row shows the coefficient and below it the t-statistic. The variables, EU, ASEAN, MERCOSUR, and NAFTA are the integration proxies as explained in the text. "E&S Asia" stands for East and South Asia; "C&S Am/ca" stands for Central and South America. The dependent variable is total national exports expressed in billions of US$.

Table 2: Panel data regression results (fixed effects).

In Table 3, we show some of the salient characteristics of the data we used and the consequences of the empirical results. Thus, we can see that the "GDP gravity" variable is very large for some countries and also very small for some others. This variable can tell us how developed the area of a country plus its neighbors is. It can also tell us the expected size of exports without the specific integration effects of regions like the EU and ASEAN. The latter may be captured by the integration proxies and the fixed effect specific to each country as a result of our panel data estimations. A negative fixed effect number indicates that the country under exports; e.g. Russia and France in Table 3.

The North American case is both the confirmation of our hypothesis and its refutation. Thus, both Canada and Mexico export about 85% of their exports to their main neighbor, that is, the USA; hence confirming the importance of neighbors in international trade. However, the USA exports a much smaller percentage of its exports to Canada and Mexico (about 19% and 13% respectively), mainly because of its worldly position in terms of GDP and overall development. In Europe, countries like Germany and France (also the oldest nations of the EU since its foundation in 1952) benefit the most from the ongoing European integration. On the contrary countries on the periphery such as Greece and Portugal have not benefited in terms of exports. The example of Greece can be illuminating: although it is the most advanced country in the Balkan area, its exports are lagging behind (in

Country	GDP gravity in 10s of bn US$	Exports	Fixed effect in US$ bn	GDP gravity impact	Fixed effect as % of exp	GDP gravity impact as % of exps
Austria	834	130	63	43	48	33
Czech Republic	206	88	41	11	47	12
Finland	135	69	50	7	72	10
France	10,390	437	-77	540	-18	124
Germany	13,578	1,050	142	706	14	67
Italy	5,766	291	22	300	8	103
Poland	724	99	33	38	33	38
Portugal	283	44	23	15	52	33
Romania	70	28	14	4	50	13
Russian Federation	9,098	207	-165	473	-80	229
Slovak Republic	33	44	25	2	57	4
Spain	3,370	218	33	175	15	80
Sweden	995	163	84	52	52	32
United Kingdom	9,310	507	29	484	6	95
China	25,486	1,470	-39	1,325	-3	90
India	3,353	217	39	174	18	80
Indonesia	191	127	74	10	58	8
Japan	22,348	778	-150	1,162	-19	149
Korea, Rep.	6,938	498	42	361	8	72
Lao PDR	12	1	-0.2	1	-16	51
Malaysia	122	162	117	6	72	4
Philippines	503	65	33	26	51	40
Singapore	135	405	237	7	59	2
Taiwan	2,989	243	74	155	30	64
Thailand	733	133	75	38	56	29
Vietnam	261	53	20	14	38	26
Cameroon	2	2	1.5	0	69	4
Egypt	174	48	22	9	45	19
Ethiopia	6	2	0.6	0	24	12
South Africa	6	47	38	0	81	1
Canada	10,122	302	-105	526	-35	174
Mexico	8,068	275	-137	420	-50	153
United States	22,959	1,530	223	1,194	15	78
Argentina	468	54	23	24	42	45
Brazil	815	119	57	42	48	36
Chile	58	36	25	3	70	9
Peru	112	16	7	6	44	36

Note: The “gravity GDP” impact in the corresponding column is calculated by multiplying the coefficient of the “gravity GDP” variable (e.g. around 5.5%) by the “gravity GDP” as indicated in the first column; the “gravity GDP” is the addition of GDP for all neighboring countries adjacent to the nation considered multiplied by the latter’s GDP (according to equation (1)).

Table 3: Main characteristics of a sample of countries (regressions without the integration proxies).

relation to other EU members) as they still remain very low even after 25 years of this nation being a member of the EU.

Our results also tell us that the initial core of 5 countries of the EU is the moving force of the European economic and social development but more importantly it is the most favored region of Europe. The center of this core, Germany (which has the largest number of neighbors) is the nation that takes advantage of the unequal European integration the most. Consequently, as an example, the central European cluster which is overwhelmingly a group of former communist countries (Poland, Czech Republic, and so on) will soon develop in a spontaneous way as a result of its close vicinity to the center of European integration (around Germany).

Taking Europe as a case of reference for other integrated regions, what can we say about them? ASEAN has a long history of integration and according to our empirical results ASEAN is well integrated in terms of international trade and therefore economic development. In addition, the coefficient of the integration proxy “ASEAN” is about 4.9 and very significant (Table 2). However, as we noted earlier, this coefficient does not necessarily capture only the integration effects but also other factors such as effect of richness of resources, time trends, etc.; this is especially true for ASEAN nations for which exports to neighbors is still relatively low (e.g. 25%). To become more precise we run another regression in which we separated the time effects from the ASEAN integration effects (a dummy variable was used with value equal to 1 for ASEAN countries and zero otherwise). The results of this regression are not shown here but it was clear that on average the ASEAN integration effect is about 74 million US$; and the time effect for 2010 was an extra amount of about 30 billion US$. The benefits of ASEAN integration can be seen through other studies and the general conclusion is that ASEAN has been integrating in many ways; see for example, Jayanthakumaran and Sanidas [10].

In addition, in this region, each country is a neighbor of all other participant countries, thus further increasing exports and enhancing

economic integration. Is there like in the EU, a core region which dominates with its economy everyone else in ASEAN? The answer is no since all nations in ASEAN seem to be on equal foot in the integration and development. Then according to our theoretical considerations regarding the EU, we do not have a pole of growth or a "blue banana" in ASEAN. However, the latter is very close to two giant economies, China and India. Consequently, it may be possible in the foreseeable future that ASEAN becomes a satellite of these two giants. Already, their gravity attraction is felt in ASEAN nations.

Regarding NAFTA, the pole attracting its neighbors is the USA. However, all three NAFTA participating nations do not have many neighbors (Mexico is in a better position as it is located in the south of NAFTA area close to Central and South American countries). Regarding MERCOSUR, all nations are still developing and their geography is somehow limiting their progress; the evidence for this loose integration is the small and only just significant at 5% proxy for integration (MERCOSUR) as you can see in Table 2.

Furthermore for Europe, let us now include some extra results based on 44 countries and 15 yearly data, from 1995 to 2009 (in Table 2 we used data up to 2010); these results are obtained not only by using the fixed effects model but also POLS (pulled OLS) and GMM (Table 4). These extra models fully support our previous results as shown in Table 2 above, thus providing more robustness to our conclusions. The variable GDP gravity (indicated as X1 in the table) is the most fundamental variable in explaining exports of European nations; it explains approximately 90% of total variance in real exports. Note that the coefficients in Table 4 panel data regressions are similar to those of Table 2 once we consider differences[4] in the construction of the real series of GDP gravity between the data used in these 2 tables (the "eu" variable is mostly affected). Finally it is important to stress that the GMM results confirm the other models and in addition they indicate that the endogeneity between exports and GDP gravity as included in the GMM estimation[5] is important in predicting national exports.

Variable	FE Coef/nt	t-stat	POLS Coef/nt	t-stat	GMM Coef/nt	t-stat
X1	0.071	29.1	0.051	51.3	0.054	106.3
Eu	2.16	5.4	1.12	8.4	1.002	11.1
Constant	-12.57	-3.3	20.8	9.5	15.2	7.9
R-sq within	0.75				AR(2) test	0.17
R-sq between	0.92				Hansen test	0.28
R-square	0.902		0.903			
No of obse/ons	624		624		624	
No of countries	44		44		44	

Notes: i) FE stands for fixed effects; POLS stands for pooled ordinary least squares; GMM stands for generalized method of moments. ii) For GMM, the variable "eu" is strictly exogenous whereas the dependent as well as GDP gravity (X1) are endogenous and used as instruments with 2 to 10 lags.

Table 4: More panel data regression results for Europe.

Conclusion

The econometric results based on our proposed gravity model with "zero" distance has engendered robust evidence that the neighbors for each country are the primary force determining national exports, explaining about 85% of these exports all over the world (despite some minor differences between regions or continents). Also, they show that the number of neighbors and the combined effect of their GDP (in the sense of the gravity model) indicate the indirect effect of their economic integration. The latter is in addition directly captured by a proxy dummy variable which shows that the EU is already successfully integrated (but not so much for the peripheral nations which are situated relatively far from the center or pole of Germany and its immediate neighbors).

ASEAN is also integrated but the lack of a strong pole or nation within its boundaries limits its fast and complete integration; however, China and India might soon make the whole East and South Asian regions more integrated through their huge gravity attraction [11]. Finally NAFTA and MERCOSUR are weaker and more specific cases of integration. In this paper we also provided indirect evidence that for regional integration to take place we need some poles of growth: the "blue banana" in Europe, the USA in NAFTA and the whole world; Japan, China and South Korea in East and South East Asia; India in South Asia; Brazil in Latin America, and so on. China is the gravity center for the whole world as well. Overall the main contribution of this paper is the emphasis on the role of neighbors in explaining national exports and regional integration; this emphasis is strongly supported by empirical evidence. Saying all this in a different way, we can confirm that economic geography of neighbors indeed matters [12,13]. However, more research is needed in the future to conduct a more detailed analysis per region.

[4]These differences are mainly due to some additions of neighbors for some countries such as Finland, France, and so on. Thus, in Table 2, the GDP gravity figures are often higher than those used in Table 4.

[5]The GMM for Europe was used for confirmation of the fixed effects approach; it would be beyond the scope of this paper to apply the GMM for all regions as the (instrumental) variables we have are limited.

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