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Comparison between FDI motivations in goods and services

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Abstract

Foreign direct investment (FDI) in goods and in services has grown substantially in the last decades, even if the importance of FDI in services has occured later. Not accounting for third-country effect misleads the determinants of FDI activity. This paper investigates the difference between FDI determinants for goods and services considering dependence in space. Using sales of US affiliates between 1983 and 2007, I find evidence of spatial interdependence in both activities, goods and services. Multinational enterprises motivations vary across regions more than across activities.

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1.Introduction

Proximity to foreign market seems to be more important for trade in services than for trade in goods. In 2008, according to the Bureau of Economic Analysis (BEA), local transactions provided by foreign affiliates of US multinational enterprises (MNEs) represent 71% for services and 55% for goods.

FDI motivations are various. Horizontal motive (Markusen, 1984) refers to the replication of home country activity abroad to sell locally, while vertical motivation (Helpman, 1984) is associated with the fragmentation of production process, locating some activity abroad to lower costs. The idea of combining horizontal and vertical motives for foreign direct investment (FDI) arises initially with the "knowledge-capital" model introduced by Markusen (2002) and tested by Carr *et al.* (2001). However, the two-country setup limits third-country concerns. As long as FDI decisions are multilateral, two other motives arise: export-platform FDI and complex-vertical FDI. The former consists in reducing trade costs by locating a plant in a given country of a region and serving the whole region through exports (Ekholm *et al.* 2007). Thus, the bigger neighboring markets are, the bigger benefits from having an export-platform in the host country will be. Complex-FDI is neither a pure horizontal FDI nor a pure vertical FDI (see Bergstrand and Egger, 2007; Baltagi *et al.* 2007). It occurs when a firm splits the production activities into several plants located in different host countries. Empirically, the presence of spatial interdependence or the third-country effect can be taken into consideration using spatial weighting-matrices as in Coughlin and Segev (2000) and Blonigen *et al.* (2007).[1] Evidence of export platform FDI for OECD countries and Europe with a role of third-country has been highlighted by Blonigen *et al.* (2007), Baltagi *et al.* (2007), Ekholm *et al.* (2007) and Garretsen and Peeters (2009). These previous studies consider only FDI in goods and a time horizon of 15 years. Davies and Guillin (2011) examine the determinants of FDI activity in services using a time horizon of 25 years, spatial techniques and alternative distance measures. They find that FDI motivations vary substantially across regions.

The spatial interdependence issue has been investigated for FDI in goods or in case of FDI in services, not both in the same analysis. This study intends to make a comparison of FDI activity in goods and services relying on a longer time horizon and accounting for the third-country effect. There is no reason that FDI in different activities (i.e. goods and services) should follow the same pattern. Services have specific features and follow a different logic compared with goods (Hill, 1977). Indeed, most of services require face-to-face interaction between supplier and consumer. Therefore, all FDI motivations do not necessarily apply to multinational enterprises decisions for services.

This paper is related to Blonigen *et al.* (2007), Garretsen and Peeters (2009) and Davies and Guillin (2010) as the empirical specification is based on their empirical works. All use a gravity framework accounting for spatial interdependence. Similarly, Baltagi *et al.* (2007) examine the determinants of US outward FDI stock and sales of US affiliates by country and industry including spatially weighted exogenous variables in addition to standard controls. Blonigen *et al.* (2007), Baltagi *et al.* (2007) and Davies and Guillin (2010) utilize US

[1]See in particular Head and Mayer (2004); Head *et al.* (2005); Amiti and Javorcik (2008) for other methods.

data while Garretsen and Peeters (2009) focus their attention on the Dutch case. Although Ekholm et al. (2007) do not apply spatial techniques, in considering the share of third-country exports as the dependent variable; they highlight the presence of export-platform FDI for Europe and NAFTA. The main findings are in line with the results in the literature. I show that third-country effects exist for FDI activity in goods and services as well and in all regions. Nevertheless, developing countries tend to attract vertical FDI while more developed countries receive horizontal FDI in both activities.

The paper is structured as follows. In the next section, I describe the empirical strategy and the data. Section 2 presents the results and Section 3 concludes.

2. Gravity model framework

2.1. Augmented gravity equation

The determinants of outbound FDI are commonly analyzed empirically using a gravity framework. Kleinert and Toubal (2010) derive a gravity equation to predict the sales of foreign affiliates. In empirical analyses of FDI activity, the gravity equation is augmented by some explanatory variables to account for different FDI motivations (see Eaton and Tamura (1994); Brainard (1997); Blonigen and Davies (2004); Egger and Pfaffermayr (2004); Braconier *et al.* (2005); Blonigen *et al.* (2007)).

As FDI activity in a given country depends on FDI activity in nearby places, spatial autoregressive models permit us to take into consideration the interdependence in space between dependent variables. Two key variables are introduced here to account for the third-country effect: the spatial lag and the surrounding market potential. The sum of inverse-distance-weighted FDI and similarly the sum of inverse-distance-weighted GDPs are required to create the spatial-weighting matrices which parameterize the distance between a given country and other countries of the sample. Following Blonigen *et al.* (2007), I do not include the GDP of the host country in the calculation of the surrounding market potential in order to distinguish the effect of the neighboring markets from the effect of the host market. In Head and Mayer (2004), the traditional market potential corresponds to the market potential of a given country without distinguishing between nearby and host markets. In the case of horizontal FDI, only the host GDP will impact positively on the amount of sales, while the surrounding market potential should not have any effect. On the contrary, in the case of export-platform FDI, the surrounding market potential should have a larger impact than the host GDP on the sales of affiliates. I estimate the following equation, where all the variables are in logs.

$$\begin{aligned} FDI_{it} &= \beta_0 + \beta_1 HostVariables_{it} + \beta_2 SurroundingMarketPotential_{it} + \\ &\quad \lambda\ SpatialLag_{it} + \varepsilon_{it} \end{aligned} \tag{1}$$

Because the country of origin is always the USA in the sample considered, the dependent variable is the sales of goods or the sales of services of affiliates from US firms in country i at time t. The control variables for the host country are the standard variables used in gravity

model, that is to say, population, real GDP, trade costs, investment costs and a skilled-labor proxy.

The spatial lag corresponds to the vector of FDI, multiplied by the spatial-weighting matrix W. Similarly, the surrounding market potential corresponds to the vector of GDP, multiplied by the spatial-weighting matrix W.

The form of inverse-distance matrices, W, is: $W \equiv \begin{pmatrix} W_{1983} & 0 & 0 \\ 0 & \ddots & 0 \\ 0 & 0 & W_{2007} \end{pmatrix}$

with $W_t \equiv \begin{pmatrix} 0 & w_{i,j}^t & w_{i,k}^t \\ w_{j,i}^t & 0 & w_{j,k}^t \\ w_{k,i}^t & w_{k,,j}^t & 0 \end{pmatrix}$ and $t = [1983; 2007]$.

Note that: $\begin{cases} w_{i,j} = d_{ij} = \frac{\alpha}{dist_{i,j}} \; if \; i \neq j \\ w_{i,i} = 0 \; otherwise \end{cases}$

where α is the minimum distance between two countries considering all the sample.[2] As is common in practice, the inverse-distance spatial-weighting matrix is normalized for the spatial lag to limit dependence. All places affect each other, as no country has a zero effect, but the weight declines with distance. Besides, the spatial lag is not exogenous, insofar as the vector of the dependent variable appears in the right-hand side as well. According to Blonigen *et al.* (2007) and Arraiz *et al.* (2008), OLS estimates give inconsistent results, while methods using instrumental variables lead to better estimations.[3] In ignoring endogenous interaction between dependent variable and explanatory variable (i .e spatial lag), results using OLS estimator are biased and inconsistent due to omitted variable bias (see Greene, 2005). An alternative approach to tackle this endogeneity issue consists of the instrumental variables generalized moments approach using linear combinations of third-country exogenous variables as instruments proposed by Kelejian and Prucha (1998).[4]

In Table 1, the expected signs of MNE motivations for the spatial lag and the surrounding-market potential are summarized. Horizontal FDI consists in investing abroad to avoid trade cost when the advantage from economies of scale is lower (referring to the so-called "proximity-concentration trade-off"). The nearby market sizes, as well as the amount of FDI in the neighboring places, do not have any impact on FDI activity. Pure horizontal FDI occurs particularly when both markets are large with a similar size; when trade costs are important between both countries/markets and when firm-level fixed costs are bigger than plant fixed costs. Vice versa in the case of vertical FDI (Markusen, 2002). Indeed, the vertical motivation refers to the fragmentation of the production process, locating activities abroad to lower costs of production. Consequently, there is no motivation of market access here, so the surrounding-market potential coefficient should not be significant**.** On the contrary, the location of FDI in a given host country will be at the expense of all other

[2]For the geographic distance, α is equals to 173.033, the distance between capital cities of Belgium and the Netherlands.

[3]See Anselin (1988), pp.58 for more details.

[4]For more details on alternative approaches see Anselin (1990), Land and Deane (1992), Kelejian and Robinson (1993) and Lesage (2004).

potential host countries. The spatial lag impacts negatively on the amount of FDI received by the host country in the case of pure vertical FDI. When a firm locates an export-platform in a given host country, the sign of surrounding market potential is positive and negative for the spatial lag. This negative sign reflects lower FDI activity in that region, as the export-platform replaces plants in all other potential destination markets of this region. Complex-FDI occurs when a firm splits the production activities into several plants located in different host countries. Hence, some agglomeration forces can set in, favouring FDI activity in nearby places of the host country. Again, there is no market access concern in complex-FDI motivation, so the effect of the surrounding-market potential variable is null, while the effect of the spatial lag is positive.

2.2. Data

The BEA provides annual data on US direct investment abroad. Sales of goods and services of US majority-owned foreign affiliates are available from 1983 to 2007 for 57 countries (displayed in Table 2).[5] Note that sales of services include information, finance and communication transactions in particular. Some descriptive statistics of the data used in the estimations are found in Table 3. The chain-type price index for gross domestic investment, from the Economic Report of the President, permits us to convert these data into real sales. Data of population, real GDP and openness (obtained by the sum of exports and imports over GDP) are from the Penn World Tables.[6] The inverse of openness is considered like a proxy of trade costs. A linear interpolation of the Economic Freedom Index, developed by the Fraser Institute is used for the host investment costs, as the index is available every 5 years between 1970 and 2000, and then annually. It is a combination of government size, legal structure, freedom to trade internationally and regulations of credit, labor and business. Similarly, the Barro-Lee's table on educational attainment is available every 5 years between 1950-2010. A linear interpolation of the average years of total schooling for the age group over 25 is used for the host skill measure.

Concerning trade costs proxy, Blonigen *et al.* (2007) and Garretsen and Peeters (2009) use also the inverse of openness, calculated by the sum of exports and imports divided by GDP. Because this measure represents the total trade as a percentage of GDP and has the advantage to be available for the whole sample, I opt for this trade costs proxy. Besides, Ekholm *et al.* (2007) utilize data from the Global Competitiveness Report provided by the World Economic Forum to obtain trade barriers and investment barriers indexes of the host country. In the literature, it is generally admitted that an investment cost variable is necessary in the specification. Nevertheless, there is no consensus on this proxy. Indeed, Baltagi *et al.* (2007) focus on the stability of political and investment climate (through an indicator developed by the International Country Risk Guide), while Garretsen and Peeters (2009) include a composite index that assesses the quality of government (provided by the Quality of Government Institute) and Blonigen *et al.*'s (2007) measure of investment cost is based

[5] See http://www.bea.gov/international/index.htm.

[6] Penn World Tables 6.3 cover the period 1950-2007.

on a composite index from Business Environment Risk Intelligence S.A which encompasses operations and political risk indexes among other categories.

Distance is used in the calculation of surrounding market potential and spatial lag. I use the geographic distance between capital cities in kilometers, provided by Cepii.[7]

3. Results

Blonigen and Davies (2004), Blonigen and Wang (2005) and Blonigen *et al.* (2007) highlight that the determinants of FDI are sensitive to the sample considered. Consequently, sub-sample examinations are more accurate. I split the sample into two different regions: OECD countries and non-OECD countries; and also into two different time periods: 1983-2007 and 2000-2007. The sub-samples OECD/non-OECD permit us to differentiate on the level of economic development, while the sample 2000-2007 allows to analyze the FDI motivations over time. All the specifications use IV estimates, and include country dummies.

In Table 4, columns (1) and (5), the whole sample is considered and sales of US foreign affiliates are analyzed not accounting for the third-country effect. Indeed, in including the traditional market potential which sums the host GDP and the surrounding market potential described below, only one coefficient is allowed. Both traditional market potential and spatial lag variables are positive and significant for goods. The vertical FDI motivation seems to dominate. However, for services, the spatial lag is negative indicating export-platform motive. Concerning the other explanatory variables, the same pattern is observed for goods and services. Countries with large population are less inclined to receive FDI. If the GDP is constant, an increase of population leads to a lesser wealth in this country, and so to lesser investment. Nevertheless, the population coefficient can turn positive as long as FDI goes from developed countries to developed countries, moving away from the North-South dynamic. As observed in OECD sample for sales of goods and for sales of services. High trade costs, high cost of labor through skill variable and high costs of investment impact negatively on the sales of US affiliates of goods and services. The analysis by sub-samples shows that FDI motivations differ substantially across regions. Indeed, traditional market potential is positive and significant for OECD countries but has no impact for non-OECD countries reinforcing the vertical motivation.

Considering the sub-sample 2000-2007, traditional market potential is still positive and significant. However, the spatial lag is no longer significant for goods, while the sign of these variables indicate export-platform FDI for services. As a result, in reducing the time horizon, the main finding is the loss of significance as in Blonigen et al. (2007).

In Table 5, the surrounding market potential and the spatial lag permit us to account for the third-country effect. The surrounding market potential is negative and significant for goods and services for the whole sample while host GDP is positive and significant. This means that a spatial interdependence exists for goods and services as well which cannot be captured using traditional market potential measure.

FDI determinants differ more across regions than across activities. For goods, the coefficient of the skill variable reflects the cost of labor in all regions. In OECD countries, high

[7] http://www.cepii.fr/francgraph/bdd/distances.htm.

cost of labor effect tends to dominate the skill-labor effect. However, in column (6), the skill variable is positive and significant. In recent times, US affiliates are inclined to locate services abroad to benefit particularly from skilled workforce at a lower cost, and concentrate skilled-labor intensive activity in one country. This confirms the importance of the difference in factor endowments highlighted in the literature (Markusen, 2002).

For non-OECD countries, FDI activity follows a common pattern for goods and services, that is to say the vertical motivation. US firms locate affiliates in non-OECD countries in order to produce more cheaply. A positive spatial lag in columns (4) and (8) underlines the complex-vertical FDI motive. This is confirmed by a negative impact of investment costs particularly for this sample. For OECD countries, sales of goods and services do not decrease significantly when investment costs increase. It can be explained by the fact that commercial presence in host countries may be mandatory to be competitive. Although column (3) indicates the presence of export-platform FDI for goods in OECD countries, the sales of services tend to follow pure horizontal motivations. Indeed, neither surrounding market potential nor spatial lag is significant in column (7). Proximity requirement between provider and consumer is probably even more important for services than for goods.

4. **Concluding remarks**

As a conclusion, both FDI in goods and FDI in services are multilateral decisions. Therefore, including only traditional market potential misleads the determinants of FDI activity.

I estimate an augmented gravity equation with the sales of goods and services of US affiliates between 1983 and 2007 as dependent variables to analyze outbound FDI. Including the set of explanatory variables commonly used in FDI analyses, I show that the impacts of different determinants are relatively close across activities but some differ across regions. In taking into consideration the spatial interdependence, I find that non-OECD countries experience vertical FDI motive in both activities. FDI motive tends to be more horizontal for OECD countries. Indeed, FDI motivations are purely horizontal for services, while some evidence of export-platform are found for goods.

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Table 1: Expected signs of the spatial lag and of the surrounding market potential

FDI motivation	Sign of spatial lag	Sign of surrounding-market potential variable
Pure horizontal	0	0
Export-platform	-	+
Pure vertical	-	0
Vertical specialization	+	0

Source: Blonigen et al. (2007)

Table 2: Sample

All countries			
Argentina	Egypt	Japan*	South Africa
Australia*	Finland*	Luxembourg*	South Korea*
Austria*	France*	Malaysia	Spain*
Barbados	Germany*	Mexico*	Sweden*
Belgium*	Greece*	Netherlands*	Switzerland*
Brazil	Guatemala	New Zealand*	Taiwan
Canada*	Honduras	Nigeria	Thailand
Chile*	Hong Kong	Norway*	Trinidad-and-Tobago
China	Hungary*	Panama	Turkey*
Colombia	India	Peru	United Arab Emirates
Costa Rica	Indonesia	Philippines	United Kingdom*
Czech Republic*	Ireland*	Poland*	Venezuela
Denmark*	Israel*	Portugal*	
Dominican Republic	Italy*	Russia	
Ecuador	Jamaica	Singapore	

*:countries included in OECD sample.

Table 3: Summary Statistics

	Mean	Standard deviation	Min	Max
Sales of goods	29531	51495	231	376823
Sales of services	5003	12812	7	140190
Host population (thousands)	70770	195471	261	1321852
Host real GDP (billions)	492	881	4	11942
Host skill	7.927	2.412	1.771	13.086
Host Investment Cost	41.549	31.614	1	138
Host trade cost	0.195	0.013	0.002	0.097
Surrounding Market Potential (billions)	1237	984	148	5788

Table 4: Outbound FDI in goods and services analysis

	Goods				Services			
	All countries		All years		All countries		All years	
	1983-2007	2000-2007	OECD	non-OECD	1983-2007	2000-2007	OECD	non-OECD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Host Population	0.510^{b}	-1.908^{a}	2.510^{a}	-0.399	-0.279	-0.447	1.379^{a}	-0.880^{b}
	(0.232)	(0.565)	(0.231)	(0.270)	(0.265)	(0.747)	(0.411)	(0.347)
Host Trade Cost	-0.784^{a}	-0.167^{c}	-0.874^{a}	-0.546^{a}	-1.144^{a}	-0.881^{a}	-0.613^{a}	-1.003^{a}
	(0.080)	(0.094)	(0.099)	(0.105)	(0.101)	(0.171)	(0.145)	(0.136)
Host Skill	-1.105^{a}	-0.002	-0.352^{c}	-0.929^{a}	-0.533^{a}	0.888	-0.190	0.050
	(0.136)	(0.289)	(0.180)	(0.194)	(0.201)	(0.617)	(0.238)	(0.362)
Host Investment Costs	-0.070^{a}	-0.084^{a}	0.001	-0.088^{a}	-0.106^{b}	-0.134^{c}	-0.038	-0.049
	(0.027)	(0.031)	(0.102)	(0.032)	(0.047)	(0.070)	(0.074)	(0.050)
Traditional Market Potential	0.404^{b}	1.602^{a}	0.837^{a}	-0.097	0.786^{a}	0.780^{a}	1.371^{a}	-0.098
	(0.184)	(0.243)	(0.138)	(0.168)	(0.218)	(0.283)	(0.272)	(0.238)
Spatial Lag	0.508^{a}	-0.256	-0.332^{b}	1.153^{a}	0.457^{a}	-0.647^{b}	0.104	0.712^{a}
	(0.168)	(0.191)	(0.141)	(0.136)	(0.135)	(0.292)	(0163)	(0.164)
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trend/Trend^{2}	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. Observations	1267	423	674	593	1269	423	674	595
R-squared	0.95	0.98	0.98	0.91	0.93	0.98	0.96	0.91

Standard errors in parentheses. ^{a} significant at 1%, ^{b} significant at 5%, ^{c} significant at 10%.

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Table 5: Outbound FDI in goods and services accounting for third-country effect

	Goods				Services			
	All countries		All years		All countries		All years	
	1983-2007	2000-2007	OECD	non-OECD	1983-2007	2000-2007	OECD	non-OECD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Host Population	-0.345^{c}	-2.192^{a}	1.483^{a}	-0.917^{a}	-0.677^{a}	-0.217	-0.769^{b}	-1.183^{a}
	(0.177)	(0.487)	(0.261)	(0.217)	(0.208)	(0.783)	(0.340)	(0.258)
Host Trade Cost	-0.843^{a}	-0.161^{c}	-0.840^{a}	-0.693^{a}	-1.103^{a}	-0.836^{a}	-0.823^{a}	-0.987^{a}
	(0.073)	(0.084)	(0.092)	(0.099)	(0.092)	(0.162)	(0.133)	(0.127)
Host Skill	-0.693^{a}	-0.001	-0.314^{c}	-0.553^{a}	-0.621^{a}	1.092^{b}	-0.549^{a}	-0.008
	(0.121)	(0.273)	(0.161)	(0.181)	(0.174)	(0.551)	(0.209)	(0.286)
Host Investment Costs	-0.047^{b}	-0.067^{b}	0.019	-0.135^{a}	-0.029	-0.045	0.021	-0.054
	(0.022)	(0.030)	(0.024)	(0.039)	(0.038)	(0.073)	(0.055)	(0.048)
Host GDP	1.561^{a}	1.121^{a}	1.172^{a}	1.250^{a}	1.859^{a}	0.810^{a}	2.485^{a}	1.153^{a}
	(0.105)	(0.142)	(0.086)	(0.146)	(0.122)	(0.223)	(0.177)	(0.126)
Surrounding Market Potential	-1.171^{a}	0.313	-0.171	-1.611^{a}	-1.306^{a}	-0.710^{c}	-0.284	-1.758^{a}
	(0.130)	(0.301)	(0.117)	(0.203)	(0.177)	(0.380)	(0.197)	(0.257)
Spatial Lag	0.646^{a}	-0.101	-0.345^{a}	1.540^{a}	0.687^{a}	0.081	-0.216	1.179^{a}
	(0.128)	(0.232)	(0.134)	(0.156)	(0.121)	(0.372)	(0.136)	(0.170)
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trend/Trend^{2}	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. Observations	1267	423	674	593	1269	423	674	595
R-squared	0.97	0.98	0.98	0.94	0.95	0.98	0.97	0.92

Standard errors in parentheses. ^{a} significant at 1%, ^{b} significant at 5%, ^{c} significant at 10%.

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