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Corporate taxes and the location of FDI in Europe using firm-level data

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Abstract:

European countries are facing an ever-increasing competition for Foreign Direct Investment (FDI). This paper studies how corporate taxes affect the location of FDI in Europe. Firm-level data is used to estimate a conditional logit model. We start by analysing the impact of the level and volatility of three different tax rates on FDI. Next, we investigate how economic and monetary integration influences the effect of taxes on FDI. The interaction between taxes and the upward and downward cycles of FDI is also studied. Finally, we focus on how the impact of taxes depends on project characteristics. We conclude that taxes play a significant role in attracting FDI, but the issues analysed imply that there are some nuances in this relation, many of which can be relevant for policy makers.

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1. Introduction

Since the second half of the 20th century and especially after 1980, Foreign Direct Investment (FDI) became increasingly important in the world and particularly in Europe. The FDI inflows to European countries had an overall positive trend between 1990 and 2009, but with large oscillations (see Figure 1). The rapid growth of the late 1990's led to a peak in 2000, when the value of FDI inflows to Europe was 5 times the value of 1997. The subsequent trough only occurred in 2004; after that it peaks in 2007, being the value of FDI inflows in 2007 approximately 5 times the value of 2004. In the last two years of the period in question Europe also reveals a severe decrease in FDI.

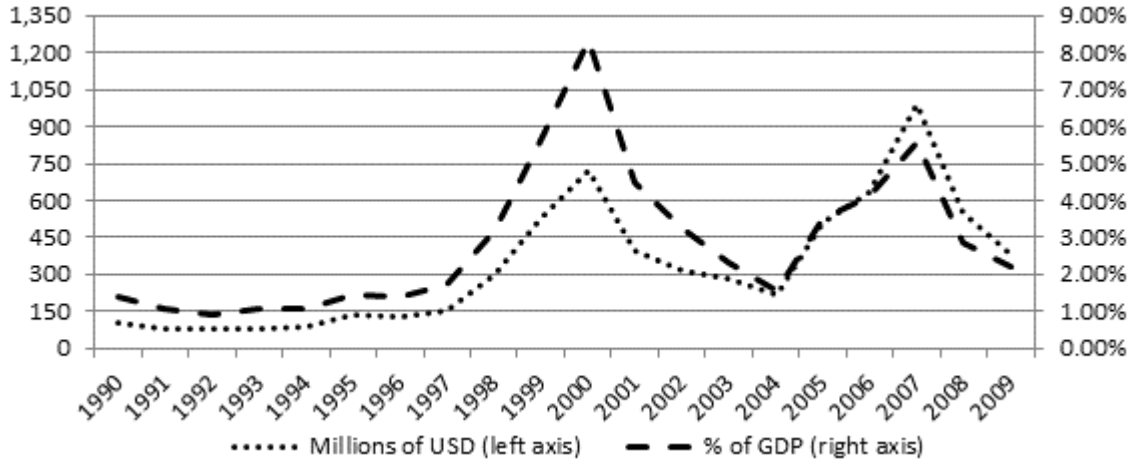
Notice that Europe is one of the largest destinations of FDI worldwide having received approximately 43% of the total world inflows of FDI between 1990 and 2009. Despite this, European countries have tried to maintain their attractiveness regarding FDI, given the increasing competition of emerging countries. In that regard, governments have to take into account that FDI motivations to choose a given location can be grouped in four categories: natural resource seeking, market seeking, efficiency seeking and strategic asset or capability seeking (Dunning, 1980). The most consensual FDI determinants arising from those motivations are market size, labour costs, economic growth, international trade, agglomeration effects and corporate taxes.

Analysing these determinants in terms of governmental policies regarding FDI, corporate taxes emerge as an instrument with the most immediate effects. Arguably, the use of this instrument to attract FDI may explain why along the last decades corporate tax rates have significantly declined around the world.[1] In a general perspective, Devereux et al. (2008) acknowledge that the average tax rate amongst the OECD countries in early 1980s was nearly 50% and by 2001 fell under 35%. According to the tax data used in this paper, provided by Overesch and Rincke (2008), the average corporate tax rate (measured by the statutory tax rate, i.e. the legally imposed tax rate) for 29 European countries has fallen from 33.4% in 1998 to 25.1% in 2006.

Although there is a generalized notion that corporate taxes may be an important determinant of FDI, the empirical literature presents diverse results. Devereux and Griffith (2002) state that "there is some evidence that taxes affect firm's location and investment decisions, although we do not have a very good idea about the size of this effect". Differences in results arise essentially from different measures of tax rates, FDI data and econometric methods.

[1] Some authors studied the relation between the decline in tax rates and the increasing capital market integration, and ended up investigating if countries compete over corporate tax rates (see for example Haufler and Wooton, 1999; Devereux et al., 2008; Karkalakos and Makris, 2008; Overesch and Rincke, 2009). There is a clear notion that countries have lowered their corporate tax rates in response to increasing capital market integration. However, the literature has found it hard to explain why and how exactly countries do in fact adjust their tax systems (Overesch and Rincke, 2009).

Figure 1 – FDI inflows to Europe



Source: Data from UNCTAD and authors' graph.

This paper contributes to the literature in three ways. Firstly, it uses a nine years (1998 to 2006) firm-level dataset consisting of 20,886 worldwide projects of real investment hosted in 29 European countries. This contrasts with majority of the studies seen in the literature that use national aggregate statistics. Besides that, the analysed period is rather interesting, since it embraces two periods of great FDI expansion interrupted by an abrupt descent. We take advantage of this to investigate whether these cycles influence the impact of taxes on FDI. Also during the same period, corporate tax rates have shown a strong declining tendency. Secondly, this paper evaluates whether the presence of a country in favoured economic areas, like the European Monetary Union (EMU), affects the impact of corporate taxes on the location of FDI. Finally, it analyses how the response of FDI to taxes depends on specific project characteristics, such as the sector, technology and capital intensity.

The empirical analysis uses three measures of corporate taxation, but focuses on the effective average tax rate which is deemed in the literature as the most appropriated to explain FDI location decisions (Devereux and Griffith, 1998).[2] This paper also investigates if tax rates' volatility has an impact on FDI.

The project-level dataset is used to estimate a conditional logit model, which allows us to conclude that if the host country's effective tax rate decreases by one percentage point (pp.), the odds ratio of this country receiving an FDI project increases by about 3.1%.[3]

Since FDI has positive effects on the host economy (Borensztein et al., 1998), our results should be of major interest for policy makers, in particular our sectorial analysis of FDI. In this regard, recall the experience of Ireland and the Netherlands, which are known for their enormous success attracting FDI, particularly in the services activities. These case studies were made possible, partially, by a strong fiscal stimulus. On the other hand, our results should be

[2] The EATR is an estimation of the tax level that a firm effectively faces taking into account all the aspects of the tax code, as for example fiscal benefits and deductions.

[3] The odds ratio is equal to the probability of locating in the country divided by the probability of not locating in the country, i.e. $odds\ ratio = p/(1-p)$.

useful for multinational companies investing in Europe, as they represent a benchmark of multinationals' behaviour.

The remainder of this paper is structured as follows. Section 2 presents a review of the literature on corporate taxes and FDI. Section 3 describes the data used in the empirical work. Section 4 explains the econometric approach. Section 5 presents and discusses the empirical results. Finally, Section 6 concludes.

2. A revision of selected literature on corporate taxes and FDI

One of the first authors studying the effect of corporate taxes on FDI was Hartman (1984) and since then the literature has grown substantially. For an extensive survey see, for example, de Mooij and Ederveen (2003). Hartman's study concludes that taxes negatively affect investments based on retained earnings, while they do not affect FDI based on new transfers. Hartman's research had some limitations and a series of researchers soon followed, trying to test his findings.

Slemrod (1990), using effective tax rates, concludes that corporate taxes do in fact repel FDI in general and, particularly, the FDI based on transfer of funds, contradicting Hartman's findings. Slemrod adds that, regarding the parent country's system of dealing with double taxation (exemption or credit), there is no evidence that it is a relevant determinant of FDI.

These two papers were part of a first body of literature, devoted to the study of inward FDI in the US using aggregate data on FDI, which has its certain limitations. In particular, aggregate data on FDI include investments such as mergers and acquisitions (M&A) which involve an ownership decision and hardly a real investment decision. Auerbach and Hasset (1993) argue that real and financial investments may be differently affected by taxes, which was validated by later research.

Building on this notion, Swenson (2001) studies inward FDI in the US, from 46 countries, distinguishing between 6 types of FDI. She argues that the statutory tax rates negatively affect new plants and plant expansions for most of the investing countries while the effect on mergers and acquisitions is significantly positive for all countries. Swenson also notes that investments in new plants are more sensitive to taxes than plant expansions. She suggests that this is justified mainly by the fact that the company's current choices may be constrained by its prior decisions.

In order to overcome the limitations of the aggregated data on FDI, some studies on the US have instead used data on property, plant and equipment (PPE), which was thought to be a better measure of real investments (Grubert and Mutti, 1991; Hines and Rice, 1994, Hines, 1996). While Grubert and Mutti (1991) use only data on manufacturing firms, Hines and Rice (1994) study all nonbank companies and obtain a higher tax elasticity. This suggests that non-manufacturing firms probably respond more to taxes than manufacturing firms. In general, the

studies using PPE found larger negative effects of taxes on FDI than the previous studies with aggregate data (Hines, 1999).[4]

Another strand of the literature uses firm-level data. For instance, Devereux and Griffith (1998) analyse the decision of US multinationals firms investing in Europe with a nested multinomial logit model. The location decision, which is the last branch of the authors' model, is modelled with a conditional logit, similar to the one used in this paper. The authors find that an increase in the effective tax rate significantly reduces the probability of a country receiving foreign investment, while the statutory and marginal tax rates do not have a significant role.[5] Devereux and Griffith also find that when considering only new entrants in Europe, the effective tax rate becomes insignificant.

More recently, Buettner and Ruf (2007) use a firm-level panel of non-financial German multinationals' subsidiaries, between 1996 and 2003. Their approach also uses a discrete choice analysis with a fixed-effect logit model, where the relevance of alternative measures of taxation is tested. Like in Devereux and Griffith (1998), the marginal effective tax rate has no effect on location decisions. In addition, the statutory tax rate has a considerable stronger effect on FDI decisions than the effective average tax rate.

Stowhase (2002) also uses data on German multinationals that choose to locate investment in EU countries between 1991 and 1998. But his focus is on the distinction between investment for profit-shifting and investment in real activity. It is hypothesized that while the first type of investment is affected by the statutory tax rates, the second type is conditioned more by effective tax rates, because the latter type of investment responds to a broader range of tax incentives which are more accurately measured by the effective tax rates. Using count data, they confirm the hypothesis: investment in production activities is affected by effective tax rates, but not by statutory rates, whereas investment more related with profit shifting (service, finance and R&D activities) is more severely affected by statutory tax rates.

The last result is not unexpected. As suggested by Devereux (1992), multinationals may undertake a strategy through which they locate production in a country where pre-tax profits are maximized, and afterwards the company shifts profits to a country with a lower statutory tax rate. Several other studies have further explored the issue of profit-shifting – see for example Haufler and Schjelderup (1999 and 2000) and Huizinga and Laeven (2008).

Later, Stowhase (2006) uses a panel of bilateral aggregate data on outward FDI – disaggregated by primary, secondary and tertiary sectors - from Germany, the UK and the Netherlands, into eight European countries between 1995 and 1999. His findings are that the

[4] The study of Hines (1996), which also uses data on PPE, was of particular interest because of the introduction in his model of dummy variables capturing state fixed-effects. In this way, he intended to solve one of the limitations of applying cross sectional data, which was the possible correlation of taxes with unobserved state characteristics (Hines, 1999).

[5] The marginal tax rate is the rate paid by a firm realizing a marginal investment decision.

primary sector is unaffected by the effective tax rate while the secondary and the tertiary sectors are, the latter to a higher degree.

Another study exploring the sectorial dimension uses a Poisson count model to examine the impact of taxes on the location of industry through the analysis of firm births across states in the US (Papke, 1991). His results point to a significant impact of taxes on the location of manufacturing plants, which varies substantially across different industries. The effective tax rate has a negative and significant effect (but with wide quantitative differences) on foreign investment in Apparel, Furniture and Communication Equipment industries, but has no effect on Electronic Equipment industry.

The survey of de Mooij and Ederveen (2003) provides an extensive synthesis of the literature on the effect of taxation on FDI. After transforming the results of 25 empirical studies they find a mean elasticity of -3.3, suggesting that a 1 pp. decrease in the host country's tax rate raises FDI by 3.3%. However, they indicate that there is substantial variation among studies that can be explained by differences in the data (both on taxes and FDI) and in the econometric specifications.

From what we have described, some points of debate seem to emerge in the literature. First, the impact of taxes on FDI depends on the exact measure of tax rate used (statutory, effective or marginal). Second, the effect of taxes on FDI seems to differ across sectors; with different definitions of tax rate having different effects across sectors. Third, project characteristics, such as the sector or whether it is a new project or an expansion, are important in determining the effect of taxes. Our paper aims to contribute to these debates.

3. Data

3.1. FDI

In this paper we use micro data on FDI projects. The dataset used is from the European Investment Monitor (EIM) of Ernst & Young (EY) and includes the announcement of FDI projects which reflect real investment in manufacturing or services carried out in Europe. M&A and other financial flows not resulting in any real investments are excluded.[6]

The dataset dates from 1998 to 2006; it includes 20,886 FDI projects originating in 95 countries, which are carried out in 29 European countries. The projects were undertaken by a total of 15,547 multinationals; 13,056 of them only account for one project, 1,532 account for two projects, and 959 account for three or more projects. The dataset contains information about the country of origin, the company, the type of investment (new/expansion), the sector, the capital invested and the number of jobs created. Table 10 in Appendix A shows several relevant descriptive statistics concerning the distribution of FDI projects.

[6] For further details on the methodology of the EIM database see, for example, Ernst & Young (2011).

Being a firm-level dataset, it allows the direct study of factual location decisions conducted by multinational firms, thus, an exact reproduction of real investment decisions. Accordingly, the use of this micro dataset in our paper is a significant contribution to the literature.

3.2. Corporate taxes

The exact measure of taxation to use is a topic of discussion within the literature. The most common types of tax measures are the statutory tax rate (STR), effective average tax rate (EATR) and effective marginal tax rate (EMTR). The first has shown to be relevant for FDI decisions and it is viewed as particularly important for profit-shifting decisions of multinational companies (Huizinga and Laeven, 2008). A clear advantage of the STR is that it does not require laborious computations and so it is easier to use. Consequently, it should be the correct rate to use whenever we study firms which are not very sophisticated in their decisions. However, the STR omits important aspects regarding the tax burden on a real investment, such as fiscal benefits, credits, deductions, depreciation allowances and non-income taxes.

The EATR, in turn, estimates the level of taxes that companies effectively face, taking into consideration several features of tax codes. Studies on FDI tend to support the view that the EATR is the most appropriate measure of corporate taxation. Contrary to the STR, it is a more complex measure of taxation, which reflects all relevant income and non-income taxes and comprises several important aspects of tax codes. Finally, the EMTR is calculated upon the tax incentive on a firm's marginal investment. In the literature, the EMTR turns out as rather insignificant in relation to FDI location decisions, since location decisions are not marginal (Devereux and Griffith, 2003).

As suggested by Devereux and Griffith (1998), investors choose between a set of locations comparing the after-tax level of profits in each of them, and the relevant measure of taxes is the EATR. As for the EMTR, it is a determinant of the optimal level of production in each alternative, which indirectly affects the location decision. Therefore, Devereux and Griffith argue that, despite the fact that both these two tax measures may affect the location decision, the direct effect of the EATR should outweigh the indirect effect of the EMTR.

In the empirical work, we use data for the three above described measures of corporate taxation, which were obtained by Overesch and Rincke (2008). The STR was calculated as the headline tax rate on corporate income adjusted to surcharges and local income taxes. As for the EATR and EMTR, Overesch and Rincke use a methodology proposed by Devereux and Griffith (2003) with some assumptions following the European Commission (2001). In essence, this method consists in determining the effective tax level of a hypothetical standardized investment project. This standardized investment project contains investment in industrial buildings, machinery, intangible assets, inventories and financial assets. The pre-tax rate of return is assumed to be of 20%, in accordance with the European Commission (2001). Table 1 shows the relevant descriptive statistics for the tax data.

Table 1– Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Country characteristics					
EATR	261	0.254	0.068	0.140	0.390
STR	261	0.286	0.079	0.100	0.565
EMTR	261	0.180	0.083	-0.195	0.356
log GDP	261	11.772	1.550	8.517	14.660
log Labour cost	261	2.828	0.925	0.558	4.051
GDP growth rate	261	0.036	0.027	-0.057	0.117
Agglom. effects	259	0.189	0.048	0.082	0.343
EA	261	0.363	0.481	0.000	1.000
EU	261	0.636	0.481	0.000	1.000
Core	261	0.276	0.447	0.000	1.000
EATR volatility	203	0.009	0.013	0.000	0.055
STR volatility	257	0.010	0.018	0.000	0.128
Change direction EATR	202	0.074	0.262	0.000	1.000
Change direction STR	257	0.027	0.163	0.000	1.000
Cycle	261	0.555	0.497	0.000	1.000
Projects characteristics					
New Investment	20,885	0.661	0.473	0.000	1.000
Services	20,886	0.520	0.500	0.000	1.000
High tech	12,587	0.168	0.374	0.000	1.000
Capital Intensity	4,965	0.404	2.182	0.000	125.000

Note: Data for agglomeration effects (GVA manufacturing as percentage of total GVA) are not available for Greece in 1998 and 1999. The meaning of the variables EA, EU, Core, EATR volatility, STR volatility, Change direction EATR, Change direction STR, Cycle, New Investment, Services, High tech and Capital intensity will be explained below.

3.3. Other variables

Our estimations include four control variables commonly referred in the literature as relevant FDI determinants: gross domestic product (GDP) in nominal terms, as a measure of market size; yearly nominal compensation per employee, as an indicator of labour costs; yearly real GDP growth rate as an indicator of economic expansion, and gross value added (GVA) in manufacturing as a percentage of total GVA, measuring agglomeration effects on the host country. The first two variables were used in logarithmic form. GDP, GDP growth rate and GVA were collected from Eurostat and the yearly nominal compensation per employee from AMECO.

The remainder of the variables will be described as they are introduced. Table 1 shows the relevant descriptive statistics for all the control and dummy variables.

4. Econometric approach

This paper addresses the multinationals' choice between several possible locations when headed to serve a foreign market through FDI. We adopt a version of the multinomial logit model developed by McFadden (1974) – the conditional logit model or "McFadden's choice" model. After deciding to undertake a project abroad, a multinational company has to choose where to locate its investment. Hence, a company realizing project *i* chooses the location *j* where it maximizes profits. This choice can be described as

$$\begin{aligned} y_{ij} &= 1 \qquad if\ \pi_{ij}^{e} = \max(\pi_{i1}^{e}, \pi_{i2}^{e}, \dots, \pi_{im}^{e}) \\ y_{ij} &= 0 \qquad otherwise \end{aligned} \tag{1}$$

, where π_{ij}^{e} denotes the expected profit of project $i = 1, \dots, n$ in country $j = 1, \dots, m$. The expected profit is a function of country characteristics x_{ij} and of project characteristics z_i, and an unobserved random element ε_{ij}

$$\pi_{ij}^{e} = x'_{\ ij}\beta + z'_{\ i}\gamma_j + \varepsilon_{ij} \qquad , j = 1, \dots, m \tag{2}$$

The model allows country-specific variables for all alternatives, not just the chosen alternative. For each country-specific variable there is only one coefficient to be estimated, while for each project-specific variable there are *j* coefficients to be estimated. The model estimates the location probability p_{ij} under which the project *i* chooses the *j* country as

$$p_{ij} = e^{x'_{\ ij}\beta + z'_{\ i}\gamma_j} / \sum_{l=1}^{m} e^{x'_{\ il}\beta + z'_{\ i}\gamma_l} \quad , j = 1, \dots, m \tag{3}$$

The model includes country fixed-effects, which translate the impact of unobserved time-invariant country characteristics on their probability to attract FDI projects. Such characteristics include, for instance, geographical location with respect to the rest of Europe, language, culture, and infrastructures. The introduction of country fixed-effects allows overcoming the possibility of correlation between taxes and unobserved country characteristics. Several authors have emphasized the importance of performing such control (Bartik, 1985; Phillips and Goss, 1995; Hines, 1996; Buettner and Ruf, 2007). In addition, since only *m - 1* of the coefficients γ_j are free to vary, one of the coefficients γ_j has to be set equal to zero. As we discuss in more detail later on, the country chosen for this normalization was France.

A possible limitation of the conditional logit model is the assumption of independence of irrelevant alternatives (IIA), which implies that the ratio of the probabilities of any pair of alternatives is independent of the set of other alternatives. This is usually illustrated with the red bus/blue bus example in the literature. This assumption is usually inadequate when we are in the presence of two or more alternatives which cannot be distinguished and weighed independently by the decision makers (McFadden 1974).

In our study, if the assumption of independence of irrelevant alternatives is verified, the unobserved profit will have an error term that is uncorrelated across alternatives. A good discrete choice model will capture all the relevant observed characteristics affecting the location decision, leaving the error term uncorrelated.

The most used test for the IIA hypothesis is the Hausman test (Hausman and McFadden, 1984). The model comprising all the alternatives, generating an efficient estimator under the null, is compared with a model where some alternatives are restricted, and which generates a consistent estimator. In practice, this test requires the computation of several models by restricting one alternative at a time, and the comparison of each one of these models against the model with all the alternatives.

The Hausman statistic is distributed as Chi-square, with the number of degrees of freedom equal to the rank of the difference in the variance matrices, and is defined as

$$H = (\beta_c - \beta_e)' \quad (V_c - V_e)^{-1}(\beta_c - \beta_e) \tag{4}$$

, where β_c is the coefficient vector from the consistent estimator, β_e is the coefficient vector from the efficient estimator, V_c is the covariance matrix of the consistent estimator and V_e is the covariance matrix of the efficient estimator. Table 2 shows the results of the Hausman test for the base model of this paper with EATR.[7] There is no evidence for the rejection of the null which suggests that the difference in coefficients between the efficient and the consistent model is not systematic, supporting the assumption of IIA.[8] The results of this Hausman test ensure that the estimators of our conditional logit model are consistent and efficient.

[7] See Table 3 for the estimation output of the base model.

[8] Notice that in some cases the Hausman statistic is negative. Although it is theoretically impossible that a Chi-square distribution is negative, in concrete applications, the Hausman statistic may be negative "due to lack of positive semidefiniteness in finite sample applications" (Hausman and McFadden, 1984). However, in any case, a negative Hausman statistic is evidence in favour of the null.

Table 2– Hausman test for IIA

Omitted	chi2	df	P>chi2	Evidence
Austria	0.48	25	1.000	for H0
Belgium	5.81	23	1.000	for H0
Bulgaria	-0.47	19	-----	for H0
Croatia	-0.49	26	-----	for H0
Czech Republic	0.73	19	1.000	for H0
Denmark	1.00	22	1.000	for H0
Estonia	0.50	22	1.000	for H0
Finland	14.84	31	0.994	for H0
Germany	-2.00	25	-----	for H0
Greece	0.16	22	1.000	for H0
Hungary	0.32	17	1.000	for H0
Ireland	0.77	16	1.000	for H0
Italy	-6.67	23	-----	for H0
Latvia	0.24	18	1.000	for H0
Lithuania	3.27	21	1.000	for H0
Luxembourg	0.30	20	1.000	for H0
Netherlands	1.55	22	1.000	for H0
Norway	-1.06	19	-----	for H0
Poland	4.98	17	0.998	for H0
Portugal	4.48	22	1.000	for H0
Romania	-3.27	18	-----	for H0
Slovakia	0.22	25	1.000	for H0
Slovenia	2.30	30	1.000	for H0
Spain	9.26	12	0.680	for H0
Sweden	0.00	29	1.000	for H0
Switzerland	-0.05	26	-----	for H0
Turkey	-0.46	21	-----	for H0
United Kingdom	24.51	20	0.221	for H0

Note: Total of 28 Hausman tests. All the tests show evidence for H0: difference in coefficients is not systematic.

5. Empirical Results

5.1. Tax rates' levels

We start by employing the conditional logit model first only with our four control variables and then introducing one measure of taxation at a time. Table 3 shows the results for this base model where column (1) includes only control variables and columns (2), (3) and (4) include the three measures of corporate taxation – EATR, STR and EMTR, respectively.

The coefficients for the control variables show the expected sign and are significant across the four specifications. They suggest, in line with the literature, that larger market size, stronger economic growth, higher agglomeration effects and lower labour costs increase the probability of a country receiving FDI.

As was already mentioned, the coefficients measuring the country fixed-effects are normalized using France as base alternative. France was chosen because within the base model with EATR, which will be the reference model throughout this paper, France is the country with the highest fixed-effect. Consequently, this normalization means that the more negative the constant, the less attractive these unobserved characteristics are for investors, relatively to France. In all the four specifications of the model, these terms turn out to be significant for almost every country. The exceptions are Belgium and the UK. There is also another set of countries with fixed characteristics only slightly less attractive than France (with a constant larger than -1.5), which are: Austria, Denmark, Germany, Hungary, Netherlands, Spain and Sweden.

Even though all three tax measures show negative and significant coefficients, the EATR is the one that clearly presents the largest negative effect on FDI. Contrary to the results of Devereux and Griffith (1998), we find a significant negative impact even for the EMTR, although inferior to that of the EATR. The STR has the smallest coefficient but also proves significant. Notice that the STR's coefficient is smaller in our results than in the study of Buettner and Ruf (2007). These authors suggest that the fact that in their study the STR proves to have a greater impact than EATR indicates that the location of subsidiaries by German multinationals may be partially driven by profit-shifting opportunities.

As already discussed in Section 3, the EATR should be the best measure of the tax burden for real investments and the results show that it has the most negative coefficient of the three tax measures. The estimated coefficient indicates that a 1 pp. decrease of the EATR raises the odds ratio by about 3.1%. The impact on the country's location probability can also be obtained by computation of the marginal effects. Following Cameron and Trivedi (2009), the marginal effects of a conditional logit model can be defined as

$$\frac{\partial p_{ij}}{\partial x_{ij}} = p_{ij}\left(1 - p_{ij}\right)\beta \tag{5}$$

Therefore, as the marginal effects are non-linear across *p*, it becomes necessary to estimate them for certain levels of probability. For instance, if we assume a country with a current location probability of 3.5%[9], then if the tax rate decreases by 1 pp. the marginal effect on the probability is about 0.1 pp., equivalent to an approximate 3% increase. The impacts on the location probabilities are non-linear across the level of probability, such that the closer the probability is to 50% the smaller is the percentual impact. For example, for the UK, which is the

[9] Equivalent to all 29 countries having the same probability of receiving a FDI project i.e. $p = 100\%/29 \approx 3.5\%$.

country with the highest probability of receiving a project, approximately 22.6%, a 1 pp. increase in the tax rate increases the probability by 0.55 (only a 2.4% increase).

Table 3 – Base model

	(1)		(2)		(3)		(4)	
	Coef.	Rob. SE	Coef.	Rob. SE	Coef.	Rob. SE	Coef.	Rob. SE
EATR			-3.119 ***	(0.407)				
STR					-0.774 **	(0.334)		
EMTR							-1.235 ***	(0.236)
log GDP	0.564 ***	(0.206)	0.507 **	(0.213)	0.577 ***	(0.215)	0.562 ***	(0.215)
log Labour cost	-0.475 **	(0.206)	-0.562 ***	(0.211)	-0.502 **	(0.213)	-0.544 **	(0.214)
GDP growth rate	8.165 ***	(0.725)	7.580 ***	(0.741)	7.968 ***	(0.740)	8.034 ***	(0.732)
Agglom. effects	4.824 ***	(0.650)	2.010 ***	(0.771)	3.860 ***	(0.775)	3.709 ***	(0.709)
Austria	-1.139 ***	(0.403)	-1.325 ***	(0.417)	-1.100 ***	(0.420)	-1.231 ***	(0.421)
Belgium	-0.309	(0.373)	-0.462	(0.386)	-0.244	(0.389)	-0.523	(0.392)
Bulgaria	-1.607 ***	(0.506)	-2.496 ***	(0.536)	-1.698 ***	(0.535)	-2.022 ***	(0.538)
Croatia	-2.293 ***	(0.624)	-2.990 ***	(0.655)	-2.325 ***	(0.656)	-2.707 ***	(0.667)
Czech Republic	-1.211 ***	(0.368)	-1.536 ***	(0.385)	-1.148 ***	(0.388)	-1.402 ***	(0.389)
Denmark	-1.027 **	(0.446)	-1.401 ***	(0.463)	-1.037 **	(0.464)	-1.218 ***	(0.466)
Estonia	-1.497 *	(0.785)	-2.233 ***	(0.822)	-1.517 *	(0.824)	-1.828 **	(0.827)
Finland	-2.564 ***	(0.480)	-2.710 ***	(0.495)	-2.498 ***	(0.499)	-2.612 ***	(0.500)
France	---------- *(Base alternative)* ----------							
Germany	-1.354 ***	(0.119)	-1.074 ***	(0.130)	-1.225 ***	(0.136)	-1.320 ***	(0.125)
Greece	-3.101 **	(0.392)	-3.566 ***	(0.410)	-3.140 ***	(0.410)	-3.357 ***	(0.412)
Hungary	-0.795 **	(0.400)	-1.423 ***	(0.424)	-0.849 **	(0.423)	-1.042 **	(0.424)
Ireland	-1.274 ***	(0.503)	-1.735 ***	(0.526)	-1.289 **	(0.526)	-1.416 ***	(0.528)
Italy	-2.330 ***	(0.067)	-2.324 ***	(0.072)	-2.262 ***	(0.077)	-2.511 ***	(0.078)
Latvia	-2.066 ***	(0.702)	-3.096 ***	(0.742)	-2.182 ***	(0.740)	-2.507 ***	(0.743)
Lithuania	-2.216 **	(0.626)	-3.055 ***	(0.658)	-2.274 ***	(0.657)	-2.604 ***	(0.660)
Luxembourg	-1.975 ***	(0.904)	-2.507 ***	(0.935)	-1.974 **	(0.941)	-2.204 **	(0.944)
Netherlands	-0.913 ***	(0.271)	-1.109 ***	(0.282)	-0.914 ***	(0.283)	-1.004 ***	(0.284)
Norway	-2.733 ***	(0.495)	-3.208 ***	(0.516)	-2.798 ***	(0.516)	-2.889 ***	(0.517)
Poland	-1.312 ***	(0.201)	-1.842 ***	(0.220)	-1.371 ***	(0.215)	-1.587 ***	(0.218)
Portugal	-1.686 ***	(0.358)	-2.052 ***	(0.375)	-1.690 ***	(0.375)	-1.881 ***	(0.377)
Romania	-1.886 ***	(0.342)	-2.435 ***	(0.362)	-1.904 ***	(0.362)	-2.168 ***	(0.365)
Slovakia	-1.689 ***	(0.517)	-2.194 ***	(0.539)	-1.672 ***	(0.543)	-1.931 ***	(0.544)
Slovenia	-3.069 ***	(0.723)	-3.514 ***	(0.749)	-3.018 ***	(0.754)	-3.297 ***	(0.757)
Spain	-1.047 ***	(0.096)	-1.006 ***	(0.102)	-1.029 ***	(0.103)	-1.023 ***	(0.103)
Sweden	-1.100 ***	(0.355)	-1.385 ***	(0.369)	-1.080 ***	(0.370)	-1.234 ***	(0.372)
Switzerland	-1.143 ***	(0.401)	-1.520 ***	(0.418)	-1.164 ***	(0.419)	-1.299 ***	(0.42)
Turkey	-3.359 ***	(0.190)	-3.660 ***	(0.201)	-3.356 ***	(0.200)	-3.606 ***	(0.205)
United Kingdom	0.171 ***	(0.029)	-0.036	(0.041)	0.132 ***	(0.035)	0.048	(0.039)
Log Likelihood	-56,695		-56,664		-56,692		-56,682	
Pseudo-R^2	0.1917		0.1922		0.1917		0.1919	
Nr of alternatives	29		29		29		29	
Nr of cases	20,875		20,875		20,875		20,875	
Nr of observations	601,091		601,091		601,091		601,091	

Note: Conditional logit model with country fixed-effects. Agglomeration effects data for Greece in 1998 and 1999 are not available implying the loss of 11 cases and 4603 observations. Robust standard errors clustered by company (in parentheses). Following McFadden 1974, the Pseudo-R2is defined as 1 - L1/L0, where L1 is the log likelihood of the full model and L0 is the log likelihood of the "constant only" model. ***, ** and * indicate significance at 1%, 5% and 10%, respectively.

Now quantitatively, let us compare our estimates with the two important studies using micro data which were already mentioned. Devereux and Griffith (1998) do not find a statistically significant role of the STR, but their results indicate that a 1 pp. decrease in the EATR increases the odds ratio by about 6.8%, which is more than twice our result. Buettner and Ruf (2007), using a measure of EATR similar to ours, find an impact on the odds ratio of only 1.3%, although not statistically significant at a 10% level of confidence. They also point to an increase of the odds ratio by about 2.5% when the STR decreases 1 pp. This is more than three times larger than our result for the STR.

It is also interesting to compare the impact of the EATR with the impact of some of the control variables. For instance, on average, the decrease of 1 pp. in the EATR has a similar effect on the odds ratio to a decrease in the labour costs (yearly nominal compensation per employee) of about 950 € per employee. As for the GDP growth rate, it would have to increase by about 0.4 pp. This clearly suggests that corporate tax rates can be instrumental for policy makers in order to attract FDI.

5.2. Tax rates' volatility

The previous results reported in this paper, as well as across the literature, suggest that the level of tax burden is a significant determinant of FDI. It is plausible, though, that the volatility of taxes also affects foreign investment. A history of frequently changing taxes may repel investors as it induces uncertainty regarding the future evolution of those taxes. This interferes with the agents' projection of after tax profits, and is especially harmful for more risk-averse investors and also for projects with a higher degree of irreversibility. Interestingly, this aspect has not received much attention in the literature, with the exception of Edmiston et al. (2003). In their study, Edmiston et al. conclude that uncertainty regarding the tax laws repels FDI.

In order to test the effect of taxes' volatility, we include as a determinant of investment the standard deviation of the current and last two periods of the EATR (t, t-1 and t-2) – Std. Dev. EATR. Consequently, the regression only embraces the period between 2000 and 2006, because we only have data for the EATR since 1998. We also introduce a dummy variable to capture the specific effect of changes in opposing directions.[10] The tax rate's volatility appears to have a significant negative impact on FDI: an increase of 0.01 in the standard deviation reduces the odds ratio of the location probability by about 4.3% (column (1) of Table 4). Furthermore, changes of the EATR in opposing directions do not have a statistically significant effect on FDI, i.e., they do not add information to the volatility of the EATR.

In order to explore the full extent of our dataset, we collected data from Eurostat for the head statutory tax rate since 1998. In a regression similar to the one of EATR, but for this

[10] This dummy variable takes the value one if the tax rate suffers a decrease (larger than 0.5 pp.) after a period where it remained constant or increased. The dummy also takes the value one if the tax rate suffers an increase (larger than 0.5 pp.) after a period where it remained constant or decreased.

statutory tax rate, the volatility does not have a significant effect on the location of FDI (column (2) of Table 4). Contrarily to the EATR, only the changes in opposing directions of the statutory tax rate have a negative impact on FDI.

Table 4 – Tax rates' volatility

	(1)	(2)
EATR	-5.104 ***	
	(0.614)	
Std. Dev. EATR	-4.169 ***	
	(0.917)	
Change Direction EATR	-0.043	
	(0.036)	
STR		-0.654 *
		(0.348)
Std. Dev. STR		0.492
		(0.531)
Change Direction STR		-0.106 **
		(0.041)
Log Likelihood	-45,582	-56,508
Pseudo R^2	0.1828	0.1897
Nr of alternatives	29	29
Nr of cases	16,588	20,848
Nr of observations	478,874	591,821

Note: See notes to Table 3. For the sake of simplicity, the coefficients for control variables and the constants for each country were omitted. In (1) and (2) the cases for 1998 and 1999 were lost.

5.3. Euro area, European Union and core/periphery

In the FDI literature some authors argue that membership in the EU and euro area facilitates the attraction of FDI. Firstly, in the recent enlargements of the EU, new members have witnessed gains in terms of FDI, which, however, have been counterbalanced by losses in some older member states (Breuss, 2001). Additionally, Petroulas (2007) suggests that countries that joined the EMU have had an increase in inward FDI. This last result is in accordance with the theory of Optimum Currency Areas (OCA), which argues that the creation of a monetary union should lead to an increase in FDI, mainly due to the elimination of the exchange rate risk and transaction costs associated with different currencies (Mundell, 1961). Exploring this reasoning, we evaluate whether countries within these two areas are able to set higher taxes than other countries, without affecting FDI.

It can also be argued that it is not the institutional belonging to some area that makes the difference in terms of FDI, but instead the existence of agglomeration forces in such areas. These forces are in some extend incommensurable and cannot be assessed simple by using one variable. In turn, this type of agglomeration forces capture with the broader distinction between core and peripheral countries (Baldwin and Krugman, 2004). Building on this notion, it can be argued that core countries will be able to set higher taxes when compared to peripheral countries without repelling FDI.

A problem that emerged in our work was that the separation between core and peripheral European countries varies widely across the literature. Taking into consideration the recent developments in the European economy, we restrict the core to Austria, Belgium, France, Germany, Luxembourg, the Netherlands, Switzerland and the UK.

To capture the importance of belonging to the euro area, European Union or core, we construct three dummy variables, which equal one if the country belongs to the group in question and zero otherwise (EA, EU and Core, respectively). Next, we multiply the EATR by each of the dummy variables and introduce these interactions individually in the regressions, producing three distinct specifications. Table 5 shows the results: column (1) for the euro area, column (2) for the European Union and column (3) for Europe's core. The coefficients are statistically significant and have the expected signs for both the euro area and the core. However, for the European Union, the coefficient is unexpectedly negative, but it is not statistically significant.

The irrelevance of the EU is understandable, since almost all countries, if not all, that do not belong to the EU, have trade agreements either with the Union itself or with its major countries. This eliminates the more obvious advantages of being part of the EU: the free movement of goods and services. Moreover, as the literature suggests, even the benefits of the EU enlargements for the new members may have been counterbalanced by losses in some older member states (Breuss, 2001).

With respect to the euro area, the results suggest that investors do in fact see the elimination of currency risk as an advantage, which is especially understandable if they intend to serve more euro area countries with their investment. Another advantage of a strong currency like the euro is that it allows foreign investors to repatriate profits with a substantial exchange rate gain. Notice also that being part of Europe's core allows countries to set higher tax rates than others, and the effect is larger than for euro area countries: the marginal coefficient is approximately three times the one of the euro area.[11]

The impact on the odds ratio of an increase in the EATR by 1 pp. is reduced by approximately 0.5 pp. if a country is part of the euro area. The equivalent marginal effect, for a current location probability of 3.5%, decreases by about 14%. As for the country being part of

[11] Notice that some countries belong to the euro area but not to the core, and vice-versa. In order to capture possible correlated effects, we ran the model with the interaction for core and euro area simultaneously. The two coefficients remained significant and in the same proportion.

Europe's core as opposed to the periphery, the impact on the odds ratio falls by around 1.5 pp. and the marginal effect at the same level of probability as before decreases by about 44%.

In order to further assess the benefits of the exchange risk elimination within the euro area, we estimated two additional specifications of the model. These consist of two separate estimations using the interaction term of EATR with the dummy variable for euro area: column (4) includes only the projects with origin within the euro area and column (5) includes all the other projects. Despite a slight loss of significance of the interaction term when the estimation includes only the projects originating within the euro area – with a p-value of 0.075 –, the results show the expected difference in the smoothing effects. While for investors from outside the euro area the reduction of the impact of the EATR on the odds ratio is approximately 17%, for investors from within the euro area the smoothing effect is about 43%.

This finding is supported by the fact that investors based in the euro area value the elimination of the exchange risk much more than other investors. The euro area investors are able to eliminate the exchange risk in two dimensions: (1) in the outflows and inflows of capital between the base country and the host country, and (2) in the transactions inside the euro area. Investors based outside the euro area, on the other hand, only eliminate the second dimension of the exchange risk.

Table 5 – Taxes and the belonging to favoured regions

	(1)	(2)	(3)	(4)	(5)
EATR	-3.390 ***	-3.027 ***	-3.481 ***	-5.537 ***	-2.176 ***
	(0.402)	(0.422)	(0.453)	(0.956)	(0.501)
EATR * EA	0.481 ***			2.360 *	0.368 **
	(0.147)			(1.324)	(0.161)
EATR * EU		-0.227			
		(0.247)			
EATR * Core			1.541 **		
			(0.736)		
Log Likelihood	-56,659	-56,664	-56,662	-16,755	-39,248
Pseudo R^2	0.1922	0.1922	0.1922	0.1627	0.2171
Nr of alternatives	29	29	29	29	29
Nr of cases	20,875	20,875	20,875	5,949	14,926
Nr of observations	601,091	601,091	601,091	171,920	429,171

Note: See notes to Table 3. For the sake of simplicity, the coefficients for control variables and the constants for each country were omitted. Specifications (4) and (5) include a dummy for the origin of the project as a case-specific variable.

5.4. Taxes and cycles of FDI

Our results indicate that economic and monetary integration reduces the negative impact of taxes on FDI. Indeed, from 1998 to 2000, just before the launching of the euro and in its first years, there was a very large increase of FDI to Europe. More generally, the inflow of FDI to Europe has evolved by the following pronounced cycles: from 1990 up to 2000 there was an upward cycle followed by a downward cycle until 2004; afterwards and until 2007, there was another upward FDI cycle, followed by a downward cycle.

It is possible to draw the hypothesis that during periods of rapid growth of FDI the adverse impact of corporate taxes is smaller. Perhaps, during such periods, profit opportunities are so high that investors pay less attention to the share given away in taxes. To test this hypothesis, we create a dummy variable (Cycle) which takes value one for the years of upward cycles of FDI inflow to Europe (1998, 1999, 2000, 2005 and 2006). This dummy was interacted with the EATR and introduced in the regression as a determinant of FDI. The dummy variable for the euro was also introduced once its creation may be partially correlated with the expansion of FDI between 1998 and 2000. The results indicate that, indeed, during cycles of FDI growth, taxes have a smaller effect in deterring foreign investments (Table 6). The effect of a 1 pp. increase of the EATR reduces the odds ratio by 4.3% in periods of FDI decline and by 3.4% in periods of FDI increase.

Table 6 – Taxes and cycles of FDI

	(1)
EATR	-4.305 ***
	(0.470)
EATR * Cycle	0.867 ***
	(0.221)
Log Likelihood	-56,652
Pseudo R^2	0.1923
Nr of alternatives	29
Nr of cases	20,875
Nr of observations	601,091

Note: For the sake of simplicity, the coefficients for control variables and the constants for each country were omitted.

5.5. Project characteristics

In the next subsections we analyse how the response of FDI to taxes depends on the specific characteristics of each project, such as the fact of it being a new investment or an expansion, as well as its sector, level of technology and capital intensity.

5.5.1. Expansions vs. New investments

With regard to different types of projects, one may argue that new investments and expansions react differently to variations of corporate tax rates. As seen above, Swenson (2001) concludes that FDI in new plants reacts more to taxes than FDI in plant expansions, arguing that the firm's current choices are constrained by prior decisions. However, this quite intuitive result has not been corroborated by other works. Devereux and Griffith (1998) find that restricting their sample only to new entrants in Europe the effective tax rate becomes insignificant in affecting FDI. In the same line of reasoning, Hartman (1984) and Young (1988) suggest that taxes negatively affect investments based on retained earnings but do not affect FDI based on new transfers. If we accept that new investments are mainly financed with new transfers and expansions are mainly financed with retained earnings, such evidence shows that new investments are less sensitive to taxes.

In order to clarify if expansions or new investments are more sensitive to taxes, column (1) of Table 7 shows a specification of our model where there is an interaction between EATR and a dummy variable that equals one when the project is a new investment and zero if it is an expansion or a new co-location (New Investment).[12] The result suggests that new investments are less sensitive to the EATR than expansions. The same occurs for the EMTR - Column (2) of Table 7. This latter result is also consistent since EMTR should be more important for marginal investments like expansions.

Generalizing, our results seem to confirm the findings of Devereux and Griffith (1998), Hartman (1984) and Young (1988). Moreover, Rolfe et al. (1993) show, using a survey of US firms' managers, that new projects are more sensitive to tax incentives that reduce their initial expenses (equipment and material exemption), whereas expanding firms prefer tax incentives that reduce profits. Taking this into account, our result can be justified by the fact that both the EATR and the EMTR are capturing more the way a country is taxing profits than the tax incentives it gives to initial investment expenses.

[12] It is worth mentioning two points. Firstly, since a new co-location project consists of a new activity that is co-located at or near an existing activity, we decided to consider the new co-location projects together with expansions. Secondly, our database does not identify in which countries the firm has already invested, it only identifies if a given project is as expansion or not.

Table 7 – Expansions vs. new investments

	(1)	(2)
EATR	-4.395 ***	
	(0.618)	
EATR * New investment	1.893 ***	
	(0.705)	
EMTR		-2.093 ***
		(0.400)
EMTR * New investment		1.196 **
		(0.469)
Log Likelihood	-56,330	-56,348
Pseudo R^2	0.1969	0.1966
Nr of alternatives	29	29
Nr of cases	20,874	20,874
Nr of observations	601,062	601,062

Note: See notes to Table 3. For the sake of simplicity, the coefficients for control variables and the constants for each country were omitted. Project type data are missing for 1 case implying the loss of 1 additional case and 29 additional observations. Number of cases per type of project: Expansion - 7,076, New - 13,798. Both specifications include a dummy for the type of investment (new/expansion) as a case-specific variable.

5.5.2. Industrial functions vs. services

A share of the literature suggests that the influence of tax rates on FDI location decisions may vary by sector. In order to investigate such differences, we create a specification of our model where a dummy variable, which equals one for services and zero for industrial functions, is interacted with each of the three tax measures (Services).[13] The results in Table 8 point to three interesting findings.

Firstly, among all the tax measures, the EATR is the one with the highest coefficient for industrial functions. This suggests that as industrial investments involve higher tax deductible expenses, such as amortizations, they react more to EATR than to other tax measures. This finding is in accordance with the study of Stowhase (2002).

Secondly, services are significantly less sensitive to all three tax measures. While it was expected that EATR and EMTR have a smaller effect on services than on industry, the reverse was expected for the STR. In fact, the literature concerning profit-shifting activities suggests that services' investments may be particularly attracted by low statutory tax rates (Devereux, 1992; Stowhase, 2002).[14]

[13] Industrial functions include the activities of logistic, manufacturing, testing and servicing; services include contact centres, education and training, headquarters, internet data centre, research and development, sales and marketing, and shared services centres.

[14] Specification (2) shows a combined positive coefficient for services although not statistically significant, according to a joint significance Wald test.

Finally, specification (3) shows that the EMTR is significantly more important for industrial functions than for services. This finding can be justified in the following way. In industry, fixed costs tend to be larger than in services, because of the larger amount of capital used. Therefore, comparatively to fixed costs, marginal costs are smaller in industry than in services. As a result, when making an investment decision, the proportional impact that taxes have on profit margins is larger in industry than in services.

Generalizing these results, it can be argued that industrial functions are more sensitive to corporate taxation than services, no matter the tax measure used. The reason for this may be related to the fact that industrial companies are more mobile and more likely to compare taxes across locations (Wells, 1986). In addition, some industrial companies operate with smaller margins than services companies, which implies that taxes can affect more severely the profits of the former rather than of the latter (Morisset and Pirnia, 1999).

Table 8 – Industrial functions vs. services

	(1)	(2)	(3)
EATR	-4.846 ***		
	(0.484)		
EATR * Services	3.041 ***		
	(0.711)		
STR		-2.671 ***	
		(0.409)	
STR * Services		3.391 ***	
		(0.548)	
EMTR			-2.249 ***
			(0.314)
EMTR * Services			1.601 ***
			(0.451)
Log Likelihood	-55,264	-55,292	-55,293
Pseudo R^2	0.2121	0.2117	0.2117
Nr of alternatives	29	29	29
Nr of cases	20,875	20875	20875
Nr of observations	601,091	601091	601091

Note: See notes to Table3. For the sake of simplicity, the coefficients for control variables and the constants for each country were omitted. Number of cases per type of project: Industrial functions - 10,014, Services - 10,861. All specifications include a dummy for the type of investment (industrial functions/services) as a case-specific variable. A Wald test for simultaneous coefficient significance proved insignificant for specification (3).

5.5.3. High-tech manufacturing industries

This section's goal is to investigate whether high-tech manufacturing industries react more or less significantly to taxes when compared to other manufacturing industries. To our knowledge, this issue remains unexplored in the literature. To perform such an analysis, we create a dummy

variable only for the 12,587 manufacturing projects, which equals one if the project is of a high-tech manufacturing industry, and zero otherwise (High-Tech Manuf.). The High-tech manufacturing industries are defined using the classification of Eurostat and OECD, and they include the following sectors: pharmaceuticals, computers, office machinery; electronics-communications and scientific instruments.

The estimations indicate that high-tech projects are less sensitive to taxes than other projects (Table 9). However, the effect is statistically insignificant as the coefficient shows a p-value of 18%. Nevertheless, this apparent smaller sensitivity of high-tech industries regarding the tax burden is arguably justified if we consider that this type of investment involves a larger amount of R&D, which tend to implicate, at least in the first years, limited or even negative cash flows and consequently absence of taxable profits. Additionally, Lindgaard and Lundvall (2004:15) refer that low taxes do not stimulate innovation, but only increase the survival of already existing firms that have a low probability of surviving.

Table 9 – High-tech manufacturing industries and capital intensity

	(1)	(2)
EATR	-3.634 ***	-8.224 ***
	(0.513)	(0.823)
EATR * High-Tech Manuf.	1.304	
	(0.973)	
EATR * Capital Intensity		3.037 ***
		(1.069)
Log Likelihood	-34,118	-13,050
Pseudo R^2	0.1924	0.2171
Nr of alternatives	29	29
Nr of cases	12,577	4,962
Nr of observations	361,832	142,767

Note: See notes to Table 3. For the sake of simplicity, the coefficients for control variables and the constants for each country were omitted. In (1) only manufacturing projects were considered. In (2) only cases with data for capital and employment were considered. Due to the lack of data for agglomeration effects in Greece in 1998 and 1999, 10 cases are lost in (1) and 3 in (2).

5.5.4. Capital intensity

The last issue to be discussed concerning project characteristics is the level of capital intensity. Column (2) of Table 9 shows the results for a specification which includes the interaction of the EATR with a variable measuring the capital intensity of the project (capital invested in millions of US $ per job created) – Capital Intensity. The number of observations is significantly reduced as the information on the capital invested and jobs created is available for only 4,962 of our investment projects.

The coefficient for the interaction term of EATR and capital intensity of the project is positive and statistically significant, suggesting that more capital intensive projects are less sensitive to taxes. This finding may be justified by the fact that more capital intensive projects induce a higher level of amortization costs, reducing the taxable profits and consequently the sensitiveness to taxes. Firms that are more capital intensive may also enjoy larger market power, because large amounts of capital may be a barrier to entry. Therefore, they will have larger margins and be less sensitive to tax rates.

6. Conclusions

This paper provides evidence on the role of corporate taxes in Foreign Direct Investment (FDI) location decisions. The use of a wide firm-level dataset grants an accurate representation of real investment decisions. We start by analysing the impact of the level and volatility of three measures of corporate taxation on FDI. Next, we analyse how economic and monetary integration determines the effect of taxes on FDI. Finally, we focus on how the impact of taxes depends on specific project characteristics.

We find that the effective average tax rate (EATR) is, among the three tax rates used, the one with the largest impact on FDI. The main result indicates that a decrease in the EATR by 1 pp. increases the odds ratio of a country receiving a FDI project by about 3.1%. Besides the tax rate level, it is also found that volatile corporate tax policy negatively affects FDI.

Regarding the impact of economic and monetary integration, we find that countries within the euro area or part of Europe's core are able to set relatively higher taxes than other European countries, to a certain degree, without an adverse effect on FDI. Our results also indicate that during periods of FDI growth, the corporate tax rates have a smaller effect than during periods of FDI contraction.

Regarding project characteristics, results indicate that the effective marginal tax rate (EMTR), as the literature suggests, is particularly relevant for expansion projects. Additionally, with respect to sectorial differences and in accordance with Stowhase (2002), the EATR proves to be the tax measure with the most negative impact on industrial functions. On the other hand, we provide evidence that services are less sensitive to the statutory tax rate (STR) when compared to industrial functions, contradicting Stowhase's findings. In fact, services are less sensitive than industry to all the three tax measures. Moreover, high-tech manufacturing projects are less sensitive to taxes, even though the difference is not statistically significant. Our results also indicate that projects that are more capital intensive are less sensitive to taxes.

Because they are new to the literature, the interaction between taxes and the level of technology and capital intensity may require further analysis, essentially regarding the justification of the empirical relations shown. As for the tax rates' volatility, there is the need of more data on tax codes' changes to allow a deeper analysis.

Summarizing, the results presented in this paper suggest that setting corporate taxes carefully may be instrumental for policy makers in order to attract FDI. In fact, many of the empirical specifications developed in this study indicate that it should even be possible to attract specific types of foreign investments by manipulating corporate taxation. Along with policy makers, these results may also prove relevant for multinational companies themselves as they are representative of some aspects of multinationals' behaviour.

7. References

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Appendix A.

Table 10– Descriptive statistics (projects)

	Projects	*Share*		Projects	*Share*
Host country					
Austria	490	*2.3%*	Lithuania	132	*0.6%*
Belgium	1,090	*5.2%*	Luxembourg	45	*0.2%*
Bulgaria	278	*1.3%*	Netherlands	695	*3.3%*
Croatia	89	*0.4%*	Norway	53	*0.3%*
Czech Republic	792	*3.8%*	Poland	904	*4.3%*
Denmark	379	*1.8%*	Portugal	264	*1.3%*
Estonia	168	*0.8%*	Romania	481	*2.3%*
Finland	134	*0.6%*	Slovakia	318	*1.5%*
France	3,441	*16.5%*	Slovenia	44	*0.2%*
Germany	1,628	*7.8%*	Spain	1,239	*5.9%*
Greece	56	*0.3%*	Sweden	652	*3.1%*
Hungary	910	*4.4%*	Switzerland	468	*2.2%*
Ireland	715	*3.4%*	Turkey	194	*0.9%*
Italy	401	*1.9%*	United Kingdom	4,721	*22.6%*
Latvia	105	*0.5%*	Total	20,886	
Origin region					
Africa	55	*0.3%*	Mideast	152	*0.7%*
Asia	2,139	*10.2%*	Multi-regional	895	*4.3%*
Caribean	69	*0.3%*	North America	7,509	*36.0%*
Central & South Ameri	55	*0.3%*	Oceania	193	*0.9%*
Europe	9,819	*47.0%*	Total	20,886	
Project type					
New investments	13,806	*66.1%*	Industrial functions	10,018	*48.0%*
Expansions	7,079	*33.9%*	Services	10,868	*52.0%*
Total *	20,885		Total	20,886	

Note: (*) Information on project type (Expansion/New) is missing for one project.