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Energy Sustainability

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ABSTRACT: This paper studies the effect of energy market integration (EMI) on foreign direct investment (FDI). EMIs diminish energy uncertainty and price volatility in the host country and affect FDI through two channels: first, by harmonizing energy prices and, second, by reducing price dispersion. FDI may, as a result, increase both within and outside the EMI area, through energy stability mechanisms and price mechanisms, respectively. An empirical application on a global dataset including bilateral FDI data, during 2003-2012, using the gravity equation, shows that the integration of Portugal and Spain's electricity market in 2007 increased the amount of FDI's participants. Additionally, a positive increase in FDI from neighboring countries (in this instance, France), albeit lower in magnitude, is observed.

JEL Codes: F20, F21, F23, Q40, Q43

Keywords: Energy integration agreements, foreign direct investment, gravity equation, electricity prices, MIBEL

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1 Introduction

The European single market programme aims to reduce physical, legal and fiscal barriers between Member States in order to achieve the free movement of goods, services, capital and labour in the European Union (EU). Electricity, as a good, forms part of this free movement being promoted by the single market. The creation of an internal electricity market is expected to increase competition as a result of major interconnection capacity and hence a reduction of concentration at national and regional levels. Actors in an integrated energy market purchase electricity on an equal basis. The single energy market improves the security of supply. In an integrated market, efficiency is enhanced by greater interconnection, because the increase in resource availability reduces the need for spare capacity. The lower level of spare capacity for each country leads to less costly power plants and to the use of cheaper infra-marginal power plants available at times of peak demand.

The harmonisation of energy prices and a higher quality of service are some of the expected outcomes of a single energy market [1, 2]. Energy Market Intergrations (EMIs), as such, have a number of economic impacts [3]; not least on foreign direct investment (FDI). This link between energy and FDI is well documented in the literature. Herrerias et al. [4] show that energy intensity has an effect on FDI across the Chinese provinces. More recently, Herrerias et al. [5] report that energy intensity impacts foreign innovation. The empirical results reported by Pao and Tsai [6] suggest a causal link between energy consumption and FDI. Moreover, energy and FDI raises questions related to energy supply and geopolitics [1]. Yet, despite the interest in the relationship between energy and FDI, the literature on the subject is not very extensive. Indeed, this study is, to the best of our knowledge, the first to explain formally and report empirically the effect of EMI on FDI.

In recent years the main issues addressed by energy economics scholars examining the restructuring process of Europe's electricity markets have been prices convergence

[7], prices dependence [8], integration [9], and cross-border integration [10]. The law of one price [11] have been used in most studies of electricity market integration as the theoretical foundation for determining whether two geographic regions comprise a single market. Robinson [12] studied the prices in ten European countries (Denmark, Finland, France, Germany, Greece, Ireland, Italy, Portugal, Spain and the UK), and concluded that electricity prices had converged. Similarly, Armstrong and Galli [13] analysed the four wholesale electricity markets in the EU, which operate with similar pricing processes and share borders (France, Germany, The Netherlands and Spain), and found that the average price difference decreased in almost all pairs of markets. From this, they inferred that prices in the main continental European markets were converging.

The previous literature provides indications of price convergence and stability for groups of energy markets. The work of De Jonghe et al. [14] examining the effect of market coupling on day-ahead prices in Belgium, France andtThe Netherlands, shows a marked fall in price differences after the coupling. Bosco et al. [15] conclude that average prices in the German and French markets were integrated. Likewise, Huisman and Kilic [16] observed a similarity in the parameter estimates of the Belgian, Dutch, French, German and Nordic prices modeling, and also noted a decrease in the impact of price spikes and volatility. In addition, Bunn and Gianfreda [9], in an analysis of price levels and volatilities, find evidence of increasing market integration between Germany, France, Spain, the Netherlands and the UK.

To create the European Electricity Market, the European Commission (EC) proposed a bottom-up regional approach to integration: starting from regional integration between countries with similar features and moving on to the integrated electricity market as a solution to boost the integration. The Nordic and the Iberian integrated markets are the first inter-country markets with recognized success. The Iberian Electricity Market (MIBEL), fully launched in July 2007, was the result of cooperation between the Portuguese and Spanish Governments with the aim of promoting the integration of both countries' electrical systems. Indeed not only the has made a significant contribution towards establishing an electricity market at the Iberian level, it has also been an important step in establishing an Internal Energy Market at the European level.

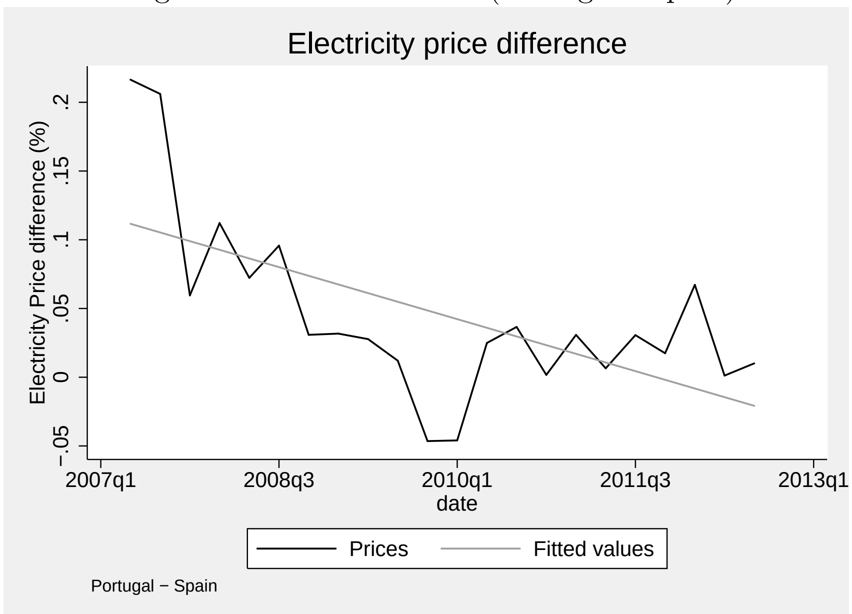
Having the right infrastructure in place is a precondition for completing the energy market, integrating renewables and securing supply [17]. In particular, an effective interconnection is one of the main conditions for achieving a fully integrated electricity market [18, 19]. However, when it comes to Europe's energy networks Spain and Portugal might be considered energy islands due to their isolation. Further, transmission activities are closely related to market design and regulation [20]. The European Network of Transmission System Operators for Electricity [21] reports that the Iberian interconnection flows are higher within the MIBEL area than with its neighbours, France. This stylized fact suggests likely spillovers of EMIs in the path towards a single energy market.

In line with findings in the previous research, Figure 1 shows that the differences between Spanish and Portuguese electricity prices (expressed as a percentage and depicted with the black line) has fallen since the creation of the integrated market MIBEL. Moreover, electricity prices have converged downwards (as shown by the grey line) as indicated by the negative slope of the linear fit of prices. These stylized facts invite us to examine the relationship between EMI and FDI in greater depth.

An EMI has several potential effects on the FDI of countries that have undergone integration. First, as a result of the greater electricity price stability attributable to integration, an increase in the attractiveness for FDI among the countries within the integrated electricity market (as well as from neighbouring countries) can be expected. This effect is augmented by the positive response of FDI to stronger and more credible institutions [23].

Second, given that electricity price harmonisation involves a readjustment of relative prices resulting in greater alignment, the flow of FDI between the two countries is expected

Figure 1: Price Difference (Portugal - Spain)



Source: Based on data from the Iberian electricity market operator (OMIE) and DATAINVEX.

to increase. Furthermore, the increase in FDI can be expected to be higher in the country with the initially higher electricity price (an input price decrease increases the attractiveness of the country for FDI). The aim of this paper is to explain and test these effects of EMI on the FDI of the integrated countries.

We develop a theoretical model and undertake an empirical application on a global dataset including FDI data from 190 countries for the period 2003 to 2012, using the gravity equation. In short, the model includes energy as a production input in a standard Melitz [24] setup. Firms then gauge capital, labour and energy costs in their decision to invest abroad.

The estimation results shows that the electricity market integration between Portugal and Spain in 2007 increased the FDI's participants. The results also show that the increase in FDI flow was greater from Spain to Portugal than vice versa. This appears to confirm that the country with an initially higher electricity price obtains greater gains from the integration in terms of greenfield foreign investments. These findings seem to suggest that, in addition to the effects of energy market integration traditionally indentified by academics and policy makers, electricity market integration facilitates investment flows between the integrated countries. This is of particular relevance when most of the Member States within Europe's internal electricity market have recently started operating under a single price mechanism, as they move closer to achieving the targeted integration.

This article is organized as follows. Section 2 presents the theoretical model regarding the effect of electricity market integration on FDI. Section 3 describes the empirical methodology and the data used to estimate the impact of EMI on FDI. Section 4 presents the results and discussion from our analysis. Finally, section 5 concludes.

2 The model

2.1 Domestic production

Let firm z from country i in a particular sector produce a variety of goods. The aggregate consumption in this sector is the sum of all goods produced. The firm uses three inputs capital K, energy E, and labour L, in the production of the goods x_{ik}. The production is a standard Nerlove's Cobb-Douglas function:

$$x_{iz} = \theta_z (K)^a (E)^b (L)^c, \tag{1}$$

where θ_z is a firm specific productivity parameter. The constants a, b and c measure the intensity with which the inputs are used in production. Let us measure labour in units so that the total amount of labour is $\bar{L} = 1$. Since the total amount of labor is fixed, equation (1) exhibits decreasing returns if $a + b = \mu < 1$.

The firms raises capital locally by negotiating with domestic banks in country i. Each unit of capital comes at a cost of r_i, which reflects the capital and interest costs. Wages in country i are captured by labour costs w_i. Each energy unit has a cost for the firm of e_i, which captures energy costs at home. The firm has a fixed cost of production f and sells its product at prices p_i. Thus, the problem maximization of the firm is:

$$\max_{K,E,L} \pi_{iz}^{Dom} = \max\{p_i\theta_z(K)^a(E)^b(L)^c - r_iK - e_iE - w_iL - f_i\}. \tag{2}$$

In equilibrium the market clears so that $L = 1$ and the firms determines the optimal level of capital investment and energy consumption according to the first-order condition shown in the Appendix.

2.2 Foreign Production

Let the firm consider a horizontal foreign production in country j. The firm faces the following problem:

$$\max_{K,E,L} \pi_{ijz}^{FDI} = \max\{p_{ij}\theta_z(K)^a(E)^b(L)^c - r_jK - e_jE - w_jL - f_j\}. \tag{3}$$

where $p_{ij}$are transfer prices that are assumed to face iceberg-type costs of $p_{ij} = p_j\tau_{ij}$. Transaction costs $\tau_{ij} < 1$ are inversely proportional to the distance between the countries. As in Melitz [24], the firms setups a foreign production plant if $\pi_{ijz}^{FDI} > \pi_{iz}^{Dom}$.
Equation 3 has the first-order conditions of:

$$p_j\tau_{ij}\theta_z aK^{a-1}E^b(L)^c = r_j \tag{4a}$$

$$p_j\tau_{ij}\theta_z aK^aE^{b-1}(L)^c = e_j. \tag{4b}$$

After the labour market clears, the optimal equilibrium for capital and energy yields,

$$K_{ijz}^{*} = \left(\frac{p_j \tau_{ij} \theta_z a \sigma^b}{(r_j)^{1-b} (e_j)^b} \right)^{\frac{1}{1-\mu}} \tag{5a}$$

$$E_{ijz}^{*} = \left(\frac{p_j \tau_{ij} \theta_z b \sigma^{-a}}{(r_j)^{a} (e_j)^{1-a}} \right)^{\frac{1}{1-\mu}}, \tag{5b}$$

where $\sigma = b/a$. This parameter controls the relative intensity of each input. Energy intensive firms ($\sigma > 1$) are relatively more constrained by energy costs than they are by capital costs. Equation (5a) is effectively a gravity equation for foreign capital and shows that foreign capital investment is governed both by capital and energy costs. Foreign investment decreases with transaction costs τ_{ij}, capital costs r_j, and energy costs e_j. The firm gauges these costs to determine the productivity level at which it enters the foreign market [24].

2.3 Energy Market Integration

An energy market integration can be seen as the convergence of energy costs on both sides of the energy border. The energy prices on both sides of the border converge to a single energy price, which is equivalent to the energy costs of both countries. Due to economies of scale and efficiency in a larger energy market, the single energy price is expected to be lower in the long run for both countries after integration. In this setup, the EMI has the following effect on the foreign capital invested:

Proposition. *An energy market integration affects bilateral investment flows between the country members. Foreign direct investment increases in countries which converge to a lower energy cost after the integration.*

Proof. Let the EMI energy costs in country j be a strictly decreasing concave function of time $e(t)$. After the integration, country j converges to a lower energy cost (e_{emi}) than that prevailing before the integration (e_{j0}), that is $\lim_{t\to\infty} e(t) = e_{emi} < e_{j0}$. All other things considered, the change in foreign capital invested by our firm z during the convergence is:

$$\frac{\partial K^*_{ijz}}{\partial t} = \frac{-b}{1-\mu} e'(t) \left(\frac{p_j \tau_{ij} \theta_z a \sigma^b}{(r_j)^{1-b} (e(t))^{b+1+\mu}} \right)^{\frac{1}{1-\mu}}. \tag{6}$$

The variation in capital after the integration is a strictly increasing function, $\partial K^*_{ijz}/\partial t > 0$,since $e'(t) < 0$ for a strictly decreasing concave function. □

Equation 6 reveals the mechanisms by which EMI affects FDI in the short run. The effect is governed by the magnitude of the price reduction, but also by the stability mechanism $e'(t)$. During convergence in the short run, the price variation mechanism prevails over the price magnitude. In the long run, firms reassess their foreign investment options.

2.3.1 Long run

After convergence, the firms only takes into consideration transaction and capital costs in their decision to enter the market. To demonstrate this mechanism, we now allow the firm two possibilities for entering the market: via trade or via FDI. The firm compares the benefits gained from domestic production and the export of its products:

$$\max_{K,E,L} \pi^{EXP}_{ijz} = \max\{p_{ij}\theta_z(K)^a(E)^b(L)^c - r_iK - e_{emi}E - w_iL - f_i\}, \tag{7}$$

with the gain from FDI in equation (3). However, in an energy market integration both (3) and (7) share a common energy cost e_{emi}. Therefore, applying the envelope theorem to equations (3) and (7), the firm decides to invest in country j if and only if

$$K/L < (w_i - w_j)/(r_j - r_i). \tag{8}$$

In equilibrium ($L = 1$), the capital threshold for investing abroad is governed by the differential wage to interest ratio in both countries. In the long run, the EMI removes the energy border between the two countries. Firms no longer consider energy costs a constraint on their decision to invest (i.e., the extensive margin).

However, energy costs still affect the volume of capital invested abroad (i.e., the intensive margin) which is determined by equation (5a). Once integration is achieved, the capital invested is

$$K^*_{ijk} = \begin{cases} \rho \left(\frac{p_j \tau_{ij} \theta_z a \sigma^b}{(r_j)^{1-b} (e_j)^b} \right)^{\frac{1}{1-\mu}} & \text{if } K^*_{ijk} < (w_i - w_j)/(r_j - r_i) \\ 0 & \text{otherwise.} \end{cases} \tag{9}$$

where $\rho = (e_{j0}/e_{emi})^{\frac{b}{1-\mu}} > 1$ is the energy cost markdown after the integration.

In sum, the EMI has an effect on both the extensive and intensive margins. In the next section we describe the estimation procedure to quantify these effects.

3 Empirical methodology and data

The goal of this section is to describe the empirical methodology for estimating the impact of an EMI on FDI. Our model presents a gravity-like equation for foreign capital investments. In equation (9), the capital invested by foreign firms (i.e., foreign direct investment or FDI) increases with demand (prices) and decreases with distance (transaction costs), financial costs (interest rates) and energy costs (energy prices). The most appropriate methodology for measuring the impact of EMI on FDI is, therefore, the gravity equation. Gravity is fully grounded in FDI theory [25, 26] and, consequently, provides an adequate empirical technique for estimating the effect of EMI unequivocally.

Our baseline specification is the following augmented gravity equation:

$$lnFDI_{ijt} = \beta_1 \ln(Y_{it} * Y_{jt}) + \beta_2 \ln(D_{ij}) + \beta_3 border_{ij} + \beta_4 colony_{ij} + \beta_5 lang_{ij} + \beta_6 smctry_{ij} + \beta_7 rel_{ij} + \beta_8 locked_{ij} + \beta_{10} BIT_{ijt} + \beta_{11} FTA_{ijt} + \beta_{12} crisis_{ijt} + \rho_1 EMI_{ijt} + \rho_2 EMIROW_{ijt} + \rho_3 EMIFRA_{ijt} + \lambda_t + \lambda_i + \lambda_j + \varepsilon_{ijt}, \quad (10)$$

where FDI_{ijt} is the aggregate investment, and total number of investments, between home country i and host j in year t. The equation measures market demand through a number of variables; Y denotes the domestic gross product (GDP); D is the distance in kilometers between countries; *border* takes a value of one when the countries share a common border and zero otherwise; *colony* is set at 1 if the two countries have ever had a colonial link; *lang* (Common language) takes a value of 1 if both countries share the same official language; *smctry* (Same country) is a dummy that indicates whether both countries where part of the same country in the past; *rel* (Religion) is a composite index which measures the religious affinity between country pairs with values ranging from zero to one; and *locked* is the number of landlocked countries (0,1 or 2). *BIT* (Bilateral Investment Treaty) is a dummy that takes a value of one if the country pair has a bilateral investment treaty in force; *FTA* (Free Trade Agreement) is a dummy that indicates whether both countries have a free trade agreement in force. The dummy variable *crisis* is the number of countries in the pair (0,1,2) with credit constraints during year t. This variable captures the impact of capital costs. *EMI* is a dummy set at 1 for investments between the countries that signed an EMI (Spain and Portugal since 2007) and captures the effect within the *EMI*; *EMIROW* captures the effect of the FDI from the rest of the world within the EMI area with a dummy set at a value of 1 for all source countries that invested in the EMI area, excluding neighboring countries; EMIFRA specifically captures the effect of neighboring countries with a direct energy connection to the EMI area with a dummy set a at value of

1 if a neighboring country (France) invested in the EMI area. The baseline specification includes a full set of country and time fixed effects (λ). Lastly e_{ijt} represents a stochastic error term.

The baseline gravity equation (10) suffers from several biases. In the first instance, theoretical developments of the gravity equation show that the benchmark equation is misspecified due to the omission of time-varying multilateral resistance terms. Secondly, the log version of the gravity equation has a self-selection bias, which stems from the omission of zeros. Thirdly, the estimation of FDI capital expenditure flows suffers a potential over-aggregation bias. To combat theses biases, we adopt different empirical strategies.

Since Anderson and Van Wincoop's [2003] seminal solution to McCallum's [1995] border puzzle, multilateral resistance has been standard in all gravity specifications, including gravity estimates of bilateral FDI Anderson [29]. Multilateral resistance is commonly interpreted as the sellers' incidence of trade costs from origin i and the buyers' incidence from destination j. The buyers' and sellers' incidence measures are usefully explained as the incidence of Total Factor Productivity (TFP) frictions. Therefore, multilateral resistance varies substantially by country because of changing expenditure and supply shares Anderson and Yotov [30]. TFP may vary with time in each country, thus Baldwin and Taglioni [31] note that country fixed effects (CFE) are more appropriate in cross-sectional data. To capture dynamic TFP, the gravity equation is accompanied with the interaction of time and CFE dummies Baier and Bergstrand [32]. The specialized literature refers to these estimates as country-year fixed effects (CYFE).

In the EMI framework, the CYFE represents an additional gain. Independent variables which are time varying and fixed per country (i.e. GDPs, institutional quality indicators, population, market size) are perfectly controlled with CYFE. Hence, with CYFE we control unobservable country specific variables that might affect the aforementioned bilateral FDI.

An additional caveat of the baseline equation (10) is its incompatibility with zeros in the right-hand side. Our theoretical framework included zeros in the amount of capital invested for firms under the threshold determined by equation (8). Zeros are not uncommon in the gravity model. Gravity data is characterized by numerous zeros in the dependent variable, which contain important information [33]. To overcome this caveat, we use a non-linear variant of the gravity equation in line with that proposed by Silva and Tenreyro [34], which does not require a log-linearization of the variables:

$$FDI_{ijt} = exp \begin{pmatrix} \beta_1 \ln(Y_{it} * Y_{jt}) + \beta_2 \ln(D_{ij}) + \beta_3 border_{ij} + \beta_4 colony_{ij} + \\ \beta_5 lang_{ij} + \beta_6 smctry_{ij} + \beta_7 rel_{ij} + \beta_8 locked_{ij} + \\ \beta_{10} BIT_{ijt} + \beta_{11} FTA_{ijt} + \beta_{12} crisis_{ijt} + \\ \rho_1 EMI_{ijt} + \rho_2 EMIROW_{ijt} + \rho_3 EMIFRA_{ijt} + \lambda_t + \lambda_i + \lambda_j \end{pmatrix} + \varepsilon_{ijt} \quad (11)$$

We apply Pseudo-Poisson Maximum likelihood (PPML) to estimate (11). PPML offers additional advantages to the log-linear specification. First, it is robust to heteroskedascity in the error term (Silva and Tenreyro, 2010). Second, it ensures the convergence of the maximum likelihood estimation by prior inspection of the data Silva and Tenreyro [35]. Additionally, Baltagi et al. [36] claim that the PPML estimator is appropriate for panel gravity data.

Our empirical strategy would not be complete without the estimation of the extensive margin. We follow similar studies [37, 38] and substitute the right-hand side variable for the number of foreign investments between country pairs. The estimation of the extensive margin reduces an over aggregation bias of capital flows in the estimation of the gravity equation Hillberry [39]. Additionally, the extensive margin reveals information about the creation of new partners Felbermayr and Kohler [40]. We expect a positive estimates of $\hat{\rho}_1$ for the extensive margin also.

3.1 Data

The Financial Times Ltd. cross-border investment monitor [41] is the source of the FDI dataset. The extensive margin is measured in firm-level projects counts, while the intensive margin is measured in capital flows in constant 2005 USD. The dataset covers bilateral firm-level greenfield investments from 2003 to 2012, aggregated between 190 countries. Greenfield projects initiate foreign production from scratch and are prone to to energy costs constrains. Consequently, greenfield investments are optimal for measuring the influence of EMI on FDI.

Overall, the database is heavily unbalanced with 70% of zero observations, meaning that not all countries received investment in all years. The World Bank [2013] is the source of GDP data, measured in constant 2005 US dollars. Distance, common language, colony and border come from the CEPII [43] database and control for freight, information, cultural, historic and administrative transaction costs between country pairs.

Religion is calculated with data from the CIA World Factbook [44] according to the following formula for country each country pair: $\%Christian_i * \%Christian_j + \%Muslim_i * \%Muslim_j + \%Hindu_i * + \%Jewish_i * \%Jewish_j$. Institutional agreements such as Free Trade Agreements and Bilateral Investment Treaties reduce the foreign investments uncertainty [45]. BITs are manually constructed with data from UNCTAD [46]. The source of FTA is Head, Mayer, and Ries [47] in conjunction with UNCTAD [46].

The source of banking crises is Laeven and Valencia [48]. We include this variable because the MIBEL integration period overlaps with that of the great recession period. Hence, to ensure that we are not capturing any spurious effects, we follow the procedure described in Gil-Pareja et al. [38]. For a detailed description of the variables, countries and descriptive statistics, see Paniagua and Sapena [49, 37].

4 Results and discussion

To evaluate the effect of the creation of MIBEL on FDI we performed two sets of estimations of equations (10) and (11) for both the intensive and the extensive margins. The results reported in Table 1 show that the gravity equation performs well when explaining bilateral FDI. The R^2 values are acceptable (over 80% for the extensive margin) and most of the variables of interest are significant and present the expected signs.

In the first set of estimations presented (see Table 1), we evaluate the overall effect of the creation of the EMI on the FDI, while in the second set of estimations (see Table 2) we decomposed the effect for the countries integrated so as to appreciate more fully the intensity of the effects on investment flows in two directions (i.e. from Spain to Portugal and from Portugal to Spain).

Results from the first set of estimations of the two equations confirm that the creation of an integrated electricity market between Spain and Portugal exerted a significant and positive effect on the countries' FDI, both for the intensive and extensive margins (see Table 1). The most conservative estimates indicate that the EMI increased bilateral capital investment in Iberia by 274% on average[1]. Furthermore, the EMI had a positive effect on the creation of new foreign projects by a similar but higher magnitude (295%).

It should be stressed that the effect of the EMI was similar for both margins. If we look beyond the number of investment projects, the scale of these was significantly affected by the implementation of a common input market. Additionally, the results from the extensive margin regressions show that FDI from neighboring countries also increased after integration.

The positive effect of EMI is consistent and robust across the several specifications we tested. Furthermore, we manage to isolate the effect of EMI from those of the Great Recession. Several studies have shown that FDI has been affected by credit constraints

[1]Calculated by $(e^{1.318} - 1) * 100\%$

Table 1: Results

	Intensive Margin			Extensive Margin		
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(Y_{it} \cdot Y_{jt})$	0.399***	-0.260		0.232***	-0.372	
	(0.147)	(0.248)		(0.0621)	(0.305)	
$\ln(D_{ij})$	-0.423***	-0.340***	-0.257***	-0.251***	-0.368***	-0.304***
	(0.0407)	(0.0560)	(0.0498)	(0.0222)	(0.0343)	(0.0401)
$border_{ij}$	0.0949	0.00509	0.217*	0.0558	-0.172**	0.0224
	(0.0909)	(0.132)	(0.123)	(0.0520)	(0.0709)	(0.0722)
$lang_{ij}$	0.556***	0.521***	0.495***	0.423***	0.643***	0.623***
	(0.0909)	(0.109)	(0.0890)	(0.0593)	(0.0817)	(0.0701)
col_{ij}	0.171**	0.490***	0.423***	0.172***	0.509***	0.377***
	(0.0763)	(0.110)	(0.0838)	(0.0446)	(0.0593)	(0.0580)
$smctry_{ij}$	0.173	0.409*	0.177	0.155	0.595***	0.181
	(0.169)	(0.245)	(0.210)	(0.0948)	(0.145)	(0.114)
rel_{ij}	0.500***	0.833***	0.122	0.227***	0.401***	-0.120
	(0.124)	(0.230)	(0.195)	(0.0606)	(0.130)	(0.154)
$locked_{ij}$	-0.00161	-0.119	-0.182**	0.00826	-0.0693	-0.108*
	(0.0584)	(0.0918)	(0.0890)	(0.0306)	(0.0560)	(0.0614)
BIT_{ijt}	-0.165***	-0.103	-0.116	-0.103***	-0.00809	-0.0202
	(0.0514)	(0.0742)	(0.0728)	(0.0280)	(0.0444)	(0.0558)
FTA_{ijt}	-0.00590	0.230**	0.162*	0.00896	0.250***	0.239***
	(0.0767)	(0.108)	(0.0913)	(0.0419)	(0.0697)	(0.0719)
$crisis_{ijt}$	0.0274	-0.0212	-3.404***	0.0194	-0.0780***	-4.026***
	(0.0492)	(0.0571)	(0.876)	(0.0190)	(0.0249)	(0.467)
$EMIROW_{ijt}$	0.148	-0.287	-0.943	-0.0148	-0.165	0.311
	(0.176)	(0.255)	(0.947)	(0.0773)	(0.149)	(0.524)
$EMIFRA_{ijt}$	0.737	0.402	-0.241	0.598	0.908***	1.346**
	(0.579)	(0.308)	(0.942)	(0.496)	(0.186)	(0.530)
EMI_{ijt}	0.495**	1.318***	1.318***	0.495*	1.431***	1.373***
	(0.245)	(0.311)	(0.295)	(0.258)	(0.305)	(0.382)
Observations	14176	38836	38253	14176	38836	38253
R^2	0.288	0.443	0.514	0.550	0.781	0.864
Method	OLS	PPML	PPML	OLS	PPML	PPML
Year FE	Yes	Yes		Yes	Yes	
Country FE	Yes	Yes		Yes	Yes	
*Country*Year FE*			Yes			Yes

Robust standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

following the 2007 crisis [38, 50]. The unfortunate coincidence in time of the two events is controlled by the negative coefficient of the crisis dummy in the regressions.

The EMI does not, however, appear to have affected FDI from the rest of the world. This seems to be capturing the fact that, relative to other EU markets, the falls in electricity prices within the EMI might not have been sufficient to attract any significant volume of this type of investments from the the rest of the world to the Iberian peninsula[2]. France, the neighboring country, is an exception in this regard, because since the creation of MIBEL French enterprises have increased their new projects by 148% on average. The volume invested by French firms is remains unchanged.

Results from Table 2 show the direction of FDI flows. The theory underlying a gravity-like specification provides predictions on unidirectional bilateral trade rather than on two-way bilateral trade[3]. In this paper, we use unidirectional FDI data (i.e, $FDI_{ij} \neq FDI_{ji}$). Our specification is not only more closely grounded in theory; it allows us to inspect the direction effect attributable to the MIBEL.

The estimated increase in FDI flows is stronger from Spain to Portugal than vice versa. These results seem to confirms that although both countries obtained benefits from the integration in terms of greenfield foreign investments, it is the country with the initially higher electricity price that obtains the highest gains. As for the effects on FDI from the neighboring country, our results are in line with the previous estimations. Thus,the EMI has a positive and significant impact on extensive margin FDI from France to both Spain and Portugal.

[2]Although the MIBEL price has significantly decreased during the period cover in this study, around 28% until 2012, by that year while the Iberian price was 49 €/MWh on average, the price in other European regional markets was lower, for instance 45 €/MWh in PHELIX and 31 €/MWh in NordPool markets.

[3]Some authors treat the average of two-way bilateral trade as the dependent variable (e.g., Rose 51). Baldwin and Taglioni [31] referred to this procedure as the silver medal mistake.

Table 2: Results Within EMI

	Intensive Margin		Extensive Margin	
	(1)	(2)	(3)	(4)
$EMIROW_{ijt}$	-0.293	-0.223	-0.167	0.809
	(0.254)	(0.924)	(0.148)	(0.515)
$EMIFRA_{ijt}$	0.402	-1.000	0.905***	1.931***
	(0.303)	(0.910)	(0.182)	(0.533)
$POR \rightarrow ESP$	1.154***	0.908**	1.014**	0.861**
	(0.340)	(0.357)	(0.402)	(0.426)
$ESP \rightarrow POR$	1.358***	1.716***	1.722***	1.928***
	(0.469)	(0.276)	(0.227)	(0.204)
Observations	38253	36796	38253	36796
R^2	0.514	0.481	0.864	0.890
Year FE	Yes		Yes	
Country FE	Yes		Yes	
*Country*Year FE*		Yes		Yes

Robust standard errors in parentheses. PPML estimation.
Only variables of interest are reported.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5 Conclusions

This paper contributes to a better understanding of the relation between energy and international economics. Specifically, we have developed a model to explain the mechanisms by which EMI is related FDI. EMI alleviates the energy costs in the foreign financial market, thus encouraging FDI. We tested the model's predictions using the gravity equation and the EMI created by Portugal and Spain in 2007.

The paper's findings provide a number of insights into the economic implications of electricity markets integration. Specifically, the members of the integrated markets increase their bilateral investment, while the investments of neighboring countries also increase. However, FDI from the rest of the world remains unchanged.

This paper suggests that energy market design and the way in which such markets operate have a direct effect on the cost-driven investment choices made by foreign firms, via energy prices. Thus, we identify additional policy implications that, in fact, extend beyond the energy sector and which have an effect on the whole of the economy. The expected effects of EMI require an effective energy market interconnection with sufficient cross-border energy interconnections. Our results point to the need to reformulate the methodology used in assessing cross-border priority energy investment plans so as to include the positive impact on FDI in the cost-benefits analysis.

Furthermore, major public investment plans in energy infrastructure (e.g., the current EU Commission's programme) are expected to have a greater impact on the Member States' economies than initially thought. Likewise, and from a broader perspective, the results from this paper suggest that the participation of supra-national financial institutions would be helpful in other contexts, such as the MENA or Latin American countries, in providing soft loan and/or financial facilities for investment to accommodate the infrastructure required by the EMI and its effects on FDI.

In short, the policy implications derived from this study stress the importance of considering the broader effects of energy market design. Moreover, future research of other single electricity markets and related features (i.e., domestic investment) is certainly encouraged.

A Appendix

A.1 Domestic Production

Equation (2) has the first order conditions of:

$$p_i \theta_z a K^{a-1} E^b L^c = r_i \tag{A.12a}$$

$$p_i \theta_z b K^a E^{b-1} L^c = p_j^E. \tag{A.12b}$$

After some math, the optimal demand for capital and energy yields,

$$K_{ik}^* = \left(\frac{p_i \theta_z a \sigma^b}{(r_i)^{1-b} (e_i)^b} \right)^{\frac{1}{1-\mu}} \tag{A.13a}$$

$$E_{ik}^* = \left(\frac{p_i \theta_z b \sigma^{-a}}{(r_i)^a (e_i)^{1-a}} \right)^{\frac{1}{1-\mu}}, \tag{A.13b}$$

Equations A.13a and A.13b show that domestic capital and energy input demand increase with prices (demand) and decrease with financial and energy costs.

References

[1] Aad Correlje and Coby Van der Linde. Energy supply security and geopolitics: a European perspective. *Energy Policy*, 34(5):532–543, 2006.

[2] Jean-Michel Glachant. *Electricity reform in Europe: towards a single energy market.* Edward Elgar Publishing, 2009. ISBN 1848446055.

[3] Bernhard Mahlberg and Thomas Url. Effects of the single market on the Austrian insurance industry. *Empirical Economics*, 28(4):813–838, 2003.

[4] Maria Jesus Herrerias, Ana Cuadros, and Vicente Orts. Energy intensity and investment ownership across Chinese provinces. *Energy Economics*, 36:286–298, 2013.

[5] M. J. Herrerias, A. Cuadros, and D. Luo. Foreign versus indigenous innovation and energy intensity: Further research across Chinese regions. *Applied Energy*, 2015.

[6] Hsiao-Tien Pao and Chung-Ming Tsai. Multivariate Granger causality between CO 2 emissions, energy consumption, FDI (foreign direct investment) and GDP (gross domestic product): evidence from a panel of BRIC (Brazil, Russian Federation, India, and China) countries. *Energy*, 36(1):685–693, 2011.

[7] Georg Zachmann. Electricity wholesale market prices in europe: Convergence? *Energy Economics*, 30(4):1659 – 1671, 2008.

[8] Erik Lindstrom and Fredrik Regland. Modeling extreme dependence between european electricity markets. *Energy Economics*, 34(4):899 – 904, 2012.

[9] Derek W. Bunn and Angelica Gianfreda. Integration and shock transmissions across european electricity forward markets. *Energy Economics*, 32(2):278 – 291, 2010.

[10] Jacint Balaguer. Cross-border integration in the european electricity market. evidence from the pricing behavior of norwegian and swiss exporters. *Energy Policy*, 39(9):4703 – 4712, 2011.

[11] A.F. Fetter. The economic law of market areas. *The Quarterly Journal of Economics*, 3(38):520–529, 1924.

[12] Terry Robinson. The convergence of electricity prices in europe. *Applied Economics Letters*, 14(7):473–476, 2007.

[13] M Armstrong and A Galli. Are day-ahead prices for electricity converging in continental europe? an exploratory data approach. *CERNA Working Paper*, 2005.

[14] C. De Jonghe, L. Meeus, and R. Belmans. Power exchange price volatility analysis after one year of trilateral market coupling. *International Conference on European Electricity Markets*, 2008.

[15] Bruno Bosco, Lucia Parisio, Matteo Pelagatti, and Fabio Baldi. Long-run relations in european electricity prices. *Journal of Applied Econometrics*, 25(5):805–832, 2010.

[16] Ronald Huisman and Mehtap Kilic. A history of european electricity day-ahead prices. *Applied Economics*, 45(18):2683–2693, 2013.

[17] European Commission. COM(2015) 80. Energy Union Package. A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy, 2015. URL `http://ec.europa.eu/priorities/energy-union/docs/energyunion_en.pdf`.

[18] Alex Jacottet. Cross-border electricity interconnections for a well-functioning EU Internal Electricity Market. *Oxford Institute for Energy Studies. Oxford Energy Comment*, pages 1–17, 2012. URL `http://www.oxfordenergy.org/wpcms/wp-content/uploads/2012/06/Cross-border-electricity-interconnections.pdf`.

[19] Micaela Del Monte. *The Cost of Non-Europe in the Single Market for Energy*. European Added Value Unit, European Parliament, 2013. ISBN 9789282348321. URL `http://www.europarl.europa.eu/committees/en/studiesdownload.html?languageDocument=EN&file=93441`.

[20] Tooraj Jamasb and Michael Pollitt. Electricity market reform in the European Union: review of progress toward liberalization & integration. *The Energy Journal*, 26:11–41, 2005.

[21] ENTSO. European network of transmission system operators for electricity, 2015. URL `www.entsoe.eu`.

[22] DATAINVEX. Ministerio de Industria, Turismo y Comercio, 2013. URL `www.datainvex.comercio.es`.

[23] Joshua Aizenman and Mark M. Spiegel. Institutional Efficiency, Monitoring Costs and the Investment Share of FDI*. *Review of International Economics*, 14(4):683–697, 2006.

[24] Marc Melitz. The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 71(6):1695–1725, 2003.

[25] Jeffrey H. Bergstrand and Peter Egger. A knowledge-and-physical-capital model of international trade flows, foreign direct investment, and multinational enterprises. *Journal of International Economics*, 73(2):278–308, 2007.

[26] R. Portes and H. Rey. The determinants of cross-border equity flows. *Journal of international Economics*, 65(2):269–296, 2005.

[27] James E. Anderson and Eric Van Wincoop. Gravity with gravitas: a solution to the border puzzle. *The American Economic Review*, 93(1):170–192, 2003. ISSN 0002-8282.

[28] J. McCallum. National borders matter: Canada-US regional trade patterns. *The American Economic Review*, 85(3):615–623, 1995.

[29] J. E. Anderson. The gravity model. *Annual Review of Economics*, 3:133–160, 2011.

[30] James E. Anderson and Yoto V. Yotov. The changing incidence of geography. *The American Economic Review*, 100(5):2157–2186, 2010.

[31] Richard Baldwin and Daria Taglioni. *Gravity for dummies and dummies for gravity equations*. NBER Working Paper No. 12516, 2006.

[32] Scott L. Baier and Jeffrey H. Bergstrand. Estimating the effects of free trade agreements on international trade flows using matching econometrics. *Journal of International Economics*, 77(1):63–76, 2009.

[33] Ronald B Davies and Helga Kristjánsdóttir. Fixed Costs, Foreign Direct Investment, and Gravity with Zeros. *Review of International Economics*, 18(1):47–62, February 2010. ISSN 1467-9396. URL `http://onlinelibrary.wiley.com/doi/10.1111/j.1467-9396.2009.00864.x/abstract?userIsAuthenticated=false&deniedAccessCustomisedMessage=`.

[34] J. M. C. S. Silva and S. Tenreyro. The log of gravity. *The Review of Economics and Statistics*, 88:641–658, 2006.

[35] J. M. C. Santos Silva and Silvana Tenreyro. poisson: Some convergence issues. *Stata Journal*, 11(2):207–212, 2011.

[36] Badi H. Baltagi, Peter Egger, and Michael Pfaffermayr. Panel data gravity models of international trade. In Badi H. Baltagi, editor, *The Oxford Handbook of Panel Data*. Oxford University Press, December 2014. ISBN 9780199940042.

[37] J. Paniagua and J. Sapena. Is FDI doing good? a golden rule for FDI ethics. *Journal of Business Research*, 67:807–812, 2014.

[38] Salvador Gil-Pareja, Rafael Llorca-Vivero, and Jordi Paniagua. The effect of the great recession on foreign direct investment: global empirical evidence with a gravity approach. *Applied Economics Letters*, 20(13):1244–1248, 2013.

[39] R. Hillberry. Aggregation bias, compositional change, and the border effect. *Canadian Journal of Economics*, 35(3):517–530, 2002.

[40] G. J Felbermayr and W. Kohler. Exploring the intensive and extensive margins of world trade. *Review of World Economics*, 142(4):642–674, 2006.

[41] FDIMarkets. FDI markets - the financial times ltd, 2013. URL `http://www.fdimarkets.com`.

[42] World Bank. World bank open data, 2013. URL `www.worldbank.org`.

[43] CEPII. Centre d'études prospectives et d'informations internationales, 2011. URL `http://www.cepii.fr`.

[44] CIA World Factbook. Central intelligence agency, 2011. URL `www.cia.gov/library/publications/the-world-factbook/`.

[45] Jeffrey H. Bergstrand and Peter Egger. What determines BITs? *Journal of International Economics*, 90(1):107–122, 2013.

[46] UNCTAD. United nations conference on trade and development, 2013. URL `www.unctad.org`.

[47] Keith Head, Thierry Mayer, and John Ries. The erosion of colonial trade linkages after independence. *Journal of International Economics*, 81(1):1–14, 2010.

[48] Luc Laeven and Fabián Valencia. Systemic banking crises database. *IMF Economic Review*, 61(2):225–270, June 2013. ISSN 2041-4161. doi: 10.1057/imfer.2013.12.

[49] J. Paniagua and J. Sapena. The ethics of foreign knowledge brokers: a conceptual and empirical framework. *European J. International Management*, 7:333–349, 2013.

[50] Jordi Paniagua and Juan Sapena. Do credit constraints reduce foreign jobs? A note on foreign direct employment. *Applied Economics Letters*, 22(3):195–198, 2015.

[51] Andrew K. Rose. One money, one market: the effect of common currencies on trade. *Economic Policy*, 15(30):7–46, 2000. ISSN 1468-0327.

2011

2011/1, Oppedisano, V; Turati, G.: "What are the causes of educational inequalities and of their evolution over time in Europe? Evidence from PISA"
2011/2, Dahlberg, M; Edmark, K; Lundqvist, H.: "Ethnic diversity and preferences for redistribution"
2011/3, Canova, L.; Vaglio, A.: "Why do educated mothers matter? A model of parental help"
2011/4, Delgado, F.J.; Lago-Peñas, S.; Mayor, M.: "On the determinants of local tax rates: new evidence from Spain"
2011/5, Piolatto, A.; Schuett, F.: "A model of music piracy with popularity-dependent copying costs"
2011/6, Duch, N.; García-Estévez, J.; Parellada, M.: "Universities and regional economic growth in Spanish regions"
2011/7, Duch, N.; García-Estévez, J.: "Do universities affect firms' location decisions? Evidence from Spain"
2011/8, Dahlberg, M.; Mörk, E.: "Is there an election cycle in public employment? Separating time effects from election year effects"
2011/9, Costas-Pérez, E.; Solé-Ollé, A.; Sorribas-Navarro, P.: "Corruption scandals, press reporting, and accountability. Evidence from Spanish mayors"
2011/10, Choi, A.; Calero, J.; Escardíbul, J.O.: "Hell to touch the sky? Private tutoring and academic achievement in Korea"
2011/11, Mira Godinho, M.; Cartaxo, R.: "University patenting, licensing and technology transfer: how organizational context and available resources determine performance"
2011/12, Duch-Brown, N.; García-Quevedo, J.; Montolio, D.: "The link between public support and private R&D effort: What is the optimal subsidy?"
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2011/17, Lin, C.: "Give me your wired and your highly skilled: measuring the impact of immigration policy on employers and shareholders"
2011/18, Bianchini, L.; Revelli, F.: "Green polities: urban environmental performance and government popularity"
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2011/20, Bogliacino, F.; Piva, M.; Vivarelli, M.: "The impact of R&D on employment in Europe: a firm-level analysis"
2011/21, Tonello, M.: "Mechanisms of peer interactions between native and non-native students: rejection or integration?"
2011/22, García-Quevedo, J.; Mas-Verdú, F.; Montolio, D.: "What type of innovative firms acquire knowledge intensive services and from which suppliers?"
2011/23, Banal-Estañol, A.; Macho-Stadler, I.; Pérez-Castrillo, D.: "Research output from university-industry collaborative projects"
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2011/28, Simón, H.; Ramos, R.; Sanromá, E.: "Occupational mobility of immigrants in a low skilled economy. The Spanish case"
2011/29, Piolatto, A.; Trotin, G.: "Optimal tax enforcement under prospect theory"
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2011/31, García-Quevedo, J.; Pellegrino, G.; Vivarelli, M.: "The determinants of YICs' R&D activity"
2011/32, Goodspeed, T.J.: "Corruption, accountability, and decentralization: theory and evidence from Mexico"
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2011/34, Jofre-Monseny, J.; Sorribas-Navarro, P.; Vázquez-Grenno, J.: "Welfare spending and ethnic heterogeneity: evidence from a massive immigration wave"
2011/35, Lyytikäinen, T.: "Tax competition among local governments: evidence from a property tax reform in Finland"
2011/36, Brülhart, M.; Schmidheiny, K.: "Estimating the Rivalness of State-Level Inward FDI"
2011/37, García-Pérez, J.I.; Hidalgo-Hidalgo, M.; Robles-Zurita, J.A.: "Does grade retention affect achievement? Some evidence from Pisa"
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2012

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2012/32, Kappeler, A.; Solé-Ollé, A.; Stephan, A.; Välilä, T.: "Does fiscal decentralization foster regional investment in productive infrastructure?"
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2013

2013/1, Sánchez-Vidal, M.; González-Val, R.; Viladecans-Marsal, E.: "Sequential city growth in the US: does age matter?"
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2013/22, Lin, J.: "Regional resilience"
2013/23, Costa-Campi, M.T.; Duch-Brown, N.; García-Quevedo, J.: "R&D drivers and obstacles to innovation in the energy industry"

2013/24, Huisman, R.; Stradnic, V.; Westgaard, S.: "Renewable energy and electricity prices: indirect empirical evidence from hydro power"
2013/25, Dargaud, E.; Mantovani, A.; Reggiani, C.: "The fight against cartels: a transatlantic perspective"
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