Gravity for Foreign Direct Divestments

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ABSTRACT

Foreign divestments, a frequent phenomenon in international economics, have been a rare academic field of study. However, the ongoing Great Recession has brought divestments to the spotlight. By embedding the OLI framework in a general equilibrium, this paper builds a gravity model for aggregate divestments between country pairs. We contrast our model empirically estimating the structural and institutional determinants of divestments in Spain in the period 1999-2011 over a sample of 106 countries. Our results, in line with the reverse hypothesis of divestments, suggest that firms hedge local financial constraints through foreign investment**.**

Keywords Foreign Direct Investment, Divestment, Gravity equation, Internalization, OLI, General Equilibrium

Paper Type Research paper

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1 Introduction

The cease of foreign economic activity in a host country through divestment is an equally frequent and unstudied phenomenon. Scholars have long sought the mechanisms underlying the long-term commitment of foreign manufacturing operations through foreign direct investment FDI. However, the specialized literature has remained relatively silent on the abrupt stop of this foreign economic marriage. Nowadays, in a context of economic downturn, foreign divestments are back in the agenda of policymakers without a full understanding on its underlying mechanisms. This paper fills a gap in the study of international economics by delving into the economic determinants of foreign direct divestment FDDI. We derive and estimate a gravity equation from general equilibrium conditions in which a collection of organization, location and internalization advantages explain divestments.

In one the first attempts to explain international production, Dunning (1973) framed the motivations of foreign versus domestic production in a triple set of organization, location and internalization (OLI) advantages. Dunning's seminal "eclectic paradigm" explains relatively well international production notwithstanding; it has known caveats to describe the determinants of bilateral economic flows between countries. The OLI model was not initially embedded in a general equilibrium framework and therefore had "only limited power to explain or predict particular kinds of international production" (Dunning, 1988, p. 1). The original OLI model fails to explain a variety of multinational activity such as affiliate sales, mergers and acquisitions, greenfield operations, re-investments, and divestments between country pairs.

In spite of the chimeric effort to develop a unique theory that explains simultaneously all forms of FDI (Cantwell, 2000), in the recent years economists have succeeded to incorporate certain aspects of OLI advantages in a general equilibrium model. The seminal work of Markusen (1984) and Helpman (1984) led to general equilibrium models accounting for multinational firm's organizational and locational advantages. In so forth, the empirical results obtained with these models gained theoretical robustness. However, internalization, one the "critical black boxes" (Ethier, 1986) has been elusive to general equilibrium models of internalization theory.

Antràs and Helpman (2004), by mapping the theory of vertical and lateral integration of Grossman and Hart (1986) into international production, provided a key insight to incorporate internalization in a general equilibrium framework by assuming a "headquarter service". In a scenario featuring firm heterogeneity and fixed costs to modes of international organization, Antràs and Helpman (2004) explain how some firms decide to internalize foreign costs and engage in FDI, even when fixed costs are especially high to prevent offshoring[1].

Being the primary motivation of this paper to model divestments in a general equilibrium, we lever on the concept of un-internalized headquarter services as a natural way to explain divestments. If affiliate sales cannot cope with foreign establishment's costs, headquarters services are required to maintain international production, internalizing foreign costs. In addition, the subsidiary's ownership is shifted towards the head office, the agent whose

[1] Empirical evidence of FDI and intra-firm trade substitution through headquarter services has been provided by Yeaple (2006).

investment contributes most to the foreign relationship (Antràs, 2003). As result of this gained ownership over the affiliate, the headquarters face the strategic decision to de-internationalize through divestment (Benito and Welch, 1997). Consequently, divestments depend on a triple conundrum of organizational (foreign affiliate sales), location (establishment costs) and internalization (headquarter transfers) advantages.

We use the FDI gravity umbrella, to show how this OLI framework arises naturally in a general equilibrium model. The FDI gravity model, derived from a multiple equilibrium where domestic and foreign enterprises coexist in a host country benefits from sound theoretical background (Bergstrand and Egger, 2007; Markusen and Venables, 2000; Markusen, 2002). It is therefore widely used in FDI empirical research in international economics (Anderson, 2011; Bergstrand and Egger, 2011). Incorporating divestments into the gravity equation, we contribute to broaden the solid gravity framework for FDI, offering a better understanding of foreign divestments.

The ability to finance headquartered services to fill the breach between establishment costs and foreign affiliate sales is essential to the divestment decision. Financing these sunk costs related to FDI is an arduous task for a number of reasons such as the lag between initial investments and production and sales or the complexity to forecast foreign revenues. Since financial constrains appear dramatically in the context of banking crises, divestments are generally associated with financial crises (UNCTAD, 2012).

Previous studies suggest that financial constraints affect foreign investment. Using an interview panel, De Maeseneire and Claeys (2012) find

that small business in Belgium face severe financial constraints for FDI through three channels. Firstly, by excessive collateral requirements; secondly, through the home bias of financers and thirdly, by the bank's risk evaluation of foreign projects. The authors find more severe financing constraints for foreign than for domestic projects. Düwel et al. (2011) find that parent German bank lending adjustment is mostly due to bank-specific factors. Buch et al. (2009), using a detailed dataset of German multinationals, find that financial factors constraint firms' foreign investment decisions, an effect felt in particular by more productive firms. Financial constraints appear to be decisive for the decision to engage in FDI, but less so for the aggregate magnitude of sales of foreign affiliates.

The main focus of this paper is divestments notwithstanding; we provide a rationale for local and foreign credit constraints on Spanish divestments. Hence, we contribute to the financial crisis literature by examining effect of the banking restrictions of the Great Recession. We choose to study Spain for various reasons. In first place, Spain is the country that has longer suffered the Great Recession with an ongoing banking crisis since 2008 (Laeven and Valencia, 2012). Secondly, not only Spain has a high number of multinationals, but their investments and divestments are registered officially by a government agency, offering a unique source of reliable data. Thirdly, empirical research on divestments in Spain has caught previous academic attention (Bordonaba-Juste et al., 2011; Jackson et al., 2005; Mata and Freitas, 2012).

Although divestments are less studied field than foreign direct investments, several authors have studied why multinationals abandon a host country. Boddewyn (1983) suggested the "reverse theory" by which, with certain

qualifications, divestment can be treated as the reverse process of FDI. With a focus on firm's characteristics, the reverse theory has been supported empirically (Belderbos and Zou, 2006; Boddewyn, 1979; Chen and Wu, 1996). Exit conditions might be sought behind a productivity surge of the affiliate, since "if a firm is productive enough, it chooses to pay the entry cost" (Arkolakis, 2011). Strategic decisions and a lack of international experience might force de-internationalization via divestments decisions (Benito and Welch, 1997; Benito, 1997; Reiljan, 2004)

From an economic perspective, a great amount of information can be drawn from the analysis of divestment. Divestments are not just a slow-down in investment; divestments imply a long term relationship rupture through partial or total exit from the recipient country. In so forth, divestments have caught the eye of policymakers due to the relevant impact on the host's economy, especially in the labor market (Gómez-Plana and Latorre, 2012; Mata and Freitas, 2012) [2].

In Figure 1 we show the number of foreign divestments and investments in Spain in the period 1999-2011. Year 2000 shows an unmatched number of foreign entries, with nearly 12,000 investments. Shortly before, in 1999 the maximum value of divestments added to more than 4,000 registered foreign exits. Both series have a steady downward trend since then.

INSERT FIGURE 1 AROUND HERE

[2] See Gómez-Plana & Latorre (2012) for an overview of the effects of foreign divestment in a country.

Figure 2 depicts the monetary amount (in constant 2000 billion dollars[3]) that foreign firms invested and divested in Spain. Both series show maximum values just before the great recession, in 2007 and 2008, with more than 30 billion dollars' worth of foreign investment. This period coincides also with the maximum divestment amount, 10 billion dollars in 2007. Both series represented in Figure 1 and Figure 2 that divestments sum up a significant figure of international economic transactions in Spain. Divestments add up to approximately 35% of the number of foreign projects in Spain. The mean invested value is 2 million, whereas average divestments sum 0.58 million thought the last decade.

INSERT FIGURE 1, FIGURE 2 and Table 1 AROUND HERE

Table 1 shows the list of the 106 countries involved in divestments during the period of 1999-2011. The first country in amounts divested is The Netherlands, followed by UK, France and USA. These countries rank also the main foreign investors in Spain.

In the next section we develop the model, in section 3 we describe the empirical methodology and present the data sources; in section 4 we present the results; in section 5 we test our results for robustness and section 5 concludes.

2 The model

The motivation behind our model is to present a solid framework, based on general equilibrium conditions, to explain international divestments. We

[3] American billion 1.000.000.000

follow Kleinert and Toubal (2010) by assuming a Cobb-Douglas utility function for consumers in host country *j*:

$$U_j = X_{Aj}^{\mu} X_{Mj}^{1-\mu} \quad [1]$$

For a two sector economy with goods *A* and *M*, where $0 < \mu < 1$. X_{Mj} is a CES sub-utility function in the form of:

$$X_{Mj} = \left[\int_i \int_k x_{kij}^{(\sigma-1)/\sigma} dk di\right]^{\sigma/(\sigma-1)} \quad [2]$$

where the host country *j* consumption of a single good *M* produced by a firm *k* from home country *i* is denoted as x_{kij}. The constant elasticity of substitution is named σ, being $\sigma > 1$ and equal for any product pair. Under the assumption of monopolistic competition, with symmetric producers and varieties, [2] is simplified,

$$X_{Mj} = n_i x_{ij}^{(\sigma-1)/\sigma} \quad [2']$$

where n_i is the number of firms in equilibrium in country *i*. The price index in country *j* where M is produced, P_{Mj}, is assumed to be a CES function: $P_{Mj} = \left[\int_i n_i p_{ij}^{1-\sigma}\right]^{1/(1-\sigma)}$. We drop the subscript M, simplifying the analysis by using a single manufacturing sector which produces a bundle of *M* differentiated goods. The prices of the goods produced in county *i* and sold in country *j* will depend on the prince index in *i* P_i, and the transaction costs τ_{ij}, resulting in the standard price equation $p_{ij}^{Ex} = P_i \tau_{ij}$. The sales of a specific firm k in a foreign market, x_{kij}, are defined as:

$$x_{kij} = p_{ij}^{1-\sigma}(1-\mu) a_{kij}^{\rho_a} Y_j P_j^{\sigma-1} \quad [3]$$

where p_{ij} is the good's price in country *j*, P_j the price index in country *j*, Y_j the market size and the marginal costs of a specific firm k are denoted by a_{kij} with $\rho_a > 0$ to allow for firm heterogeneity. Entry and exit modes to a foreign market depend also on the firm productivity (Helpman et al., 2004; Melitz, 2003). Different firm productivity will result in different marginal costs, different prices and different quantities for each firm, being the firm productivity $1/a_k$. Profit maximization will bring a dynamic markup over the marginal costs a_k. Therefore, dynamic firm-specific prices for a firm located in *i* and selling in *j* yield firm-specific quantities sold in *j:*

$$p_{ij}^{Ex} x_{kij}^{Ex} = {P_i}^{1-\sigma} {a_{kij}}^{\rho_a(1-\sigma)} {\tau_{ij}}^{(1-\sigma)} (1-\mu) Y_j P_j^{\sigma-1} \qquad [4]$$

Firms can either export goods to foreign market *j* or produce them on site, facing the following benefits dilemma to decide on trade or engage in FDI:

$$\pi_i^{FDI} - \pi_i^{Ex} = (1-\rho)\left[p_{ij}^{FDI} x_{kij}^{FDI} - p_{ij}^{Ex} x_{kij}^{Ex}\right] > f_{kij} - HQ_{kij} \qquad [5]$$

where $\rho = \sigma/(\sigma-1)$; f_{kij} stands for firm specific fixed costs of establishing an additional producing plant in *j* and HQ_{kij} are the firms specific "headquarter services" which alleviate the sunk costs of establishing a foreign subsidiary offshore (Antràs and Helpman, 2004).

Firms will produce abroad in a new site if the profits of doing so are higher than exporting:

$$\pi_i^{FDI} - \pi_i^{Ex} > 0 \iff (1-\rho)\left[(p_{ij}^{FDI} x_{kij}^{FDI} + \frac{(HQS_{kij} - f_{kij})}{(1-\rho)}) - p_{ij}^{Ex} x_{kij}^{Ex}\right] > 0 \qquad [6]$$

Substituting [4] in [6], a general equilibrium condition is obtained:

$$n_i p_{ij}^{FDI} x_{kij}^{FDI} + n_i \cdot \frac{(HQS_{kij} - f_{kij})}{(1-\rho)} =$$

$$n_i P_i^{1-\sigma} a_{kij}{}^{\rho_a(1-\sigma)} \tau_{ij}{}^{(1-\sigma)} (1-\mu) Y_j P_j^{\sigma-1} \qquad [7]$$

Recurring to the notation used in Redding and Venables (2003), we define: Home country *supply capacity* as $s_i = n_i P_i{}^{1-\sigma}$; host country *supply capacity* as $m_j = (1-\mu) Y_j P_j^{\sigma-1}$; and assuming that transaction costs such as transport and information costs, can be proxied with iceberg type distance costs, $\tau_{ij} = D_{ij}^{\rho_1} e^{\vartheta_{ij}}$ where D_{ij} is the distance between home *i* and host *j* countries ; $\rho_1 > 1$, and ϑ_{ij} are unmeasured investment frictions.

Additionally we can write aggregate Foreign Affiliate Sales (FAS) in country *j as* $FAS_{kij} = n_i p_{ij}^{FDI} x_{kij}^{FDI}$; aggregate Foreign Affiliate Costs in host country *j as* $FAC_{kij} = n_i f_{kij}/(1-\rho)$; and total $FHQ_{kij} = n_i f_{kij}/(1-\rho)$ thus, [7] can be written as:

$$FAS_{kij} + FHQ_{kij} - FAC_{kij} = s_i a_{kij}{}^{\rho_a(1-\sigma)} \left(\tau_{ij}\right)^{(1-\sigma)} m_j =$$

$$s_i m_j \left(D_{ij}^{\rho_1}\right)^{(1-\sigma)} \left(a_{kij}{}^{\rho_a} e^{\vartheta_{ij}}\right)^{(1-\sigma)} \qquad [8]$$

which reads, foreign direct investment, as the combination of affiliate sales (organizational advantages), establishment costs (location advantages) and headquarter transfers (internalization advantages), depend on foreign and domestic market sizes plus the transaction costs between them, allowing for firm specific productivity. In a nutshell, the aggregate OLI advantages depend on the general equilibrium of the economy.

When sales are significantly lower than the fixed costs, $FAS_{kij} \ll FAC_{kij}$, , the headquarter is forced re-invest in the subsidiary with FHQ_{kij} in order to sustain productivity and remain active in the foreign market. The foreign affiliate maintains artificially productivity high enough to survive in the foreign market. In return, the residual rights of control over the affiliate's operations is shifted towards headquarters (Antràs, 2003).

In this scenario, headquarters have ownership power to decide re-invest to keep foreign production abroad or divest partially shutting part of the foreign operations. If the magnitude of the productive loss is such to revert the benefits conditions of [6], the firm will divest totally and cease to produce in market *j* and become an exporter. Further productivity plumps will result in a total exit of the host market. Divestments depend on the conditions that affect foreign sales and previous capital investment in the form unamortized fixed costs. Hence, we propose an interpretation of divestments an outcome of a triple equilibrium between sales, costs and headquarter services transfer, namely,

PROPOSITION 1. Foreign direct divestments occur when internalization advantages are not sufficient to cope with the relative loss of locational and organizational advantages.

As a result of Proposition 1, $FAS_{kij} \ll FAC_{kij}$ and $FHQ_{kij} < FAS_{kij} - FAC_{kij}$, the equilibrium equation in [8] yields:

$$FDDI_{ij} = s_i m_j \left(D_{ij}^{\rho_1}\right)^{(1-\sigma)} \left(a_{kij}{}^{\rho_a} e^{\vartheta_{ij}}\right)^{(1-\sigma)} \qquad [9]$$

where FDDI is the absolute aggregate foreign direct divestment. In [9], the reverse hypothesis of FDDI is a direct outcome of the general equilibrium of the

economy. The same determinants that explain why investment flows in, describe why it flows reversely out. Therefore, we would expect an opposite value of the estimated coefficients of an empirical specification of [9].

3 Data and empirical methodology.

We have effectively derived a gravity equation for divestments, which can be estimated with standard econometric techniques. Economic data flows between countries are typically characterized by numerous zeros (46% in our set). Zeros are typically exogenous to most trade and FDI models. However, our model offers a simple endogenous explication to zero divestments among countries. When the aggregate foreign sales plus headquartered services sustain establishment cost, $FAS_{kij} + FHQ_{kij} = FAC_{kij}$ zero divestments appear in [8]. Nonetheless, we have to take zeros into account in our estimation strategy in order avoid a non-random sample selection that would bias estimates.

In particular, we estimate a non-linear variant of the gravity equation [9] with a Possion maximum likelihood PML estimator, which does not require a log-linearization of the variables in line with that proposed by Silva and Tenreyro (2006):

$$FDDI_{ijt} = e^{\begin{pmatrix} \beta_1 \ln(Y_{it}) + \beta_2 ln(D_{ij}) + \beta_3 border_{ij} + \beta_4 col_{ij} + \beta_5 lang_{ij} + \\ \beta_6 rel_{ij} + \beta_7 BIT_{ijt} + \beta_8 FTA_{ijt} + \beta_9 CC_{ijt} + \beta_{10} GR_{ijt} + \beta_{11} GR_{it} + \beta_{11} GR_{jt} + \lambda_j + \delta_t \end{pmatrix}} + \varepsilon_{ijt} \quad [10]$$

where *i* and *j* denote FDDI partners, in this case j is associated with Spain, *t* is time, and the variables are defined as follows: $FDDI_{ijt}$ is the aggregate divestment in Spain from country *i* in year t; Y_{it} is the gross domestic product of home divestor country; D_{ij} is the distance in kilometers between country

capitals; $border_{ij}$ is one when countries share a common border with Spain and zero otherwise; col_{ij} (Colony) is set to 1 if the two countries have ever had a colonial link; $lang_{ij}$ (Common language) takes positive value if both countries share the same official language; rel_{ij} (Religion) is a composite index which measures the religious affinity between country pairs with values from zero to one; BIT_{ijt} (Bilateral investment treaty) is a dummy that takes a value of one if the country pair has a bilateral investment treaty in force; FTA_{ijt} (Free Trade Agreement) is a dummy that indicates if both countries have a free trade agreement in force; CC_{ijt} (Common currency) is set to 1 if countries share a common currency or have a fixed exchange rate; and GR_t are a dummy variable for systemic banking crises; following Anderson and Van Wincoop (2003) we home country fixed effects (λ_i) and time effects denoted by δ_t; lastly ε_{ijt} represent an stochastic error term[4].

Since the gravity equation is a natural way to control for the evolution of incomes in countries, following Gil-Pareja et al. (2013) we add dummy variables to capture the impact of financial constraints on FDDI. We use GR_{it}, for home country involved in the Great Recession and GR_{jt} for Spain. Additionally we use GR_{ijt} when both home and host countries belong to the recession club. GR_{ijt} captures the effect of global banking crises on FDI among countries involved in a contemporaneous banking crisis whereas GR_{it} gives the impact of host countries in Spain. With GR_{jt} we disentangle the effect of local credit constraints on international investment. The countries involved in the Great Recession can be found in Table 2.

INSERT Table 2 AROUND HERE

[4] Since we only contemplate a destination country, the Spanish GDP is perfectly explained with the fixed effects and left out the econometric equation.

Several control variables which capture bilateral investment costs have been taken from the CEPII (2011) database: distance, common language, colony and border. BIT has been manually constructed from the UNCTAD website. The World Bank (2011) is the source for GDPs, measured in constant 2000 US dollars.

The source of FTA and common currency is Head, Mayer, and Ries (2010). Religion is calculated with data from CIA World Fackbook (2011) according to following formula: for country each country pair: $\%Christian_i*\%Christian_j + \%Muslim_i* \%Muslim_j + \%Buddhist_i*\%Buddhist_j + Hindu_i*Hindu_j + Jewish_i* Jewish_j$.

The FDDI dataset has been taken from the Spanish Registry of Foreign Investment (DATAINVEX, 2011). Investment flows are measured in constant 2000 US dollars and projects are an integer count. The dataset covers divestments from 1999 to 2011 from 106 countries. Overall, the database is heavily unbalanced with 764 non-zero observations, meaning that not all countries divested in all years.

4 Results and discussion

The estimation results are shown Table 3, where we find empirical evidence in line with the predictions of model. The gravity equation performs well explaining 79% of foreign direct divestment in Spain during the period under study. Column 1 of Table 3 shows the estimation results of the empirical equation [11] with a clustered country pair pseudo PML estimator (Silva and Tenreyro, 2011, 2010). Additionally, we present PML- panel estimation in

columns [2] and [3] along with a OLS lin-log panel specification in columns [3] and [4], obtaining similar results.

INSERT Table 3 AROUND HERE

The variables measuring common language, common currency and Bilateral investment treaties show the opposite sign as expected with foreign investments, sustaining partially the reverse theory of divestments, where the exit conditions reverse the entry determinants.

On the other hand, GPD, distance and colony[5] align their signs with FDI. However, multinational firms can geographically fragment their production processes into stages and locate activities according to international differences in factor prices. The expected sign of home GDP in this factor proportion model is negative (Kleinert and Toubal, 2010), explaining the reverse positive sign of home GDP. With a strong home economy, multinational firms can revert certain activities back home or search for other opportunities elsewhere.

A popular gravity topic has been the negative effect of distance, which is commonly interpreted as a proxy for freight costs (Bergstrand and Egger, 2011). In trade, an increase in distance will result in a surge of transports costs and therefore, distance deters trade. Since most studies consider trade and FDI as substitutes (Helpman, 2006), one would expect a positive impact of distance in FDI (Markusen, 2002). For countries far apart with significant freight costs, high-cost trade would be expected to be replaced by low-cost FDI. However, since "FDI and distance are negatively correlated in the data" (Bergstrand and Egger,

[5] The Netherlands is considered a Spanish colony during the XVI and XVII centuries. As shown in Table 1, The Netherlands is one of the first Spanish divestors, excluding it from the variable colony gives the same negative result as the variable same language.

2011), most of the empirical studies show a negative relationship between distance and FDI[6].

The most plausible interpretation for the negative effect of distance on FDDI is information costs. It is not unusual that host countries implement exit barriers to prevent divestments[7]. Far away countries will face higher informational costs related to exit procedures than neighbors, explaining the negative sign of distance on divestments.

Focusing on policy variables such as institutional agreements between countries, BITs reduce divestments in 88%[8]. BIT not only strengthen investments (Bergstrand and Egger, 2012), but deter divestments. Policy makers can find in this result an effortless way to reduce divestments.

The effect of the great recession is captured in the last rows of column 1 of Table 3. When both supply and demand markets suffer financial restrictions, divestments are not significantly affected. However, when either dyad member is affected independently by financial constraints, divestments are significantly reduced. Our results suggest that when the home market is free from financial constraints, foreign investors seek to maintain opportunities on countries under financial stress. On the other hand, when the supply market faces financial difficulties, the foreign firms seek to stay on bull host markets.

For robustness, following Herz and Wagner (2011), we perform additional panel estimations. Columns [2] and [3] of Table 3 show the estimation results

[6] Egger and Pfaffermayr (2004), using a Hausman-Taylor approach, find a positive effect of distance on FDI.

[7] For example, firms in Spain are required to demonstrate loses and foreign firms face union and labor regulations. Additionally, foreign firms in Spain are expected to fill a divestment form, which is good for research, but questionable for business.

[8] Calculated by exp(-2.164)-1

for the country panel estimation with a PML country pair estimation with fixed and random effects. Due to the significance of the Hausman test, we turn our attention on the fixed effects specification in column 3, where we capture two interesting results.

In first place, Free Trade Agreements increase divestments by 34% on average[9]. When countries find a cost-effective alternative way to serve the demand in the host country, these results could indicate a substitution between trade and FDI via divestment.

Secondly, when both countries face simultaneously a financial crisis, divestments increase by 121% on average. When neither headquarters nor the affiliates find credit to finance foreign establishment cost, delving in our previous discussion on financial constraints and foreign cost internalization.

5 Sensitivity analysis: Extensive margin

The decomposition of international economic flows among extensive (how many) and the intensive margin (how much) has been one of the breaking points to understand the underlying mechanisms of FDI and trade in a gravity framework (Chaney, 2008). The most widely used empirical specification for bilateral economic relationships (trade or FDI), suffers from an over-aggregation specification bias. One key assumption of the gravity model, firm symmetry, is not empirically present in aggregate investment regressions. The distinction between margins was first introduced in gravity equation to solve the firm level misspecification (Felbermayr and Kohler, 2006). In the extensive margin all

[9] Calculated by exp(0.299)-1

firms are made equal: Millionaire investments are modeled equivalently with humble investments.

Following Hillberry and Hummels (2008), the aggregate divestment flows can be separated into two margins:

$$FDDI_{ij} = \sum_{x=1}^{N} I_{ijx} = N_{ij} * \bar{I}_{ij} \quad [12]$$

where I_{ij} is the quantity divested in each individual project from country *i* to *j*, N_{ij} is the number of divestment from *i* to *j* and $\bar{I}_{ij}$ the average dollars divested per project. Therefore, the log-linear form of [1]:

$$ln(FDI_{ij}) = ln(N_{ij}) + ln(\bar{I}_{ij}) \quad [12']$$

In order to capture the differences between FDDI's margins, we estimate a second equation where we substitute the regressand in [11] for the individual investment project count.

INSERT Table 4 AROUND HERE

The first column in Table 4 shows the estimation results for the extensive margin using PPML. Focusing on the differences between margins, we can appreciate that neighbor countries divest less, enriching our interpretation of information costs associated to divestments.

The financial restriction variables of the great recession follow the general trend of previous results. However, we can learn from the negative sign of GR_{ijt} that under twin crises, multinationals diversify their foreign endeavors: the number of divestments diminishes, however the monetary quantities of these investments increases. The results of the benchmark PML and OLS country pair estimation show similar results.

6 Conclusions

In explaining foreign divestments, the OLI triumvirate finds a natural accommodation in a general equilibrium model. We have derived a gravity model for foreign divestments that performs well estimating divestments in Spain. Furthermore, we have found empirical evidence that supports the reverse theory of divestment, meaning the same reverse determinants that favor investments deter divestments, in line with the predictions of our model.

Financial constrains impact divestments, deterring the presence of multinationals in the home country when both countries suffer credit restrictions. However, foreign investors find their way out of local financial constraints.

Policy makers can benefit from our work by understanding mechanisms on foreign exit of multinationals. In first place, we have shown that similar determinants affect investments and divestments. Therefore, similar policies are can be implemented both to attract new investments and to stop the foreign investment drain. In second place, we have shown that multinational divestment hedge local financial restrictions. Therefore, policies aimed to ease credit flow should be aimed primarily to local firms.

Although our estimation results suffer from a regional bias, this paper opens a new line of research, which would benefit from further empirical research to continue delving into international divestments.

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Figure 1 Number of investments and divestments in Spain per year

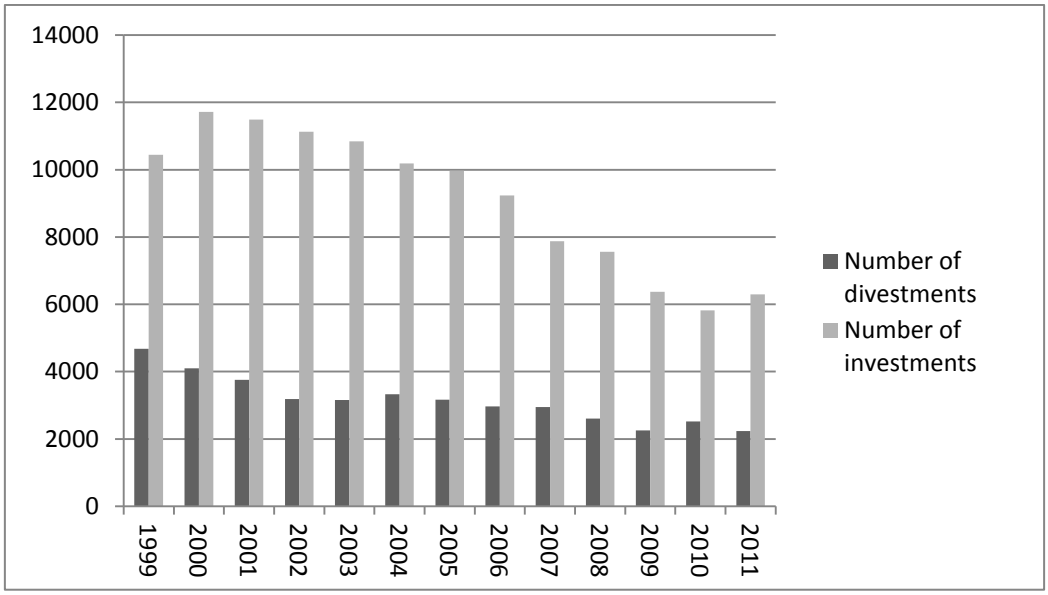

Figure 2. Investments and divestments in Spain per year

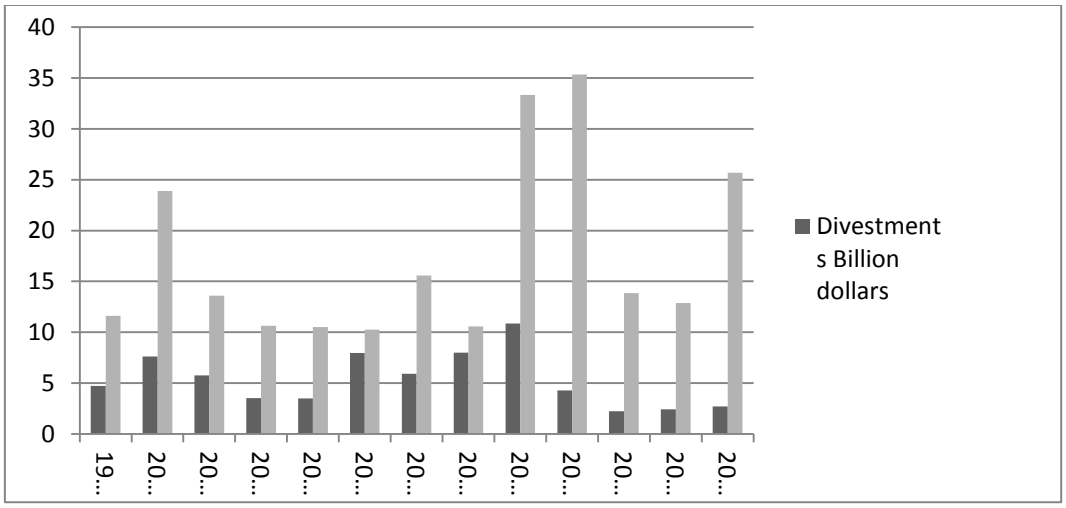

Table 1. List of countries and divestments

COUNTRY	Divestment	COUNTRY	Divestment	COUNTRY	Divestment
NETHERLANDS	1.9E+10	LIBIA	12005615.9		
UNITED KINGDOM	7.8E+09	DOMINICAN REP	11521165.9		
FRANCE	6.85E+09	MALTA	10151525.1	PAKISTAN	256266.889
UNITED STATES	3E+09	AUSTRALIA	6783671.01	UKRAINE	245009.165
PORTUGAL	2.79E+09	MALAYSIA	5077436.9	GUATEMALA	244642.013
GERMANY	2.73E+09	ISRAEL	5009728.89	EGYPT	224109.55
BELGIUM	2.21E+09	RUSSIA	4832586.44	TUNISIA	216546.68
SWITZERLAND	2.11E+09	ICELAND	4503101.35	CROATIA	139061.234
ITALY	1.54E+09	HUNGARY	3762491.48	ANGOLA	127013.662
SWEDEN	1.29E+09	CYPRUS	3412048.06	EQUATORIAL GUINEA	123313.587
DENMARK	8.33E+08	ALGERIA	2479364.85	LATVIA	104501.622
BAHRAIN	5.43E+08	ST KISS AND NEVIS	2347708.61	CENTRAL AFRICAN REP	76967.9548
CANADA	4.12E+08	MOROCCO	2149776.07	JAMAICA	73453.7934
JAPAN	2.91E+08	PHILIPINES	2087198.31	IRAN	47741.0697
PANAMA	2.11E+08	THAILAND	2073828.08	KAZAKHSTAN	45994.0722
ECUADOR	1.53E+08	SLOVAK REP	1899248.93	SEYCHELLES	45140.5025
IRELAND	1.34E+08	LEBANON	1734567.54	INDONESIA	34435.5042
AUSTRIA	1.32E+08	NEW ZEALAND	1668198.36	SYRIAN	33153.9894
SINGAPORE	1.19E+08	POLAND	1375333.35	TOGO	28815.2078
MEXICO	1.19E+08	BULGARIA	1295366	NIGER	25910.3612
ARGENTINA	75885617	BERMUDA	1254852.8	ESTONIA	23482.6485
URUGUAY	41193867	SENEGAL	1129334.51	CAMEROON	16358.9832
GREECE	33761620	MOZAMBIQUE	1006095.94	BOLIVIA	14015.4417
SAUDI ARABIA	33064055	CHINA	990759.291	SLOVENIA	5789.13815
SOUTH AFRICA	32413115	UNITED ARAB EMIRATES	951526.727	BELARUS	3830.49701
CHILE	26571598	NAMIBIA	808417.358	SRI LANKA	3661.383
NORWAY	24687425	TURKEY	659930.293	BANGLADESH	3358.58533
COSTA RICA	23807586	GUINEA	616567.936	GHANA	3267.054
PERU	22082167	EL SALVADOR	606412.557	DOMINICA	3256.326
BRASIL	21558362	CZECH REP	497459.247	NICARAGUA	2732.25243
VENEZUELA	20661142	INDIA	352469.336	MAURITIUS	2274.19347
COLOMBIA	19560608	PARAGUAY	333763.426	GEORGIA	2216.23668
FINLAND	19044748	CONGO RP	325972.617	AZERBAIJAN	1843.28688
BAHAMAS	14999604	UGANDA	271440.608	HONDURAS	1122.33397
JORDAN	12457731	NIGERIA	270720.468	ALBANIA	676.859619
KUWAIT	12022930	ARMENIA	261126.255	BOSNIA-HERZ	321.01526

Table 2: Systemic Banking Crises

Country	Year	Country	Year	Country	Year
Austria	2008	Latvia	2008	UK	2007-2008
Belgium-Luxembourg	2008	Mongolia	2008-2009	USA	2007-2008
Denmark	2008-2009	Netherlands	2008	Kazakhstan	2008-2010
Germany	2008-2009	Nigeria	2009-2010	Ukraine	2008-2009
Greece	2008	Spain	2008-2010	UK and USA	2007-2008

Source: Laeven and Valencia (2012)

Table 3. Results

Regressand / Variable	[1] $FDDI_{ijt}$	[2] $FDDI_{ijt}$	[3] $FDDI_{ijt}$	[4] $FDDI_{ijt}$	[5] $FDDI_{ijt}$
GDP $\ln(Y_{jt})$	0.889*** (0.12)	0.037*** (1.70e-3)	0.0366*** (1.70e-3)	0.146*** (0.04)	0.019*** (0.01)
Distance $\ln(D_{ij})$	-1.675*** (0.30)		-0.261 (0.41)		-0.043* (0.3)
Border $border_{ij}$	-0.126 (0.32)		-1.182 (2.16)		0.031 (0.09)
Common language $lang_{ij}$	-1.995*** (0.71)		-2.980*** (1.16)		-0.263*** (0.07)
Colony col_{ij}	3.288*** (0.25)		0.677 (1.08)		0.332*** (0.07)
Religion rel_{ij}	0.276 (0.44)		1.113*** (0.01)		-0.011 (0.05)
Common Currency CC_{ijt}	-1.080*** (0.28)		1.926 (1.27)		0.128** (0.06)
Bilateral Investment Treaty BIT_{ijt}	-2.164*** (0.50)	-0.096*** (1.27e-3)	-0.096*** (1.27e-3)	0.011 (0.03)	-0.003 (0.02)
Free Trade Agreement FTA_{ijt}	0.086 (0.42)	0.299*** (1.81e-3)	0.299*** (1.81e-3)	0.027 (0.03)	0.007 (0.02)
GR in both GR_{ijt}	0.826 (0.63)	0.796*** (6.58e-3)	0.796*** (6.58e-3)	0.135 (0.11)	0.108 (0.11)
GR in Home GR_{it}	-1.456*** (0.36)	-1.078*** (4.85e-3)	-1.093*** (4.85e-3)	-0.140*** (0.04)	-0.171* (0.10)
GR in Host GR_{jt}	-0.989** (0.50)	-1.094*** (8.14e-3)	-1.078*** (8.14e-3)	-0.200* (0.11)	-0.041* (0.21)
Hausman test		85.20***		20.58	
Observations	1360	1360	1360	1360	1360
Country pairs	106	106	106	106	106
R^2	0.79			0.07	0.24
Wald statistic		1.49e+10***	1.49e+10***		
F-test				3.08***	108.66***
Log likelihood	-2.344e+10	-1.559e+10	-1.559e+10		
Estimation	PPML - CP	PML-CP FE	PML-CP RE	OLS-CP FE	OLS-CP RE
Fixed Dummies	Year	Year	Year	Year	Year

Notes: Standard errors in parentheses,; ***p<0.01 **p<0.05 *p<0.1.
PML coefficients are elasticities (FDI in real dollars),
OLS coefficients are semi-elasticities (FDI in real million dollars)

Table 4. Sensitivity Analysis: Extensive margin

Regressand / Variable	[1] N_{ijt}	[1] N_{ijt}	[2] N_{ijt}	[2] N_{ijt}	[2] N_{ijt}
GDP $\ln(Y_{jt})$	0.914*** (0.05)	0.225** (0.10)	0.430*** (0.05)	0.051** (0.02)	0.018*** (0.003)
Distance $\ln(D_{ij})$	-1.815*** (0.21)		-0.675*** (0.21)		-0.020 (0.01)
Border $border_{ij}$	-0.888*** (0.20)		-0.516 (0.86)		0.034 (0.04)
Common language $lang_{ij}$	1.082** (0.51)		0.867 (0.65)		-0.068** (0.03)
Colony col_{ij}	1.628*** (0.16)		0.134 (0.54)		0.071** (0.03)
Religion rel_{ij}	-0.030 (0.28)		1.060*** (0.60)		0.032 (0.02)
Common Currency CC_{ijt}	-0.206 (0.18)		1.541 (0.56)		0.075 (0.02)
Bilateral Investment Treaty BIT_{ijt}	-0.578** (0.25)	0.386*** (0.07)	0.236*** (0.07)	0.007* (0.003)	0.006 (0.004)
Free Trade Agreement FTA_{ijt}	-0.415* (0.25)	0.149* (0.09)	0.172*** (0.08)	0.012*** (0.004)	0.008* (0.005)
GR in both GR_{ijt}	-0.349* (0.17)	-0.353*** (0.06)	-0.353*** (0.06)	-0.056*** (0.01)	-0.059*** (0.02)
GR in Home GR_{it}	0.315** (0.13)	0.241*** (0.05)	0.238*** (0.05)	0.043*** (0.007)	0.046*** (0.02)
GR in Host GR_{jt}	-0.875*** (0.08)	-0.643*** (0.05)	-0.947*** (0.03)	-0.064** (0.02)	-0.039*** (0.004)
Hausman test		76.01***		63.48***	
Observations	1360	1360	1360	1360	1360
Country pairs	106	106	106	106	106
R^2	0.92			0.22	0.44
Wald statistic		1954.50***	2121.39***		
F-test				7.05***	242.61***
Log likelihood	-9704.6488	-3482.6204	-4062.336		
Estimation	PPML - CP	PML-CP FE	PML-CP RE	OLS-CP FE	OLS-CP RE
Fixed Dummies	Year	Year	Year	Year	Year

Notes: Standard errors in parentheses,; ***p<0.01 **p<0.05 *p<0.1.
PML coefficients are elasticities (FDI in real project count),
OLS coefficients are semi-elasticities (FDI in thousands project count)