Integration Effects and Trade Barriers: Does European Economic Integration affect Foreign Direct Investment?

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Abstract:

This paper analyzes the net effect of integration, as a measure of changes in trade barriers, on reducing the border effects between European countries. In order to study this contribution, we examine the size of home bias in the market for goods among 18 European countries over the period 1995-2006. The construction of a gravity model, using disaggregated data for 23 sectors, allowed us to come out with an index for economic integration based on the nature of the home bias. Our results suggest that, since 1995, the integration effect has lead to the reduction of border effects by more than 50%. According to the literature, the large decline of home bias in the European Market might cause a fall in the amount of bilateral Foreign Direct Investment (FDI) flows among these countries. Consequently, we expound a FDI non-restricted model for different specifications: vertical, horizontal and a hybrid "Knowledge Capital" model. Surprisingly, we found that European Economic Integration does not affect the FDI allocation of resources and, moreover, the FDI pattern is driven either by a horizontal motivation or by the "Knowledge Capital" specification, displaying similar characteristics to those in the US economy (see Markusen and Maskus, 2002).

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1 Introduction and theoretical background

International trade and economic integration are central topics in the economic literature. However, the study of the home country bias phenomenon in the market for goods and services is relatively scarce and only began to proliferate since the mid 90s. The home bias defines the people's preference for consumption of home made goods rather than foreign made ones. The paper by McCallum (1995) was one of the pioneers. This study uses Canadian province-level data applied to a gravity model; the estimation results accounts for this impressive outcome: trade between two Canadian provinces is 20 times larger than trade between a Canadian province and an American state. Helliwell (1996) confirmed the results obtained by McCallum for a temporal horizon that goes from 1988 to 1994.

The relevance and size of the home bias, together with the lack of contributions on the field, stimulated a florescent number of important papers. Wei (1996) studied the size of home bias in the goods markets among OECD countries over the period 1982 to 1994. This was the first attempt to analyze home bias between countries rather than provinces. The author faced an important challenge. First of all, the necessity to measure country trade with itself, and, secondly, since data about intra-national trade were not available, the author overcame the issue based on the assumption that a country's imports from itself is just the difference between its total production and its total exports to foreign countries. The bottom-line behind the idea of the home country bias is the fact that people seem to have a stronger preference for consumption of their home goods than foreign ones. In this paper, we based our home bias approach on calculating the total production minus the total exports for each of the 23 sector considered.

Additionally, it is necessary to find a measure for the intra-national distance in order to try to estimate correctly the home bias effect. This is a question of no minor importance since the home bias shows a high sensibility to the unit used. Wei (1996) considered the internal distance of a particular country as one quarter of the distance to the border or to the nearest neighboring country. The main innovation proposed was an augmented version of the gravity equation that included the geographic position relative to all other countries. The variable was called remoteness. The model controls for common language and also for common border. All these variables are now widely accepted in the literature as determinants of trade flows between countries.

Wei´s estimation shows that an OECD country´s trade with itself was about 10 times as high as its trade with a foreign country during that period. Although this estimation could be surprisingly high only represents half of the size estimated by McCallum (1995) and Helliwell (1996) for Canada and the US. Wei´s estimation focused on the EU, found that a country´s imports from itself are about 1.7 larger than imports from a foreign country. These figures show that the European Union was more economically integrated than the OECD and that the area formed between Canada and the US. Preference for home made goods is much lower in Europe. In other words, countries in the European Union exported a larger proportion of their production than OECD countries.

Recent studies on home bias have been focused on the European Union. Nitsch (2000) presented an estimator for home bias of 2.43, after controlling for language, common border, distance and remoteness. This means that on average, imports of any European country from itself are approximately 11 times higher than imports from a different country. This data indicates that home bias in the EU is substantially lower than the one for Canada and the US (McCallum, 1995 and Helliwell, 1996), but is substantially larger than Wei´s (1996) estimation for the European Union [=exp(0.52)].

To the light of these findings, the size and importance of the home bias has been highlighted by Obstfeld and Rogoff (2000). They defined the home bias issue as one of the most important phenomenon to be studied by the economic science. The burgeoning growth of theoretical and empirical work in this area has contributed substantially to a better understanding and advancement of the subject. However, still remains certain controversy regarding the most accurate way to measure intra-national distances. The most recent studies propose new alternative measures, for example Nitsch (2000), proposed the internal distance of a country to be 0.56 x sqrt(country´s area) and Head and Mayer (2002) multiply the Nitsch´s measure by a factor of 0.67. Both approaches have the advantage of calculating the distance just with knowing the geographical area of the country. Superior measures use actual data on the spatial distribution of the economic activity within nations, although, "these measures are more complex to compute and require more disaggregated data on activity, area, longitude and latitude" (Head and Mayer, 2002).

The motivation to study the connection between economic integration and FDI flows comes from the difficulty to measure the size and impact of the net effect of reduction in trade barriers on FDI flows (Motta and Norman, 1996; Dunning, 1997; Neary, 2002).

According to the literature, FDI can be considered as substitute or complement of trade. If FDI is vertical and driven by endowments differences, it can be seen as complement of trade. On the other side, if FDI is horizontal and driven by economies of scale and replication of production, FDI and trade can be seen as substitutes. Theories also suggest the possibility of coexistence of vertical and horizontal motivation (Markusen, 1997). Then, real reduction in trade barriers may have either positive or negative effects on FDI. In this study, we do not measure directly the relationship between trade and FDI, instead, we test whether a more integrated area leads to a more dynamic FDI flows within the area.

This paper addresses the lack of empirical evidence about the influence of the home country bias on FDI flows. Based on the empirical studies mentioned above, we think that, in the case of the European Union, a well known integrated area, it is more relevant to study the evolution of the home bias over time than the level. This procedure will allows us to create a new variable called integration to test a FDI model with the aim of capturing the influence on FDI on the 18 European countries considered. Evolution of the home bias captures the reduction in trade barriers over time. This reduction can be quantified by the exponential of the coefficient from the outcome of a gravity equation. An area with decreasing trade barriers is an increasingly integrated area, thus, we can create a variable capturing this reduction in barriers and introduce it in a FDI specification to test whether economic integration is a determinant of the FDI flows.

The organization of the paper is as follows. Section 2 discusses previous empirical work on this topic and introduces our approach about how to measure economic integration and the home bias. Section 3 describes the data set and section 4 estimates the gravity equation proposed in section 2. Our results suggest that there is an integration process running behind the data as the home bias declines by more than 50% over the period studied. Section 5 displays and estimates the second model proposed in this paper, an unrestricted FDI model based on Markusen and Maskus (2002), that includes the variable integration constructed in section 4. Results on FDI flows indicate that the FDI flows between the 18 countries considered are driven by economies of scale rather than by difference in factor endowments. In other words, FDI flows seem to follow a horizontal or "knowledge-capital" motivation rather than a vertical motivation. Surprisingly, Integration variable does not seem to play any role in FDI flows. Finally, section 6 concludes.

2 Methodology

In this section, we quantify economic integration by adopting the outline proposed by Wei (1996), which captures the home country bias and constructs a method of measuring integration. The basic framework for estimating the home country bias in the goods markets is the gravity equation, where the volume of trade between any two countries is related to the economic size of these countries and the geographic distance between them:

$$\ln(X_{ij}) = \alpha + \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_3 \ln(D_{ij}) + \varepsilon_{ij} \qquad (1)$$

Where X_{ij} are exports from country i to country j, Y_i and Y_j are the GDP of countries i and j, respectively; D_{ij} denotes the direct distance between the two countries and ε_{ij} refers to the error term.

The basic model proposed in equation 1 requires some modifications to capture other forces that are assumed to be related to the bilateral volume of trade. Other authors have found statistically significant coefficients on dummies for country pairs that share a common border or speak a common language (Frankel, Stein and Wei, 1996). Deardorff (1995) found that what matters for bilateral export volume is not just the absolute distance between two countries, but their geographic position relative to all other countries. Following Wei´s (1996) theoretical discussion, the remoteness of a country i is defined as the reciprocal of country j´s GDP divided by the bilateral distance between countries i and j summed over all trading partners of country i in the sample:

$$R_{it} = (\sum_{jt}[Y_{jt}/D_{ij}])^{-1} \qquad (2)$$

By adding these considerations to the basic gravity equation, and also introducing a dummy that takes the value of 1 for trade flows within countries and 0 otherwise, we can estimate the home bias. In this paper, we construct the model using data at industry level rather than aggregated data. Hillberry (2002) suggested the aggregate gravity model seriously overestimated the border effects due to compositional change and aggregation bias, so more reliable estimates of border effects should come from a more disaggregated model. In our model, we consider exports from 23 industries. We specify our border effect model, based on the previous theoretical specifications, as follows:

$$Ln(X_{ijkt}) = \alpha + \beta_1 \ln(Y_{it}) + \beta_2 \ln(Y_{jt}) + \beta_3 \ln(D_{ij}) + \beta_4 \, home_{1996} + \beta_5 \, home_{1997} + \ldots + \\ + \beta_{15} \, home_{2006} + \beta_{16} \ln(R_{it}) + \beta_{17} \ln(R_{jt}) + \beta_{18} \, language + \beta_{19} \, adjacency + u_{ijkt} \quad (3)$$

How to measure Home Bias?

The key variables of this model, for our purposes, are $home_{1996}$ to $home_{2006}$; these are the so-called home country bias. $Home_{1996}$ - $home_{2006}$ are dummy variables that take value 1 if the importer and the exporter country is the same in a certain year from 1996 to 2006 and 0 otherwise. The home country bias is also called border effect. The estimation of equation (3) gives us the evolution of the home bias over the period 1995-2006.

In the following sections, we will define a new variable, integration= $e^{\beta n}$, and test it into the FDI determinants model to investigate the effect of economic integration on bilateral FDI between countries involved in economic integration. This measure captures the "de facto" reduction in trade barriers within countries, contrary to the "de jure" measures based on formal trade agreements.

How to measure internal distance of a particular country?

Wei (1996) demonstrated that the home bias shows a high sensibility to changes in internal distances. For this reason, there are some concerns to take care of when it comes to measuring internal distance within a country.

Head and Mayer (2002) made a survey of the literature on this issue, exposing the strengths and weaknesses of each measure.

There are three different ways to measure internal distances:

1- Measures based on direct distances between capitals of neighbor countries.
2- Area-based measures.
3- Measures based on actual data on the spatial distribution of economic activity within nations.

Type 1 measures have been seriously criticized in the literature and are considered as a first attempt at solving the "measuring problem". Nitsch (2000) exposed that these measures can suffer from possible geographical inconsistencies. The two more important shortcomings are that these measures implicitly assume that the cities are equally close to the border; and that the distance between the capitals of two neighboring countries is taken as an approximation for the average intra-national distance of both countries.

To correct these weaknesses, it is suggested that the average distance within a particular country be made a function of the size of the country. Although this procedure does not take into account different shapes, internal structures, or trading patterns, and therefore also has obvious shortcomings, it provides at least a measure that is consistent across countries. Another advantage is that they can be calculated with only a single, readily available datum, the region´s area.

Different measures have been proposed to account for internal distances according to the area-based assumption. In this paper we will use the one proposed by Head and Mayer (2002). It assumes that countries are circular, production is concentrated in a single point at the centre of the disk and that consumers are uniformly distributed across the disk. These assumptions lead to the following distance formula:

$$D_{ii} = 0.67\ (\text{area}/\pi)^{1/2} \qquad (4)$$

3 Data

Data used to implement the model proposed in this paper came mainly from the OECD´s Structural Analysis databases (STAN). Bilateral trade between different country pairs is available at the STAN database; however, countries´ imports to themselves require a previous transformation. This measure is the difference between total goods production and total exports to the rest of the world. Both measures are directly available from the STAN database. GDPs for the importer and exporter countries are available form the OECD as well.

Bilateral distances are provided by the Centre d´Etudes Prospectives et d´Informations Internationals (CEPII). CEPII provides different measures of bilateral distances available for most countries across the world. Distances between two different countries are measured using city-level data to assess the geographic distribution of population inside each nation.

The idea is to calculate distance between two countries based on bilateral distances between their biggest cities; those inter-city distances being weighted by the share of the city in the country's overall population. Intra-national distances are calculated using the area-based formula proposed by Head and Mayer (2002) and described in the last section. Language and adjacency dummies are also provided by the CEPII.

Data used in the last sections of this paper to analyze the FDI activity and the influence of integration came from different organizations. FDI data are available from the OECD, as well as GDP for both parent and host countries.

Skilled labor abundance is defined as the sum of occupational categories 1 (legislators, senior officials and managers) and 2 (professionals) in employment of each country divided by total employment. These figures are available from the LABORSTA database from the ILO organization.

4 Estimation

In this paper, we estimate the gravity equation (3) using panel data for 18 EU countries. Since the gravity model proposed above includes some variables that are time-invariant (distance, language and adjacency), that the theory imposes, we cannot apply the classical fixed effects OLS estimation. If doing so, the time invariant variables will be dropped off from the equation. One of the alternatives is to run the model using random effects but this will derive in inconsistent estimators. In cases with time-invariant variables and correlated with the unit effects, the Hausman-Taylor estimation procedure has been proposed by econometricians. The idea of is to overcome the bias of the random effects model in the presence of correlated unit effects by using the appropriate instruments for the endogenous variables. Unfortunately, this procedure can only work well if the instruments are uncorrelated with the errors and also when the unit effects are highly correlated with the endogenous regressors.

In this paper we have used a new econometric technique to overcome all these difficulties linked to panel data models with unit effects. This procedure was first proposed by Plümper and Troeger (2007), and consists in a three-stage method that allows the estimation of time-invariant and "rarely changing" variables in panel data models with unit effects (fixed effects). Authors called this estimator the "fixed effects vector decomposition".

Briefly, the estimator works as follows:

In the first stage, it estimates a standard fixed effects model with the sole intention of obtaining estimates of unit effects. In stage 2 it decomposes the estimated unit effect into two parts; explained and unexplained. It regresses the unit effects from stage 1 on the observed time-invariant to obtain the unexplained part. In stage 3 it re-runs the full model without the unit effects but including the unexplained part from stage 2. This stage is estimated by pooled OLS. By construction, the estimated unexplained part of the unit effects is no longer correlated with the vector of time-invariant variables.

We have bilateral exports data for 23 industries in 18 countries[1] of the European Union. The estimation method is not the classical OLS for panel data with fixed effects. Instead we have used what is called "fixed effects vector decomposition".

The basic results are reported in TABLE 1. As expected, the overall empirical fit of the gravity approach is excellent. Approximately 93 per cent of the variation of trade flows is explained by the model. Moreover, all of the estimated coefficients on the standard gravity variables have the expected sign and are statistically and economically significant. The GDP coefficients range from 0.3 to 0.6 for the exporter country and from 0.9 to 1.8 for the importer country. This means that when the GDP of the exporter country rises 1 per cent, the trade volume increases by about 0.6 per cent. This relationship is even deeper for the importer country, when it increases GDP by 1 per cent trade volumes are higher by about 0.9 to 1.8 per cent. In the same way, a 1 per cent increase in distance decreases trade by about 0.8 to 1.2 per cent.

In columns 2 and 3, language and adjacency dummies are included and found to be statistically significant. In column 3, the results of including remoteness variables are reported. The introduction of these variables changes the estimators of all gravity variables, and even initial home bias increases considerably. However, none of these change sign or significance.

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[1] Countries considered in the analysis are: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Holland, Poland, Portugal, Spain, Slovakia, Sweden and the United Kingdom.

TABLE 1: Home Country Bias.

Gravity model fixed effect vector decomposition (Plümper and Troeger, 2007)

$Ln(GDP_i)$	0.617	***	0.617	***	0.313	***
	(0.000)		(0.000)		(0.000)	
$Ln(GDP_j)$	1.836	***	1.836	***	0.903	***
	(0.000)		(0.000)		(0.000)	
$Ln\ (D_{ij})$	-1.292	***	-1.143	***	-0.807	***
	(0.001)		(0.001)		(0.001)	
Adjacency			0.321	***	0.934	***
			(0.002)		(0.000)	
Language			0.379	***	0.116	***
			(0.01)		(0.006)	
$Ln(Remote_i)$					1.874	***
					(0.000)	
$Ln(Remote_j)$					-2.772	***
					(0.000)	
$Home_{1996}$	-0.046		-0.046		-0.053	
	(0.341)		(0.431)		(0.364)	
$Home_{1997}$	-0.114	*	-0.114	*	-0.122	**
	(0.052)		(0.052)		(0.036)	
$Home_{1998}$	-0.193	***	-0.193	***	-0.199	***
	(0.001)		(0.001)		(0.001)	
$Home_{1999}$	-0.225	***	-0.225	***	-0.229	***
	(0.000)		(0.000)		(0.000)	
$Home_{2000}$	-0.293	***	-0.293	***	-0.304	***
	(0.001)		(0.001)		(0.000)	
$Home_{2001}$	-0.362	***	-0.362	***	-0.393	***
	(0.000)		(0.000)		(0.000)	
$Home_{2002}$	-0.419	***	-0.419	***	-0.465	***
	(0.001)		(0.001)		(0.000)	
$Home_{2003}$	-0.513	***	-0.513	***	-0.555	***
	(0.001)		(0.001)		(0.001)	
$Home_{2004}$	-0.594	***	-0.594	***	-0.643	***
	(0.001)		(0.001)		(0.001)	
$Home_{2005}$	-0.639	***	-0.639	***	-0.696	***
	(0.000)		(0.000)		(0.001)	
$Home_{2006}$	-0.716	***	-0.716	***	-0.778	***
	(0.000)		(0.000)		(0.000)	
# Observations	85845		85845		85845	
Adjusted R^2	0.937		0.937		0.9372	
Sargan-Hansen Overidentification Test for R. E.	332.8	***	340.1	***	414.6	***

NOTES: P-values are in parenthesis; *, **, *** denotes significance at 1, 5 and 10 per cent levels.
Distance (D_{ii}) is defined as 0.67 x sqrt (area/π).

Turning to home bias, estimators for the home variables captures the evolution of the border effects over time. More precisely, coefficients show the changes in the home bias compared to the first year of the analysis, in this case 1995. As shown in Table 1, $home_{1996}$ – $home_{2006}$ variables appear with a negative sign (and significant at a 99% level except for home 2), which means that the home bias, reduces over time. In other words, there is a process of integration behind the data. The interpretation of the coefficient in column 1 for home in 1996 (β_4=-0.046) means that the home bias for that year was ($e^{\beta 4}$= 0.955) times the home bias in 1995. Another example, if we focus on 1997 (β_5=-0.114), the home bias was ($e^{\beta 5}$= 0.892) times the home bias in 1995. Therefore $e^{\beta n}$ reflects the changes of the national border effect on trade from 1995.

Tables 2a and 2b show the coefficients of our home variables in Column 1 and their exponentials in Column 2. In TABLE 2a we show the coefficients of home variables obtained from the gravity model (Column 2 of TABLE 1 - remoteness not included) and in TABLE 2b the coefficients correspond to those obtained from the model in Column 3 of TABLE 1. If we normalize the border effect in 1995 to 1, $e^{\beta n}$ (n=4, 6, 7, …, 14) can be taken as border effects of the following years. By the final year of our sample, in 2006, the difference between intra-national trade and international trade caused by national borders is only 50% as it used to be in 1995 according to Table 2a and 45% according to Table 2b.

TABLE 2a: Border effects calculated from the gravity model (Remoteness not included)

year	βn	eβn	Changes compared to last year	Rate of growth	Changes compared to 1995
1995	0	1			
1996	0	1	0%	0%	0%
1997	-0.114	0.892257956	-10.77%	-10.85%	-10.77%
1998	-0.193	0.824481974	-6.78%	-7.61%	-17.55%
1999	-0.225	0.798516219	-2.60%	-3.18%	-20.15%
2000	-0.293	0.746022141	-5.25%	-6.57%	-25.40%
2001	-0.362	0.696282368	-4.97%	-6.67%	-30.37%
2002	-0.419	0.657704195	-3.86%	-5.57%	-34.23%
2003	-0.513	0.598696792	-5.90%	-8.90%	-40.13%
2004	-0.594	0.552114404	-4.66%	-7.77%	-44.79%
2005	-0.639	0.52781998	-2.43%	-4.47%	-47.22%
2006	-0.716	0.488703164	-3.91%	-7.40%	-51.13%

TABLE 2b: Border effects calculated from the gravity model (Remoteness included)					
year	βn	eβn	Changes compared to last year	Rate of growth	Changes compared to 1995
1995	0	1			
1996	0	1	0%	0%	0%
1997	-0.122	0.885148369	-11.49%	-11.49%	-11.49%
1998	-0.199	0.819549893	-6.56%	-7.41%	-18.05%
1999	-0.229	0.795328534	-2.42%	-2.96%	-20.47%
2000	-0.304	0.737860866	-5.75%	-7.23%	-26.21%
2001	-0.393	0.675028748	-6.28%	-8.52%	-32.50%
2002	-0.465	0.628135105	-4.69%	-6.95%	-37.19%
2003	-0.555	0.574072261	-5.41%	-8.61%	-42.59%
2004	-0.643	0.525712917	-4.84%	-8.42%	-47.43%
2005	-0.696	0.498575623	-2.71%	-5.16%	-50.14%
2006	-0.778	0.459323741	-3.93%	-7.87%	-54.07%

5 Estimation FDI nested general equilibrium with economic integration

In this section, we perform an analysis of FDI across the 18 countries considered. In this analysis we test which kind of FDI is more plausible with the data, and whether economic integration plays a role in FDI.

We base our analysis on Markusen and Maskus (1998, 2002). As stated in theory, FDI can either be horizontal or vertical. In Vertical models (VER), firms geographically separate activities by stages of production driven by differences in factor endowments between countries. Horizontal models (HOR) are described by multi-plant firms that replicate the same activities in many countries, driven by economies of scale. These authors proposed a new model, a hybrid model they called the “Knowledge-capital model” (KK) and estimate the three specifications to see which of them fits better with the data[2].

We add our integration variable to their model and get the following specification:

$$FDI_{ijt} = \alpha + \beta_1 \text{ Integration}_t + \beta_2 \, \Sigma GDP_{ijt} + \beta_3 \, (\Delta GDP)^2_{ijt} + \beta_4 \text{ INT1} + \beta_5 \text{ INT2} + \beta_6 \text{ INT3} + \\ + \beta_7 \text{ Distance}_{ij} + \beta_8 R_i + \beta_9 R_j + \beta_{10} \text{ INVCJ}_t + \beta_{11} \text{ TCI}_t + \beta_{12} \text{ TCJ}_t + \varepsilon_{ijt} \qquad (5)$$

[2] For an extensive explanation see Markusen and Maskus (2002)

Where FDI is the real bilateral FDI in the year t, ΣGDP is the sum of the parent and host countries´ GDPs, $(\Delta GDP)^2$ is the square of the difference between the GDP of the parent country and the GDP of the host country, INT1, INT 2 and INT3 are interaction terms between skilled labor and GDP, they are defined by Markusen and Maskus (2002) as:

$$\begin{aligned}
&INT1 = \Delta SK * \Delta GDP, && \text{if } \Delta SK>0, && =0 \text{ otherwise} \\
&INT2 = \Delta SK * \Sigma GDP, && \text{if } \Delta SK>0, && =0 \text{ otherwise} \qquad (6) \\
&INT3 = -\Delta SK * \Sigma GDP, && \text{if } \Delta SK<0, && =0 \text{ otherwise}
\end{aligned}$$

Where ΔSK is the difference between skilled labor in parent and host countries, INT1 is the interaction term between the skilled labor abundant difference and the GDPs, INT2 is the interaction term between the skilled labor abundant difference of the two countries and the sum of GDPs, INT1 and INT2 are nonzero if the parent country is skilled labor abundant, O otherwise. INT3 is the negative of the interaction term between the skilled labor abundance difference of the two countries and the sum of GDPs. INT3 is nonzero if the host country is labor abundant, 0 otherwise.

INVCJ is the investment cost of the host country, we have proxied this variable by the inverse of Corruption Perception Index from the Heritage Foundation. TCJ and TCI are trade costs of the host country and parent country respectively, and are proxied by the inverse of the index of economic freedom for trade from the Heritage Foundation as well. Distance is the bilateral distance between the two countries. R_i and R_j stand for remoteness and denote the geographic position of countries i and j relative to all other countries.

The sum of GDPs proxy for the economic size of the market. It has a positive expected sign in the KK and HOR models, because a larger market size strengthens the economies of scale and intensifies the motivation for horizontal FDI. However, the sign of this variable should be zero in a vertical FDI model since vertical FDI is driven by factor endowments differences between countries rather than by economies of scale. The expected sign of $(\Delta GDP)^2$ is negative in the KK and HOR models and it is also zero in the vertical FDI model with no economies of scale motivation. A small and skilled labor abundant parent country tends to invest abroad in the knowledge-capital model and vertical FDI model, so INT1 has a negative expected sign in both.

INT1 has a zero expected sign in the horizontal model because factor endowments do not playa role in it. The explanation of INT2 is slightly more complex and depends on the simulation results of Markusen and Maskus (2002), so we just point out its expected sign here. The expected sign of INT2 in the KK model and the HOR model is negative while it is positive in the vertical model. All three theoretical models predict that, when the parent country becomes unskilled labor abundant, the outward investment will fall, so the expected sign of INT3 is negative in all models. INVCJ should also have a negative sign in all three models since investment costs are definitively FDI resisting.

As stated above, trade costs in our model are constructed using the inverse of the index of economic freedom from the Heritage Foundation. This index proxies the trade costs of host and parent countries to the rest of the world. Those variables affect FDI outside the trade blocs and may affect intra-regional FDI indirectly through the competition from outside investors. However, regional economic integration arrangements should have made the countries involved in the integration process different from the other countries. That is why we introduce the integration variable in the model. The expected sign of integration is positive when economic integration resists FDI flows. It is negative when economic integration is FDI-promoting. The expected signs of trade costs variables (TCI and TCJ) can either be positive or negative, depending on the nature of the outside investments and the relationship between the investors inside and outside the trade blocs.

Finally, a longer distance, as well as a more remote country, enhances the motivation of investment abroad rather than exports whilst simultaneously increasing the cost of operating overseas at the same time, so the expected sign of distance is ambiguous.

Results obtained by Markusen and Maskus (2002) show that US foreign direct investment activity is driven either by a horizontal model or by the knowledge-capital model. They stated that it is impossible to distinguish between the two in their sample.

We present the estimation results in Table 3. In all cases, the independent variable is real FDI flows in country j coming from country i. We have performed a weighted least square regression to correct the possible heteroscedasticy due to differences in country sizes.

TABLE 3: FDI and European Economic Integration.

	KK			HOR			VER		
	Group mean WLS estimate [t-estat]		sign as predicted? (p-value)	Group mean WLS estimate [t-estat]		sign as predicted? (p-value)	Group mean WLS estimate [t-estat]		sign as predicted? (p-value)
Integration	15.28		?	15.333		?	16.85	**	?
	[0.52]		(0.601)	[0.52]		(0.601)	[2.22]		(0.027)
Ln (ΣGDP)	0.753	***	YES	0.758	***	YES			
	[3.74]		(0.000)	[3.78]		(0.000)			
$Ln[(\Delta GDP)^2]$	-0.026	***	YES	-0.028	***	YES			
	[-4.23]		(0.000)	[-4.49]		(0.000)			
INT1	-0.892		YES				-0.838		YES
	[-0.46]		(0.648)				[-0.42]		(0.675)
INT2	-6.485	***	YES	-6.214	***	YES	9.313	***	YES
	[-3.47]		(0.001)	[-3.51]		(0.001)	[5.17]		(0.000)
INT3	-1.928		YES	-1.811		YES	-5.246	***	YES
	[-1.03]		(0.302)	[-0.98]		(0.327)	[-3.00]		(0.003)
$Ln(D_{ij})$	-1.184	***	?	-1.185	***	?	-1.126	***	?
	[-7.07]		(0.000)	[-7.09]		(0.000)	[-6.56]		(0.000)
$Ln(Remote_i)$	-0.712	***	?	-0.697	***	?	-1.065	***	?
	[-2.62]		(0.009)	[-2.59]		(0.010)	[-4.00]		(0.000)
$Ln(Remote_j)$	-1.001	***	?	-1.029	***	?	-1.313	***	?
	[-3.65]		(0.000)	[-3.85]		(0.000)	[-4.81]		(0.000)
INVCJ	-0.713	***	YES	-0.699	***	YES	-0.645	**	YES
	[-3.19]		(0.002)	[-3.16]		(0.002)	[-2.81]		(0.005)
TCI	-22.838	***	YES	-22.841	***	YES	-23.328	***	YES
	[-9.15]		(0.000)	[-9.17]		(0.000)	[-9.12]		(0.000)
TCJ	1.665		YES	1.496		YES	0.776		YES
	[0.88]		(0.377)	[0.81]		(0.418)	[0.40]		(0.687)
# Observations	2168			2168			2168		
Adjusted R^2	0.6800			0.679			0.369		

NOTES: Dependent variable is the logarithm of real FDI flows from country i to country j.
T-statistics are in square brackets. P-values are in parenthesis; *, **, ***, denotes significance at 1, 5 and 10 per cent levels.

The first column contains the results for the "knowledge-capital model". This model explains 68% of the variation in weighted FDI. All of the coefficients are highly significant, with the expected signs, except those of INT3 and TCJ, which are not significant.

Comparing these results with the ones in Column 2 (HOR model) we observe that making the coefficient of INT1 zero does not reduce the adjusted R^2, and the remaining coefficients are close to those in the KK model.

The VER model has the right signs on all coefficients, but it has a much lower explanatory power than the KK and HOR models. Thus, the VER model seems to fail to fit with the data.

Turning to the integration variable, the coefficients are always positive. The positive sign implies that integration is FDI resisting. The variable integration is constructed in such a way that lower values mean that border effect is reducing, and therefore economic integration is taking place. Negative sign would means that integration is FDI promoting. However, it is not significant in the horizontal and knowledge-capital models. Consequently, European economic integration does not significantly affect bilateral FDI within those countries.

Our results suggest that FDI flows follow a horizontal or “knowledge-capital” pattern, driven by economies of scale and replication of production rather than by factor endowments differences as predicted by a vertical FDI model. Markusen and Maskus (2002) reached similar conclusions for the US FDI activity. Either the horizontal model or the “knowledge-capital” model seem more accurate in order to explain the world multinational activity.

6 Concluding remarks

In this paper we tried to fill a gap in the literature by analyzing the evolution of the home bias between European countries and its influence on the FDI flows. The idea is to test if there is a process of economic integration between the EU countries and whether the reduction in trade barriers over time has an effect on FDI flows within the area as has been suggested from a theoretical point of view.

In the case of estimating the home bias in the EU, we have developed a measure of European economic integration from a panel sectoral gravity model with year-specific border effects. We have defined the measure variable to be the changes in the border effects over time. The data analyzed in this paper suggest that border effects have declined over time from 1995 to 2006. At the end of the period considered, difference between intra-national trade and international trade caused by national borders is only about 50 to 45 per cent as it used to be in 1995.

The border effect estimation allows us to construct a new variable we have called integration, consisting in the changes in border effects over time. This new variable is included in the study of the effect of European economic integration on bilateral FDI flows. We have based our analysis upon the theoretical specification proposed on Markusen and Maskus (2002). Our results suggest that The FDI flows within the countries analyzed are mainly horizontal or "knowledge-capital" driven. The FDI pattern responds to economies of scale rather than to factor endowment differences. According to our analysis we cannot appreciate that European economic integration has a significant net effect on the bilateral FDI between EU countries.

Reduction in trade barriers caused by European economic integration might have promoted bilateral FDI through reducing the distribution costs of products within the European Union. However, the reduction in the trade barriers of the host countries also stimulated the horizontal multinational enterprises to substitute international trade for FDI. These two opposite effects offset each other and make the bilateral FDI flows independent of the European economic integration process.

7 References

Anderson, James E. (1979). "A theoretical foundation for the gravity equation". American Economic Review, Vol. 69, No. 1, pp. 106-107

Anderson, James E., and Van Wincoop, Eric. (2003). "Gravity with gravitas: a solution to the border puzzle". American Economic Review, Vol. 93, No. 1, pp. 170-192

Bergstrand, Jeffrey H. (1985). "The gravity equation in international trade: some microeconomic foundations and empirical evidence". Review of Economics and Statistics, Vol. 67, No. 1, pp. 474-481

Brenton, Paul., Di Mauro, Francesca., and Lücke, Matthias. (1999). "Economic integration and FDI: an empirical analysis of foreign investment in the EU and in Central and Eastern Europe". Empirica, Vol. 26, No. 2, pp- 95-121

Carr, David L., Markusen, James R., and Maskus, Keith E. (2001). "Estimating the Knowledge-Capital Model of the Multinational Enterprise". The American Economic Review, Vol. 91, No. 3, pp. 693-708

Chen, Natalie. (2004). "Intra-national versus international trade in the European Union: why do national borders matter". Journal of International Economics, Vol. 63, No. 1, pp. 93-118

Deardorff, Alan V. (1995). "Determinants of bilateral trade: does gravity work in a neoclassical world?". NBER Working Paper 5377

Dunning, John, H. (1997). "The European internal market programme and inbound foreign direct investment". Journal of Common Market Studies, Vol. 35, No. 1, pp. 1-30

Feenstra, Robert C. (2002). “Border effects and the gravity equation: consistent method for estimation”. Scottish Journal of Political Economy, Vol. 49, No. 5, pp. 491-506

Frankel, Jeffrey., Stein, Ernesto., and Wei, Shang-Jin. (1995). “Trade blocs and the Americas: the natural, the unnatural and the super-natural”. Journal of Development Economics, Vol. 47, No. 1, pp. 61-95

Head, Keith., and Mayer, Thierry. (2002). “Illusory Border effects: distance mismeasurement inflates estimates of home bias in trade”. Centre dÉtudes Prospectives et d´Informations Internationals (CEPII) Working Paper No. 2002-01

Helliwell, John F. (1996). “Do national borders matter for Québec’s trade?” Canadian Journal of Economics, Vol. 29, No. 3, pp. 507-522

Helliwell, John F. (1998). “How much do national borders matter?” Washington, DC. Brookings Institution.

Hillberry, Russel H. (2002). “Aggregation bias, compositional change, and the border effect”. Canadian Journal of Economics, Vol. 35, No. 3, pp. 517-530

Markusen, James, R. (1997). “Trade versus investment liberalization”. NBER Working Paper No. 6231

Markusen, James R., and Venables, Anthony J. (1998). “Multinational firms and the new trade theory”. Journal of International Economics, Vol. 46, No. 2, pp. 183-203

Markusen, James R., and Maskus, Keith E. (2002). ”Discriminating among alternative theories of multinational enterprises”. Review of International Economics, Vol. 10, No. 4, pp. 694-707

McCallum, John. (1995). “National borders matter: Canada-US regional trade patterns”. American Economic Review, Vol. 37, No. 3, pp. 615-623

Motta, Massimo, and Norman, George. (1996). ”Does economic integration cause foreign direct investment?”. International Economic Review, Vol. 37, No. 4, pp. 757-783

Neary, Peter. (2002). “Foreign direct investment and the single market”. The Manchester School, Vol. 70, No. 3, pp. 291-314

Nitsch, Volker. (2000). “National borders and international trade: evidence from the European Union”. Canadian Journal of Economics, Vol. 33, No. 4, pp. 1091-1105

Obstfeld, Maurice., and Rogoff, Kenneth. (2000). “The Six Major Puzzles in International Macroeconomics: Is There a Common Cause?”. NBER Macroeconomics Annual, Vol. 15, pp. 339-390

Plümper, Thomas., and Troeger, Vera E. (2007) "Efficient estimation of time-invariant and rarely changing variables in finite samples panel analyses with unit fixed effects". Political Analysis, Vol. 15, No. 2, pp. 124-139

Wei, Shang-Jin. (1996). "Intra-national versus international trade: how stubborn are nations in global integration". NBER Working Paper 5531