

Foreign Direct Investment in the Enlarged EU: Do Taxes Matter and to What Extent?

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Abstract Foreign direct investment is of increasing importance in the European Union. This paper estimates the effect of taxes on foreign direct investment (FDI) flows and on three sub-components of these flows for the countries of the enlarged European Union. The model in the spirit of gravity equations robustly explains FDI flows between the 25 member states. Sample selection needs to be addressed in the estimation. We show that the different subcomponents of FDI should and indeed do react differently to taxes. After controlling for unobserved country characteristics and common time effects, the top statutory corporate tax rate of both, source and host country, turn insignificant for total FDI and investment into equity. However, high source country taxes clearly increase the probability of firms to re-invest profits abroad and lower the percentage of debt financed FDI. This might reflect profit re-allocation to avoid taxes. Market size factors have the expected signs.

Keywords Foreign direct investment · FDI · Corporate taxes · Fixed set-up costs · Sample selection model

JEL Classification F3 · F2 · F4 · E6 · H2 · H8

1 Introduction

In the last 15 years, the structure of the European economies changed substantially. An important tendency was the increased integration of those economies that were

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once separated by an “iron curtain.” After the fall of the “iron curtain,” in particular the ten new member states of the European Union underwent profound changes of their economies. While GDP levels significantly dropped in most countries until the mid 1990s, the economic performance was quite dynamic in its second half. This dynamic evolution together with the prospective EU membership also attracted significant foreign direct investment (FDI) inflows. Against the background of relatively low tax rates in the new EU member states, the political debate in Europe focuses especially on the effect of taxes on FDI flows.

Increased FDI flows are a global trend and are extensively investigated in the economic literature. Blonigen (2005) provides a survey of the two main motives of FDI. Vertical FDI serves to allocate different steps of the production to those countries, where the corresponding production costs are lowest. Horizontal FDI represents just a duplication of the entire production process to a second country in order to be closer to the foreign market. Empirical studies therefore explain FDI by firm level factors and external factors such as the market size to capture horizontal FDI motives and labor costs and taxation to capture vertical FDI motives. The empirical literature on tax effects is surveyed by de Mooij and Ederveen (2003), who report a median semi-elasticity of FDI to taxes of -3 and document a wide range of empirical estimates. Important recent contributions include Bénassy-Quérée et al. (2005), Desai et al. (2004), and Devereux and Griffith (1998, 2003).

So far, almost all studies on the empirical effects of taxes on FDI either focus on the discrete decision to invest, or on the amount of investment. Buettner and Ruf (2004), for example, study in how far discrete location decisions are affected by taxes with a panel of German multinationals. The statutory tax rate significantly influences the probability to locate in a country. Bénassy-Quérée et al. (2005), on the other hand, estimate the reaction of FDI flows to corporate taxation in a gravity model of 11 OECD countries abstracting from the discrete location decision problem. The authors find that tax differences negatively affect FDI flows.

Devereux and Griffith (1998) show that factors determining the discrete location decisions of multinational firms can differ from the factors relevant for the size of the investment. Similarly, Razin et al. (2004) argue that a representative firm takes two sequential decision, first whether to invest and second, how much to invest. Razin et al. (2005a) apply this idea to macroeconomic FDI data and corporate tax rates. To our knowledge, they are the first to simultaneously estimate the determinants of the discrete investment choice and the amount of FDI. With OECD data, they show that failure to address this sample selection problem leads to biased results. Furthermore, high source country taxes increase the probability of observing FDI, while high host country taxes lower the amount of FDI to that particular country.

Only few papers study FDI in transition countries. Carstensen and Toubal (2004) examine the determinants of FDI into the Central and East European countries (CEECs). Traditional determinants of FDI such as market potential, low relative unit labor costs, and relative factor endowments have plausible effects. Buch et al. (2003) do not find significant evidence for the relocation of FDI to Eastern Europe. Bevan and Estrin (2000) present evidence that country risk, unit labor costs, host market size and gravity factors determine FDI. Frenkel et al. (2004) find that FDI flows from developed countries to emerging economies depend on market size, distance and host country risk and economic growth. Kinoshita and Campos (2003) focus

more narrowly on transition countries and show that the main determinants of FDI inflows are institutions, agglomeration and trade openness.

We contribute to the literature in several ways. To our knowledge we are the first to simultaneously estimate the determinants of the flow size and the decision to invest with EU 25 data. To do so, we employ a sample selection gravity framework. Addressing sample selection is of particular relevance in the enlarged EU, as many source-host country pairs (still) report zero FDI flows. Four different bilateral FDI measures are used (total FDI flows, equity capital flows, reinvested earnings, and other FDI), which are usually lumped together in empirical studies. With the data provided by Eurostat, we are able to show, that these different components of FDI react differently to taxes and basic macroeconomic determinants, reflecting investment decisions and allocation of profit operations. Furthermore, we are among the first to separate the differential effects of host and source country taxes on FDI.

The remainder of the paper is organized as follows. The next section presents theoretical considerations on the effects of taxes on the different FDI components. Section 3.1 discusses the structure of FDI relationships in the EU of 25 countries, and its evolution. It also provides summary information on the tax data. Section 3.2 discusses the empirical strategy, while Section 4 presents the empirical results and interprets the findings. The final section concludes.

2 Theoretical framework

Economic theory points at numerous factors, that influence the amount of FDI and the decision to undertake FDI. In our empirical part, we follow very closely the specification of Razin et al. (2005a), which is similar to the standard way of modeling FDI proposed by Markusen et al. (1996). In this section, we therefore focus the discussion on the effect of host and source country taxes on total FDI, equity FDI, retained earnings and other FDI. Especially the different impact of taxes on equity and retained earnings investment has not been discussed so far.

Our theoretical framework extends the framework by Razin et al. (2004, 2005a). The second paper looks specifically at the role of source and host corporate tax rates on FDI. In this model, two decisions are taken: First whether to engage in FDI, second, how much to invest. Razin et al. (2005a) assume that fixed set-up costs of new FDI projects accrue in the source country of FDI. If fixed set-up costs should arise in the host country, the representative firm can use transfer pricing to transfer the fixed set-up costs in the source country.¹ In most cases, large parts of the fixed cost in terms of assembly line planning, R&D and similar activities occur in the source country of FDI anyway. This implies that the investment is only undertaken if the present discounted profits in the host country, which depend negatively on the host country tax rate, is larger than the fixed set-up cost, which is tax deductible in the source country, i.e.,

$$c(1 - \tau_s) \leq v(\tau_h) \quad (1)$$

¹ Razin et al. 2005b discuss the relevance of firm level heterogeneity. They show that firm level heterogeneity can explain, why FDI flows in both directions. Helpman et al. (2004) show that productivity differences across firms determine whether firms choose to serve only the domestic market, export or engage in FDI.

Larger source country tax rates τ_s reduce the fix cost c , thereby lowering the threshold at which an investment will be undertaken and increasing the probability to invest. Larger host country tax rates τ_h , on the other hand, reduce the marginal return on investment and thereby the net present value of the investment v . This reduces the amount of FDI. Source country taxes on the other hand should matter little for the amount, as any investment project, whether abroad or at home, is subject to the same source country tax rate upon repatriation of the profit. In this sense, source country corporate tax rates can be expected to impact on the investment decision as fixed costs are source country tax deductible, but not on the amount of FDI in particular.

Following Razin et al. (2005a), host country tax rates should negatively affect the amount of FDI as they reduce the marginal return of an investment project and thereby the present value of income streams from abroad. The validity of this hypothesis, however, largely depends on the precise tax system. The majority of world's countries exempt from tax most of the income earned by foreign affiliates of domestic multinational corporations (Hines 2001).² In this case, host country taxes should matter strongly for FDI quantities while source country taxes matter only to the extent that foreign source income is taxed. Several major countries permit tax credits. If a tax credit is given on taxes paid abroad, host country taxes should matter little since they reduce the tax payment in the source country accordingly.³ However, since many source countries only grant partial tax credit thereby the relevance of host country taxes increases. On the other hand, many countries in Europe, especially the ten NMS, attract foreign investment by granting tax breaks for some initial period. In such a case, host country corporate tax rates probably matter only little for the amount of investment, because the profits earned are exempted from tax payments. Source country taxes should still play a role for the discrete investment decision because of set-up costs.

The discussion so far has made no distinction between different components of FDI. Razin et al. (2005a) use total FDI flows to test their empirical hypothesis. In the following, we will argue, that the different parts of FDI should depend differently on tax rates. We will also show that the empirical predictions concerning total FDI can be distorted by the different reactions of sub-components of total FDI.

Investment into new equity constitutes the largest part of FDI. It also approximates best the part of FDI flow, to which Razin et al. (2005a) refer. Set-up costs relate to new investment projects, which are contained in equity FDI, but, by definition, not in retained earnings or inter-company credits. The effects of source and host country taxes on equity, as pointed out, crucially depend on the tax system in place. Deductibility of taxes already paid in the host country against the source country tax payments reduces the relevance of host country tax rates. Also, granted tax breaks probably reduce the importance of host tax rates for FDI flows. On the other hand, exemption of foreign source income from source country taxes increases the relevance of host country taxes and reduces the importance of source country

² Also see McLure (2005) for a short description of the current European rules and the European Commission's proposals for reform.

³ If the tax rate in the host country is larger than in the source country, the difference in tax rates times the profit has to be paid. However, if firms make other profits in the home country, accounting might enable companies to reduce even the tax payment resulting from higher host country taxes.

taxes. The empirical predictions concerning the relevance of host country tax rates for equity FDI flows are thus unclear.

Reinvested earnings (RE) help to clarify the importance of taxes for FDI. RE can only happen, after a profitable FDI has been effectuated. Profits that are re-distributed to the source country of FDI are most likely to be taxed somehow in the source country. We therefore predict, that the likelihood of re-investing profits abroad should increase with the source country corporate tax rate, holding constant the host country tax rate. In addition, transfer pricing can be used to shift profits abroad. These increased profits can be recorded as RE and are a direct reaction to source country taxes. RE might be depressed by high host country taxes, which can lower the profits that can be reinvested. We also expect RE to most robustly depend on taxes as they presuppose a profitable investment. Overall, RE are probably much more guided by tax considerations than equity investments, which strongly depend on other economic factors, such as market acquisition, production cost advantages and the like.

Concerning the FDI category, “other,” which mostly covers credit FDI, empirical predictions are difficult.⁴ Probably, companies will extend less funds to countries, where taxes are higher, as investments in the country are less profitable. They might also want to use debt instruments instead of equity to a larger extent if host country taxes are high, since interest payments resulting from financial credits are not taxed in the host country, but in the source country.⁵ In other words, financial credits and the like are probably also extended to shift costs from the source to the host country and profits from the host to the source country. Overall, the effects go in opposite directions and the predictions for other FDI are unclear.⁶ We expect however that high source country taxes will lower the percent of credit financing of FDI.

To summarize the predictions of source and host taxation of the different components: The effects of taxes on FDI flows are not always unambiguous. We expect the results for tax effects to be most explicit for retained earnings because they should be independent of more fundamental investment considerations and ultimately reflect decisions on where to allocate profits. Furthermore, source country tax rates might matter more than host country tax rates because tax payments abroad are partially deductible and because tax breaks exist to attract FDI. Finally, the discussion suggests that empirical studies need to look at the three subcomponents of FDI, since they may react differently to taxes.

3 Data summary and empirical strategy

3.1 Data

Foreign direct investment has increased worldwide and this trend is also prevalent in Europe. In our analysis, we focus on the years 1994–2003, as data before and after

⁴ “Other” consists of inter company debt transactions: covering the borrowing and lending of funds, including debt securities and trade credits and land acquisitions. More details are given in the online appendix.

⁵ See Hines (2001) for a description of increased debt financing because of corporate taxation.

⁶ To get a better view on the cost shifting aspect, we later extend our empirical analysis with a regression of inter-company debt-FDI in percent of equity FDI on source and host country tax, more formally: $\log(\text{other/equity}) = \alpha_1 \text{tax}_i + \alpha_2 \text{tax}_i + \varepsilon_{jit}$.

that period are not yet available. We include data for the EU 25 and Bulgaria, no data for Belgium and Luxembourg are included.⁷ We rely on Eurostat data as they provide a comprehensive and comparable data set.⁸

Total FDI flows consist of equity, reinvested earnings, and other direct investment capital. Equity investment comprises equity in branches, all shares in subsidiaries and associates and other capital contributions such as provisions of machinery, etc. Reinvested earnings consist of the direct investors' share in proportion to direct equity participation of earnings not distributed. Other FDI is inter-company debt transactions such as covering the borrowing and lending of funds, including debt securities, trade credits, and land acquisition.

Figures 1, 2, 3, and 4 provide information on the evolution of FDI flows in the period 1994–2003. As Fig. 1 shows, FDI flows among the EU 15 countries have evolved dynamically, amounting to 80 billion Euros in 2001 after a peak in 2000 of 350 billions.⁹ FDI flows from the EU 15 countries to the ten NMS have steadily increased in this period to reach almost 14 billion Euros in 2001 (Fig. 2). The share of these FDI flows in percent of intra EU 15 FDI has considerably increased from virtually zero to almost 16% in 2001.

It is interesting to note that FDI flows from the ten new member states to the old 15 are still quantitatively small. However, in recent years they have increased in importance (Fig. 3). Also, bilateral FDI flows among the ten new member states have picked up (Fig. 4). As regards the different kinds of FDI, we see that the predominant share of FDI comes from investment into equity capital. Reinvested earnings and “other FDI capital flow” are also relevant, especially for the aggregate flows to the ten new member states. A separate investigation into the determinants of these different FDI flows therefore appears justified.

An important characteristic of bilateral FDI data in general and especially in the present sample concerns zero FDI flows between countries. Table 4 in the [Appendix](#) gives information on the frequency of positive FDI flows in the investigated countries. The data indicate that smaller countries invest less frequently abroad.¹⁰ Also, the ten NMS are relatively rarely a source of FDI. Table 1 below shows that more than 33% of the bilateral relations, for which data are available, report that the FDI flow was zero.¹¹

In the earlier years, few East European countries were recipients of FDI, while the number and the amounts of investment to them strongly increased in time. But also in the EU 15, there are numerous country pairs without an FDI flow. Recently, East

⁷ Eurostat reports FDI data for Belgium and Luxembourg as investing country jointly, making their inclusion difficult. Separate data for Luxembourg and Belgium are only available as of 2002 for equity FDI. Furthermore, Luxembourg is known to be a very large conduit of indirect flows of FDI.

⁸ The data follow the benchmark definition of FDI as given by the IMF Balance of Payments Manual and being fully consistent with the OECD guide IMF (1993) and OECD (1996). We look at inflow data net of disinvestment.

⁹ The peak in 2000 is a world-wide phenomenon. Global FDI flows according to UNCTAD data peaked at almost 1,500 billion US\$ in 2000, falling back to less than 800 in 2001. The peak reflects an M&A wave also prevailing in Europe (Pagano and Thadden 2004).

¹⁰ On a yearly basis, this feature of the data becomes even more important.

¹¹ Eurostat does properly differentiate between zero and missing observations. Negative values are disregarded in the analysis.

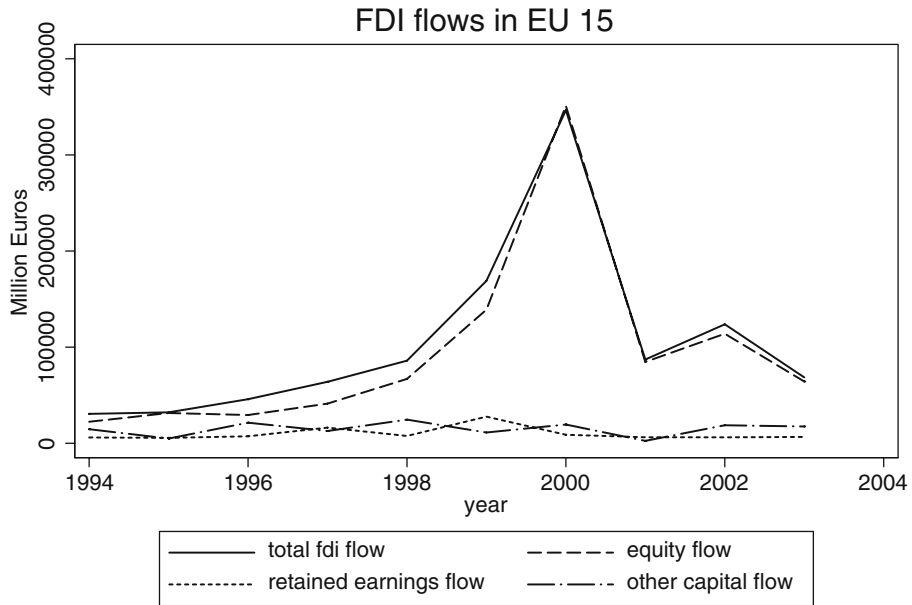


Fig. 1 Evolution of intra-EU 15 FDI flows, Million Euros, (*Source:* Eurostat, author's calculations from the data set)

European countries have also started to invest in other EU countries. FDI flows have not only increased in amount, but more country pairs have established positive FDI relationships. The mean annual FDI flow from one to another country, where observations are available, amounts to 637 million Euros. An empirical analysis of FDI flows in Europe should therefore take into account the structure of the bilateral FDI flows and especially the information contained in the zero bilateral FDI flows.

Concerning our main explanatory variable, the tax burden, the literature has seen different approaches towards its measurement. One can distinguish between backward and forward looking measures and between effective tax rates, tax quotas and legal tax rates. All measures have advantages and disadvantages. The most widely used measure is the statutory tax rate, which is given by law. Devereux and Griffith (1998, 1999, 2003) and Devereux et al. (2002) argue in favor of rather complex measures of forward looking effective tax rates and distinguish between average and marginal concepts. This measure is not available for the enlarged EU in one coherent definition. Furthermore, it presupposes an asset and financing structure of an investment project. However, firms adjust their asset portfolios and their way of financing investments to tax burdens. Due to this endogeneity problem, Razin et al. (2005a) suggest to instrument it by the corporate tax rate. While Bellak et al. (2005) argue in favor of the theoretical superiority of the Devereux et al. measures, they also show that the cross sectional information contained in statutory tax rates is close to the more complex measures. Moreover, it is well known, that the more complex effective measures converge to the statutory rates as profits increase. We therefore believe that the top statutory tax rate is a good proxy for forward looking measures of Devereux et al. Effective ex-post tax rates for most countries in the EU 25 are computed by Wolff

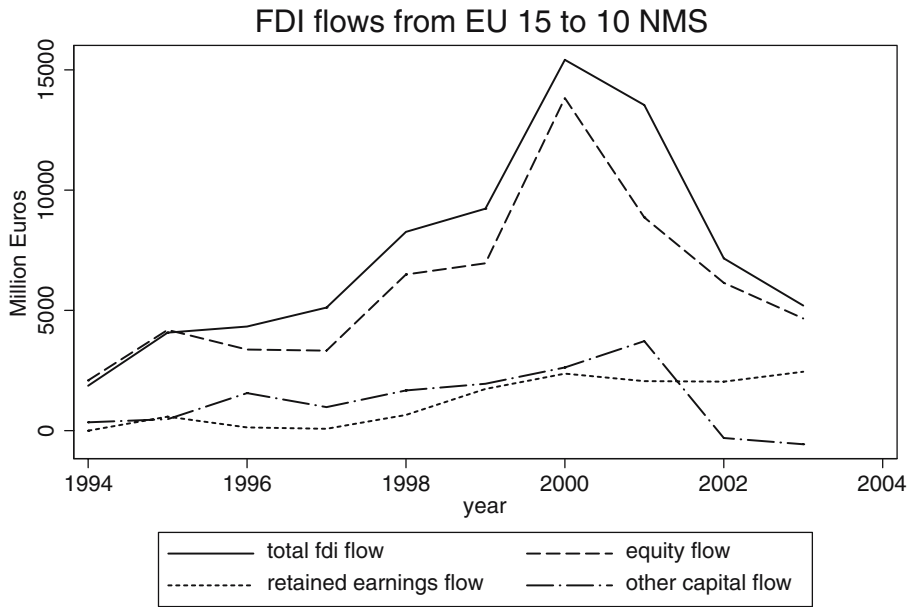


Fig. 2 Evolution of FDI from the EU 15 countries to the ten NMS, Million Euros (*Source:* Eurostat, author's calculations from the data set)

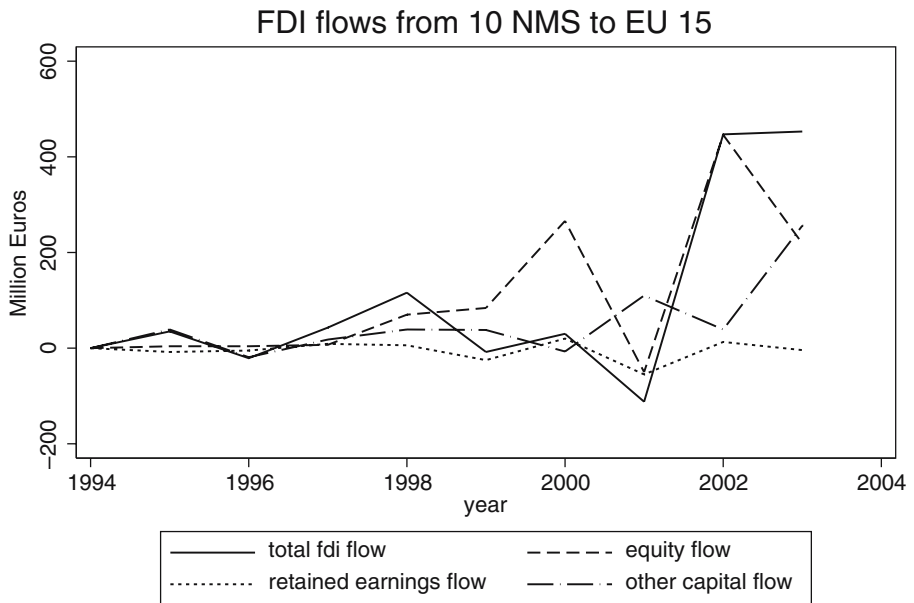


Fig. 3 Evolution of FDI from the ten NMS countries to the EU 15, Million Euros (*Source:* Eurostat, author's calculations from the data set)

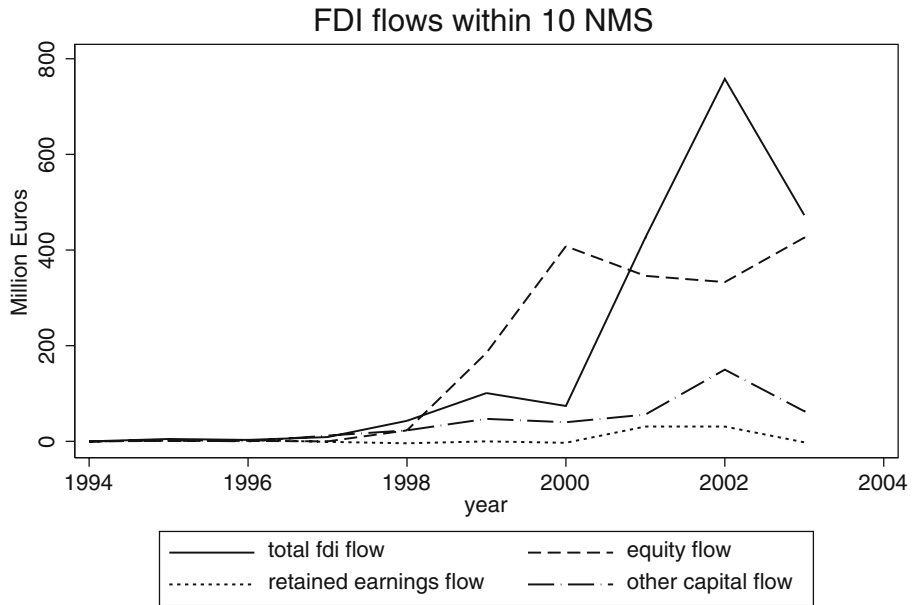


Fig. 4 Evolution of FDI flows within the ten NMS, Million Euros (*Source:* Eurostat, author’s calculations from the data set)

(2006b) following a methodology developed in Mendoza et al. (1994). This measure gives a very rough price wedge for capital income, which takes into account all possible tax exemptions and base reductions. However, it is measured for all capital income in a country and is therefore not well suited for FDI flow determinants. In this study, we follow Razin et al. (2005a) and restrict our analysis to the top statutory tax rate taken from European Commission (2004, p. 116).

The corporate tax rates of corporations in Europe differ substantially. Especially the new member states can be characterized by relatively low levels of taxation. Figure 5 shows the top statutory tax rates in the EU countries in 1995 and 2004. Most countries have experienced a reduction in the tax rate, the average tax rates are lower in the ten new member states compared to the older members of the EU.

The time variation of this tax reduction is, however, relatively small with only a few tax reforms per country in the investigated period.

Table 1 Structure of the data for the EU25, 1994–2003

	Total FDI	%	Equity	%	Reinvested	%	Other	%
Number	1,996		2,724		1,772		2,314	
Equal zero	661	33.1	991	36.4	991	55.9	1,073	46.4
Greater 0	1,335	66.9	1,733	63.6	781	44.1	1,241	53.6
Mean	637.9		402.74		111.16		163.23	
Std. dev.	4,763.98		3,978.91		471.69		629.41	

Source: Author’s calculations from Eurostat data, mean in million Euros

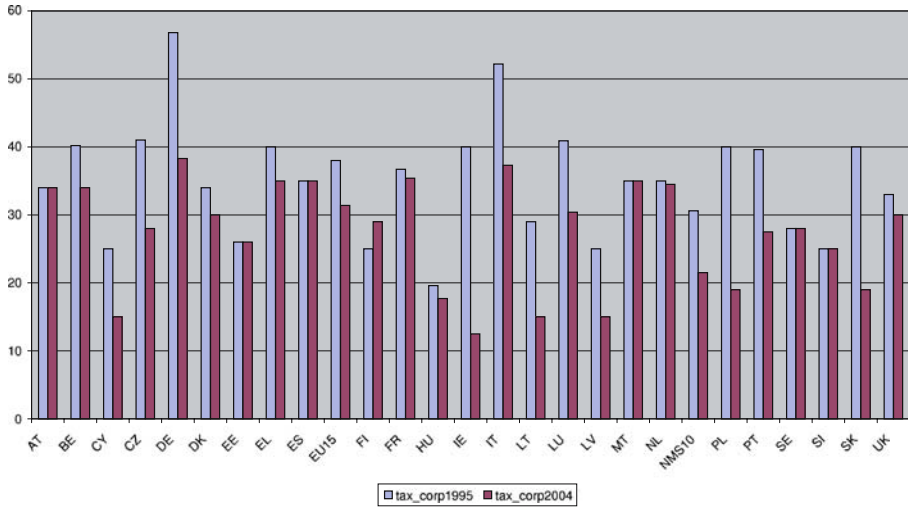


Fig. 5 Comparison of the top statutory tax rate on corporate income (Source: Eurostat)

3.2 Methodology

In the theory part, we have given reasons, why the decision to engage in FDI might depend differently on explanatory variables than the amount of FDI. The data description of the FDI flows in the 25 EU countries further confirms that some country pairs do not choose to engage in FDI. We show that about one third of the observations have zero FDI flows.¹² When estimating the effect of taxes and other variables on FDI flows, these “zeros” have to be taken into account. Standard OLS estimation will yield biased results for the effect of the independent variable on the actual flow.

A standard procedure in the international trade and FDI literature is to treat all zero observations as resulting from a censored process. The appropriate econometric model is then Tobit estimation. The Tobit estimator assumes that the effect of the independent variable x on $E(y)$ is the same as the effect of x on $P(y>0)$. If this assumption is violated, the Tobit estimator is inappropriate. In terms of our theoretical part, the Tobit model is too restrictive. Tobit requires host and source country tax rates to matter equally for the amount and the probability of FDI.

A more flexible estimation approach, which allows for the possibility of endogenous selection, is the sample selection model (Kyriazidou 1997; Heckman 1979). In this model, the probability of being selected, i.e., of observing a positive FDI flow depends differently on the same explanatory variables than the amount of FDI. In particular, it is possible, that taxes matter for selection, but not for the amount. The model is thus more flexible than Tobit and suited for estimating

¹² It is possible to have a positive FDI flow, which is exactly offset by an equal negative FDI flow, resulting in a zero net FDI flow. The probability of this to happen is however very low.

differential effects of taxes. More specifically, in a sample selection approach the following empirical model is estimated (see, e.g., Verbeek 2000, p. 209).

$$FDI_{ijt}^* = X_{1ijt}\beta_1 + \varepsilon_{1ijt} \tag{2}$$

$$h_{ijt}^* = X_{2ijt}\beta_2 + \varepsilon_{2ijt} \tag{3}$$

$$FDI_{ijt} = FDI_{ijt}^*, h_{ijt} = 1 \quad \text{if } h_{ijt}^* > 0 \tag{4}$$

$$FDI_{ijt} = 0, h_{ijt} = 0 \quad \text{if } h_{ijt}^* \leq 0 \tag{5}$$

where h_{ijt} is one in case of a positive FDI flow from country I to country j , while it is zero if no FDI is observed. The two error terms are assumed to be normally distributed with a covariance σ_{12} and correlation coefficient ρ . Equation 3 determines the probability of investing, while Eq. 2 measures the impact of the X_1 variables on the amount of FDI. Note that β_1 measures the impact of X_1 on the latent variable. The marginal effect of the common regressors X_1 in the observed sample consists of two components. There is a direct effect on the mean given by β_1 . In addition, the respective variable will influence FDI through its presence in the inverse Mills ratio $\lambda = \frac{\phi(X_2\beta_2)}{\Phi(X_2\beta_2)}$ (Greene 2000, p. 929), since the variables in X_1 are included in X_2 . If ρ is positive, an OLS estimate of Eq. 2 will understate the effect of X on FDI flows. Note that the selection equation is a non-linear Probit estimator. The probability of investment is thus a non-linear function of the source (and also host) country tax rate and given by

$$P(\tau_s) = \int_{-\infty}^{c+\beta_2\tau_{it}} (2\pi)^{-0.5} \exp(-y^2/2) dy \tag{6}$$

where c is the effect of all other variables at their averages.

Even though our theoretical model predicts that Tobit has too restrictive assumptions we want to test empirically whether this is the case. Furthermore, the Tobit estimator is more efficient than the sample selection model given that its restrictions are valid. We therefore test its restrictions with a likelihood ratio test developed by Fin and Schmidt (1984) and described in Greene (2000, p. 915). The likelihood ratio statistic can be computed as

$$\lambda = -2[\log L_T - (\log L_P + \log L_{TR})] \tag{7}$$

where L_T is the likelihood given by the Tobit model, L_P is the likelihood of the Probit model and L_{TR} is the likelihood for the truncated regression model. The test results clearly reject the null hypothesis that the restrictions are valid. The test thus shows that the independent variables have different effects on the probability to observe FDI and the amount of FDI. A sample selection approach is justified.

A further important issue when estimating a sample selection model concerns identification. If X_1 and X_2 are identical, the model is only identified through the fact that the inverse Mills ratio depends on the same variables in a non-linear fashion. Some authors therefore suggest, that X_2 should at least include one additional

variable. However, this variable is always subject to criticism, since the variable might also be relevant for the flow equation. We rely only on the functional form for identification and present our empirical results with the same variables for both, selection and flow equation. We also present robustness checks, where we include one additional identifying variable, a dummy for previous FDI flows, suggested by Razin et al. (2005a).

Our empirical specification is in the tradition of the gravity model. In a first step, we present estimation results without country and time dummies. These estimates give information on the effects of the main explanatory variables. It is, however, possible that unobserved country characteristics determine the results. The estimation of fixed effects (within estimator) is not possible if one wants to identify the importance of distance and other time invariant country pair characteristics. Also, the sample selection estimation procedure involves non-linearities making the computation of a within estimator impossible. Therefore, Matyas (1997, 1998) argues that a proper specification of the gravity model should include source and host country and time dummies. In general, we expect these dummies to significantly weaken the impact of the other explanatory variables. This holds especially as FDI flows react to long term characteristics of countries. The macroeconomic control variables capture well the long term characteristics. However, at the same time, they change relatively little in the short time period investigated. Also, top statutory corporate tax rates are changed only irregularly. Therefore identification of the effects of macroeconomic aggregates on FDI flows, when country dummies are included, will be more difficult. Time dummies also appear necessary, as the flows reveal common time effects.

We include several variables for X_{1ijt} to capture cost advantages, market access and agglomeration effects identified by economic theory. The following equation specifies the set-up of the estimation Eq. 2 in greater detail:

$$\begin{aligned}
 FDI_{ijt} = & \gamma_1 TAX_{jt} + \gamma_2 TAX_{it} + \gamma_3 \log(L)_{jt} + \gamma_4 \log(L)_{it} \\
 & + \gamma_5 \log(Y/L)_{jt} + \gamma_6 \log(Y/L)_{it} \\
 & + \gamma_7 Z_{ij}^1 + \dots + \varepsilon_{ijt}
 \end{aligned} \tag{8}$$

where FDI is one of the following four FDI categories: total FDI, equity capital FDI, retained earnings and other capital. L is population size, and Y is nominal GDP measured in million Euros, both taken from Eurostat. The tax variables is the top statutory tax rate in the recipient country and in the investing country. γ_3 gives the effect of population size holding constant the degree of development of a country. The total effect of the population size can be tested with an F -test on the coefficient difference $\gamma_3 - \gamma_5$ for the recipient country, while the effect of income levels is given by γ_5 . The same holds—mutatis mutandis—for the investing country. Z_{ij}^1 is a vector of variables varying across country pairs, but not in time, such as distance, common language, and border dummies.

Population size and GDP should both positively affect FDI flows as they capture factors determining horizontal FDI. GDP in the host country is a measure of market potential and should be positively associated with FDI. A high level of GDP in the investing country measures the ability to engage in significant amounts of FDI. We

therefore expect the coefficient on GDP per capita to be positive in both, the host and the source country.

Differences in magnitude of the coefficient size of GDP per capita in host and source country reflect the impact of relative GDP per capita values on the *net* FDI flows between countries. If the coefficient is larger for source country GDP per capita than for host country GDP per capita, then more FDI will flow from the richer to the poorer country than from the poorer to the richer country.

We include the distance between two countries as a standard gravity measure (distance).¹³ A negative coefficient reflects increasing transaction costs (e.g., longer travel times for executive personnel, greater cultural differences). A positive coefficient might be explained by the fact that trade costs become too high so that investment is chosen instead. A dummy for bordering countries (border) should have a positive effect on FDI as transaction costs are significantly lower.

Finally, we check the robustness of the results to the inclusion of additional control variables, such as the monthly wage rate, total government expenditure in percent of GDP and the openness for the host and investing country, and the difference in financial risk and in education levels of the two countries.¹⁴

4 Results

4.1 Baseline results

The basic empirical results are presented in Table 2. For each FDI component we present two sets of regressions, one without country and time fixed dummies, and one with country and time fixed dummies. The lower part of the table gives the estimation results for the selection equation, while the upper part reflects the effect of the independent variables on the amount of investment.

The first important result relates to the sample selection term. Our test results indicate that in most regressions a failure to address sample selection will bias the empirical result. The null hypothesis of no correlation of the errors of the two regression can be rejected in most regressions. Analyzing the effect of taxes on FDI in Europe with this data set thus requires a sample selection estimation approach.

In the regression excluding country and time effects, the control variables have the expected signs. Distance is detrimental to FDI flows and probability, while bordering countries have more FDI. GDP in host and home country increases FDI flow and probability. The coefficient on the home country GDP per capita is roughly three times the size of the host country GDP coefficient. This implies that, on average, net FDI flows from rich to poor countries. Countries with larger GDP size invest more in small sized countries than small sized countries in large ones. The coefficient for population is significant and of similar size for both, source and host country after controlling for GDP per capita.

¹³ Distance and the border dummy are taken from Andrew Rose's data set at <http://faculty.haas.berkeley.edu/arose/>.

¹⁴ For the precise definition of the additional control variables see the online appendix.

Table 2 Estimation results for the effect of taxes on FDI

	FDI		Equity		RE		OC	
tax_{jt}	-1.80	-0.65	-2.73	-0.27	-2.46	-1.29	-2.40	0.79
	-2.27	-0.48	-4.03	-0.23	-2.44	-0.74	-3.19	0.62
tax_{it}	0.29	2.14	-0.77	1.71	-2.42	-2.01	-0.94	2.48
	0.35	1.34	-0.98	1.11	-2.04	-1.06	-1.08	1.46
$\log(L)_{jt}$	0.74	3.18	0.84	0.35	0.54	-8.09	0.69	5.17
	13.18	0.73	15.99	0.1	7.07	-1.69	11.25	1.26
$\log(L)_{it}$	0.61	-0.49	0.73	13.63	0.62	1.44	0.53	3.77
	9.35	-0.05	10.56	2.07	7.88	0.12	7.85	0.48
$\log(Y/L)_{jt}$	0.71	-0.92	0.71	0.59	0.66	0.85	0.98	1.45
	10.45	1.85	11.95	1.35	7.47	1.3	14.9	3.09
$\log(Y/L)_{it}$	2.54	1.13	2.37	2.36	2.12	0.69	2.50	0.34
	12.84	1.35	12.49	3.23	9.11	0.81	13.62	0.4
Dist	-1.97	-2.43	-2.14	-2.66	-1.41	-2.32	-1.69	-1.82
	-10.28	-13.53	-12.69	-14.55	-6.78	-9.34	-10.33	-10.6
Border	0.32	0.64	0.41	0.58	0.42	0.49	0.01	0.39
	2.09	4.61	2.8	4.55	2.47	2.93	0.07	2.64
Cons	-2.86		-6.97		-1.97		-0.31	
	-2.06		-5.46		-1.27		-0.23	
Select								
tax_{jt}	-0.51	-0.09	-0.68	0.66	-0.81	-1.58	-1.93	0.31
	-0.63	-0.05	-1.11	0.47	-1.15	-0.89	-3.08	0.2
tax_{it}	2.96	6.19	1.99	1.60	-1.56	7.11	0.08	1.90
	2.66	1.65	2.29	0.56	-1.93	3.21	0.11	1.57
$\log(L)_{jt}$	0.47	1.90	0.44	0.71	0.39	-7.14	0.41	7.09
	7.74	0.35	9.58	0.15	8.53	-1.42	9.78	1.32
$\log(L)_{it}$	0.27	2.73	0.41	11.61	0.18	-22.75	0.32	-4.66
	4.34	0.28	8.33	1.87	3.3	-2.14	7.02	-0.7
$\log(Y/L)_{jt}$	0.28	-0.23	0.19	1.05	0.26	-0.35	0.24	1.02
	4.28	-0.31	3.72	1.81	4.44	-0.52	4.6	1.6
$\log(Y/L)_{it}$	1.66	-0.67	1.41	1.24	1.52	-1.27	1.13	-1.86
	16.12	-0.49	19.2	1.5	16.5	-1.22	16.65	-2.21
Dist	-1.55	-2.69	-1.28	-2.46	-0.89	-1.96	-0.94	-2.11
	-10.29	-6.52	-12.68	-8.15	-7.12	-7.07	-9.68	-6.82
Border	0.84	0.95	0.54	0.70	0.31	0.39	0.13	1.02
	3.18	4	3.19	3.9	1.69	1.96	0.9	5.4
Cons	-1.78		-0.36		-0.20		-4.12	
	-1.35		-0.25		-0.16		-4.2	
Dummies	No	c+time	No	c+time	No	c+time	No	c+time
N	1,552	1,552	2,057	2,057	1,379	1,379	1,766	1,766
Censored	461	461	676	676	754	754	749	749
χ^2	7.99	4.21	9.34	9.54	1.48	6.03	22.44	11.26
P	0.005	0.040	0.002	0.002	0.224	0.014	0.000	0.001

t -values below the coefficient. "Equity" refers the equity flows, "RE" are retained earning flows, "OC" is other capital flow. Y refers to GDP, L refers to population size. $c+t$ dummies means that source and host country and time dummies are included in the regression

For total FDI and equity FDI, we can confirm the empirical results for OECD countries by Razin et al. (2005a). Higher host country taxes are associated with lower FDI flows. Higher source country taxes are insignificant in the flow equation, but significantly increase the likelihood of observing a positive FDI flow in a country pair.

For retained earnings and other FDI, the estimated coefficients give a different picture. While for the control variables the results are essentially the same as for equity FDI, the coefficients on source and host country taxes are less intuitive. In particular, source and host country tax rates reduce the amount of retained earnings. For other capital, host country taxes appear to lower the amount and the probability of the intercompany credits.

These empirical results are, however, based on regressions without country and time dummies. The coefficients might therefore reflect other unobserved country characteristics. In the following, we present the estimation results of the sample selection model specified with the necessary dummies. An *F*-test on the dummies confirms, that they have to be included. The dummies dramatically reduce the significance of the other variables. The most robust variables across all specifications is the distance measure and the border dummy. More distant countries have less FDI flows and are less likely to engage in FDI.

For total FDI, the only control variable besides distance and border dummy staying significant is GDP in the host country. An *F*-test on the difference between the population and GDP per capita coefficient cannot reject the null hypothesis that population in the host country significantly matters for FDI after controlling for GDP. For the selection equation, we find that source country taxes increase the probability of FDI flows at a 10% level. However, for the flow equation, host corporate tax rates are insignificant.

Equity FDI represents the largest part of FDI. Also, any firm intending to start production abroad has to start by acquiring equity. We therefore expect equity FDI to most strongly depend on market size and cost factors. This holds for both, the selection and the flow equation. This view is confirmed by our regression results. We find that especially source country GDP per capita and population size matter for the amount of FDI. Population and GDP in the host country, on the other hand, are not significant. For the selection equation, population in the source country and GDP per capita in the host country are significant at a 7% significance level. For equity FDI, source and host country statutory tax rates do not matter significantly. These results indicate that equity FDI seems to be mostly determined by fundamental source country characteristics and unobserved country characteristics, while statutory tax rates do not matter.

Retained earnings are driven by different factors than equity FDI. Here, the regression results indicate that GDP and population as well as wages are insignificant, while source country taxes very significantly increase the probability of observing re-investments of profits abroad. Finally, for other FDI we do not find significant tax effects after controlling for country and time fixed effects.

4.2 Robustness checks

We perform a variety of robustness checks. In a first step, we control for several additional variables that are potentially also related to FDI flows. The regressions are reported only in the working paper version of this paper (Wolff 2006a) or are available on the author's personal homepage as an online appendix due to space constraints.¹⁵ Government expenditure as a percent of GDP in the host and the

¹⁵ <http://www.uni-bonn.de/~guntram>.

source country is used as a control variable. Wage differences, a factor very often cited as a prime determinant of FDI, are also used as control variable. In a further set of regressions, we control for the openness of the receiving and the investing country. We also control for the difference in financial risk between the host and the source country. Finally, we control for the difference in the level of education between the country pair. Again, controlling for wage, education or financial risk differences or the openness or the level of government expenditure of a country does not change the results on taxes. In particular, the tax effect for the re-invested earnings equation remains strongly significant as before for all control regressions.

To improve the identification of the Mills ratio we include an additional variable in the selection equation. We follow the suggestion of Razin et al. (2005a) and include a dummy for previous FDI. The dummy variable is significant, indicating that country pairs with previous FDI flow interactions are more likely to observe again an FDI flow relation in the current period. Including this dummy, however, does not change the estimation results for the other variables.

Finally, we perform robustness checks regarding the sample size. First, to check that the difference in the effects of source country taxes on equity respectively retained earnings is not driven by the sample, we re-estimated the model with equity FDI as the dependent variable for the sample, for which retained earnings observations were available. The coefficients for source and host country taxes stayed insignificant. We also estimated the regressions with retained earnings as the dependent variable for only those observations, for which equity flows are available. The source country tax rate stays significant in the selection process.

Since the ten new member states have arguably a different history, and different characteristics than the old EU members and since they probably have less funds for investment, we estimate the regressions for EU 15 source countries only. The estimation results broadly confirm the picture obtained with the data for the EU 25. In particular, only for retained earnings, the source country tax increases the probability to re-invest abroad significantly. Also, for equity FDI, the macroeconomic fundamentals are significant in explaining amount and decision of FDI. The basic empirical results are also not driven by the fact, that the ten new member states do not invest in the other new member states.

4.3 Interpretation

Our empirical results give a more differentiated picture of the effects of taxes and market size on FDI flows. In the specification without country and time dummies, we find that host country corporate taxes reduce the amount of FDI, in particular equity FDI. Source country taxes, on the other hand, very robustly and strongly significant operate on the selection. Thus, higher source country taxes increase the probability of observing FDI. These results might be explained by a fixed set-up cost argument as put forward in Razin et al. (2005a). Higher source country taxes reduce the cost of set-up costs if they are incurred at home and thereby increase the probability of FDI flows. However, the results have to be taken with great caution, as they might be driven by unexplained country characteristics.

After controlling for source and host unobserved country characteristics and common time effects, the significance of the tax measure disappears in this EU data

set for equity FDI. Equity FDI, the largest part of total FDI, is however still determined by source country characteristics such as GDP per capita and population size. For the decision to establish an FDI flow, host country GDP matters significantly. We do, however, observe very significantly positive source country tax effects for the probability of observing re-invested earnings. On the other hand, for re-invested earnings, population size and GDP are insignificant.

The results must be interpreted cautiously. The insignificant coefficient might reveal, that taxes do not matter for total and equity FDI flows in the EU during the period 1994–2003. This interpretation is also supported by a recent survey study of German manufacturing firms, in which tax considerations are mentioned by a relatively small percentage of firms as decision variable for shifting production abroad (Kinkel et al. 2004). The main determinants in this study are cost factors and market acquisition arguments. Our empirical results confirm this view as macroeconomic fundamentals remain significant for the main FDI category, investment into equity. A further argument along these lines contents that in this particular period under investigation firms might have tried to use the occasion of the opening of the new markets to establish themselves in the market. The transition economies presented huge new opportunities. Therefore, firms might have focused on the fundamentals rather than on tax rates.

The insignificance of the top statutory tax rate might also result from an identification problem. In the regressions without country and time controls, we find the expected signs for host and source statutory tax rates. An insignificant tax coefficient after controlling for country and time fixed effects can be explained by the fact that tax incentives cannot empirically be distinguished from the additional unobserved country and time characteristics. Indeed, identification is only achieved by time variation of the tax rate. As we have seen, this variation is relatively minor. This view is further supported by auxiliary regressions of the host country dummies' coefficients on the host country tax rates. In this regression, the tax rate significantly negatively explains the value of the host country dummies, even after controlling for GDP per capita and population. However, this auxiliary regression does not establish a proof that tax rates matter.

Corporate tax rates might be a bad measure of actual tax burdens on FDI. In particular, tax exemptions, credits and the like cannot be captured well by any measure of tax burdens. Many countries indeed grant generous tax breaks to attract FDI, anecdotal evidence for the ten new member states points at that. Real tax burdens are however difficult to measure. The existing effective measures each suffer from various drawbacks and are not available for all countries. We are nevertheless confident, that top statutory tax rates should be positively connected to actual tax burdens and therefore we believe that our empirical results are not an artefact of the precise tax measure.

The insignificant coefficient might also mean, that company taxation is met by an equivalent provision of public goods improving location advantages. Buettner (2002) does not find evidence in support of significant public spending effects for FDI flows. It is indeed unlikely, that a direct equivalence between company taxation and public goods relevant for FDI exists.

Finally, our empirical evidence shows that top statutory corporate tax rates in the enlarged EU have very strong and significant effects on the probability of firms to

Table 3 Estimation results for the effects of taxes on debt financing of FDI

	tax_{jt}	tax_{it}	Obs	R^2
$\log(\text{oc}/\text{equity})$	-0.66 -0.95	-1.53 -2.14	899	0.01

t-values below the coefficient

retain profits abroad, even after controlling for country dummies. Evidence for increased financial transactions of US companies to reduce dividend repatriation and avoid source country taxes is also presented in Hines and Hubbard (1990). Previous research Ramb and Weichenrieder (2005) also indicates that inter-company loans are used as an instrument to avoid taxes, even though the estimated effects are small. Our study complements this result by showing a significant effect of taxes on re-investment of profits.

To gather further evidence on the effect of taxes on the financing structure, we regress other capital FDI in percent of equity FDI on host and source country tax rates.

Since interest on debt represents a cost in the host country, which is not taxed, but a revenue, which increases profits in the source country, we expect high source country taxes to lower the amount of debt as an instrument of investment. High source country taxes indeed significantly reduce inter-company debt in percent of equity investment (Table 3). Top statutory tax rates therefore do not appear to matter for the more fundamental decisions of where and how much to invest. They, however, prevent firms from re-distributing their profits and lower the amount of debt FDI.

Overall, with the present data set, it is difficult to confirm the hypothesis of significant tax effects on (equity and total) FDI flows. We do find evidence, however, that taxes matter for the allocation of profits in the European Union.

5 Conclusion

The empirical determinants of FDI are a hotly debated issue. In the public debate, high corporate tax rates are often mentioned as one of the key reasons for low investment rates from abroad, while low tax rates abroad are claimed to constitute unfair competition attracting FDI. The available empirical studies, however, show a rather wide range of estimates of tax elasticities of FDI.

The empirical results presented in this paper indicate that the importance often attributed in policy circles to the top statutory corporate tax rate for FDI is difficult to confirm. After controlling for unobserved country characteristics and common time effects, the tax rates of both, source and host country, turn insignificant for equity FDI. Equity FDI, however, is influenced significantly by market size factors. High source country taxes clearly increase the probability of firms to re-invest profits abroad, while market size factors play less of a role. We also find some evidence that source country taxes lower the use of debt to finance FDI. Further research could investigate in greater depth, in how far taxation determines the financing structure of foreign investments. Our results provide some evidence that taxes influence the allocation of profits, while possibly leaving total FDI flows unaffected.

Appendix

Table 4 Frequency of source-host interactions by countries

	Host	Source	
	Australia	0.28	0.67
	Bulgaria	0.09	0.00
	Cyprus	0.10	0.07
	Czech Republic	0.27	0.09
	Germany	0.35	0.78
	Denmark	0.27	0.18
	Estonia	0.17	0.10
	Spain	0.31	
	Finland	0.21	0.52
	France	0.32	0.56
	Greece	0.22	
	Hungary	0.30	0.14
	Ireland	0.25	0.03
	Italy	0.31	0.40
	Lithuania	0.21	0.07
	Latvia	0.17	0.03
	Malta	0.05	
	Netherlands	0.32	0.69
	Poland	0.33	0.15
	Portugal	0.21	0.39
Values calculated as number of total FDI flow observations larger than zero divided by number of possible observations in the entire period	Sweden	0.31	0.07
	Slovenia	0.18	0.29
	Slovakia	0.23	
	UK	0.35	0.56

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