CORPORATE TAX REFORM AND FOREIGN DIRECT INVESTMENT IN GERMANY – EVIDENCE FROM FIRM-LEVEL DATA

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Abstract

Does the reduction of the effective tax burden on corporations trigger foreign direct investment? We take the German tax reform of 2000 as a natural experiment in order to isolate the impact of corporate taxation on the investment of foreign-held affiliates in Germany. We do so by exploiting the very rich MiDi data base from the Deutsche Bundesbank. Although we deliberately choose an approach which is likely to underestimate the tax effects on investment we find significant evidence that the tax reduction had the intended effect of - ceteris paribus - fostering inward direct investment. We find an elasticity of inward foreign direct investment with respect to the effective marginal tax rate of -0.7. We repeat the analysis for different subgroups and find high degrees of heterogeneity. Our results do not allow to decide whether the model of discrete investment choices or the model of marginal adjustment of the capital stock performs better in explaining the investment data.

JEL Code: H25, H21.

Keywords: corporate taxation, foreign direct investment.

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1 Introduction

After more than twenty years of empirical research in the relationship between taxes and foreign direct investment (FDI), there is consensus among most researchers that taxes do matter for the decision of multinational enterprises (MNE) on where and how much to invest. Correspondingly, policy-makers often rely on the effectiveness of corporate tax policy reforms in order to attract FDI, and the current debate suggests that they will continue to do so in the future. But, lowering the tax burden on investment necessarily implies a cut in public expenditure or a shift of the tax burden to other tax bases like e.g. labor or consumption. Therefore, it is necessary not only to know *whether* taxes do matter but also *how much* they do. In other words, the quantitative dimension of the tax impact on FDI is decisive for the design of sound tax policy which carefully weighs the benefits of a corporate tax reduction to the economy as a whole against the cost.[1] The question is: How much additional investment or production do we get for a given loss of tax revenue?

The purpose of this paper is to measure the elasticity of FDI with respect to corporate tax reductions. We do so by analyzing the effect of the German tax reform in 2000, which came into force in January 2001. This reform implied substantial corporate tax rate cuts and broadened the corporate tax base. A frequently cited goal of the tax reform was to attract foreign direct investment in order to foster economic growth and mitigate the high unemployment rate. Now, five years after the reform, we ask whether the tax reform reached its goal.

We analyze this question by using the very rich MiDi data set from the Deutsche Bundesbank with firm-specific balance sheet data of foreign-held companies. Our analysis contributes to a literature that tries to clarify the incentive effects of existing tax systems on corporate investment. As corporate investment is assumed to be crucial for the generation of new jobs and growth, we think that this question is at the heart of future debates on corporate tax reforms.

Figure 1 illustrates the increasing importance of cross-border investment. It shows the inward flows (left scale) and stocks (right scale) of foreign direct investment in Europe. As the graph indicates, international foreign direct investment stocks experienced high - and even exponential - growth rates in the last 25 years. There were extraordinarily large FDI inflows in the second half of the Nineties and then a sharp fall from 2001 on. The volatility of the flows time series hints at the difficulties empirical economists face in isolating the impact of taxes. The German reform was passed in 2000, when investment had its peak, and came into power in 2001, when FDI - and domestic investment as well - saw a considerable decrease.

[1] For recent surveys on the theory of capital tax competition see e.g. Wilson and Wildasin (2004) or Fuest, Huber and Mintz (2005).

As will become clear in the empirical section of this paper, the task of identifying the tax impact in such a volatile environment is a major challenge.

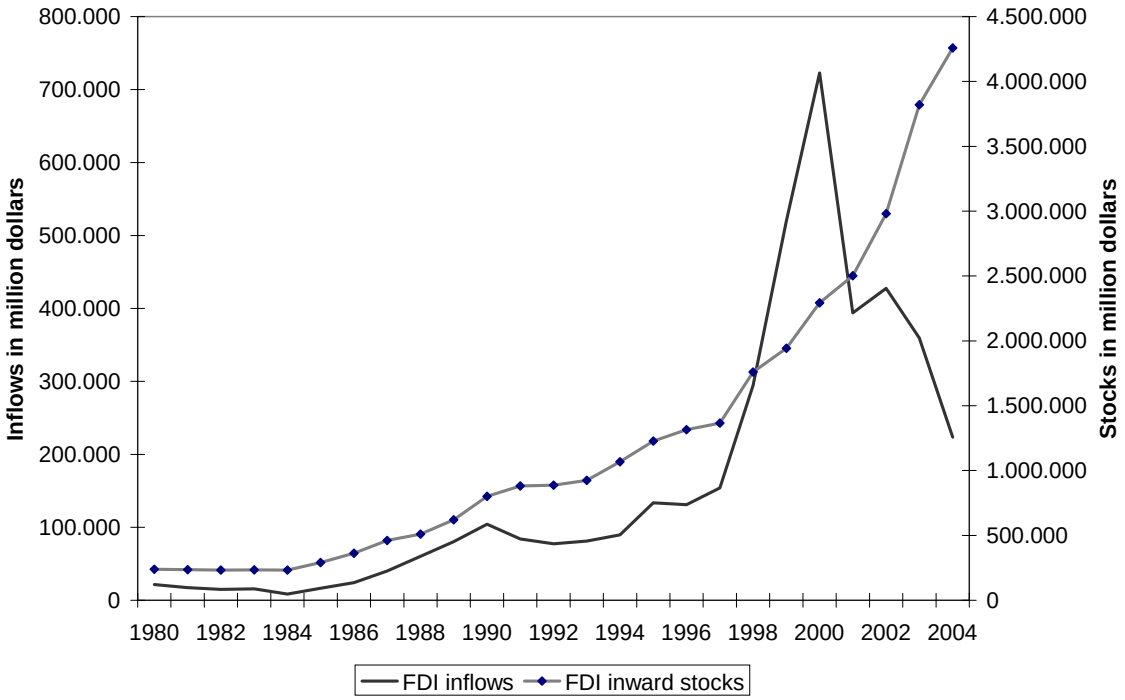

Figure 1: Inward FDI in Europe, flows and stocks. Source: UNCTAD.

Tax policy is just one environmental condition which may influence the location and investment decision of multinational companies. Other impact factors are market size, infrastructure, the availability of inputs like well-trained workers, regulatory policy, institutions like property rights, climate etc. There is a vast literature on the (possible) determinants of FDI, which has been surveyed by Markusen (1995), Markusen (2002) and Blonigen (2005). Recently, Buch, Kleinert, Lipponer and Toubal (2005) analyzed the determinants of German outbound investment using the same data set as we do in this paper. This study is now considered the most complete and thorough analysis in the German or even European context and serves as a qualitative benchmark. Buch et al. (2005) stress the importance of firm heterogeneity which leads to a broad variety of investment motives and determinants. The strongest predictors for German outward FDI are market size (positive) and distance (negative), which both cannot be controlled by economic policy. However, the authors hint at possible policy implications which are lowering the barriers to international investment and developing human capital. Unfortunately, they do not check for the impact of the tax system on FDI flows

or stocks. This is in line with the literature which has longtime assumed that tax policy is of negligible importance to the investment decision.

However, there is a bunch of thorough and methodologically sophisticated papers on the relationship between taxation and investment which find strong evidence for the relevance of the tax system. Hines (1999) and Gresik (2001) provide surveys of these studies related to cross-border investment data. Whereas Hines reports a tax rate elasticity of investment of about $-0,6$, the meta-study by Mooij de and Ederveen (2003) shows that many studies yield higher results. It is evident, though, that the quantitative dimension of the results strongly depends on the quality of the data and the methodological approach used for the empirical analysis.

In order to isolate the impact of taxation on investment it is necessary to identify an exogenous variation in the tax parameter which is our explanatory variable. Apart from seldom and fortunate exceptions like the one described in Slemrod, Blumenthal and Christian (2001), public finance economists do not have the opportunities of controlled experiments. However, if we assume that tax policy reforms are exogenous in the sense that they do not depend on periodical variation in the investment time series, we can interpret tax reforms as "natural experiments" which allow us to detect the causal relationship between taxes and investment behavior.[2] In the following, we will interpret the major reform of the corporate tax system of 2000 in Germany as such a natural experiment.

As Hines (1999) points out, *"(t)he empiricial literature on the effect of taxes on FDI considers almost exclusively U.S. data, either the distribution of U.S. direct investment abroad or the FDI patterns of foreigners who invest in the United States"*. This is still true, apart from the recent study by Büttner and Ruf (2006) who use pooled-cross-sectional methods in order to determine the tax effects on cross-border location and investment.[3] The American dominance is surprising because the geographical environment of Europe suggests that tax competition should be fiercer among those countries than e.g. between the US and Europe. The main reason is probably the lack of available and appropriate data sets. The MiDi data set of the Deutsche Bundesbank can therefore be considered a valuable source which might help close the gap to the American literature.

[2] This approach has first been used in labor economics in the seventies. Auerbach (1991) and Cummins, Hassett and Hubbard (1994) were among the first to propose interpreting tax reforms as natural experiments in order to isolate their impact on business investment. Other studies using this quasi-experimental approach are Givoly (1992) for the financial structure, Cummins, Hassett and Hubbard (1995) for domestic investment and, finally, House and Shapiro (2005) and Slemrod, Dauchy and Martinez (2005) using the introduction of bonus depreciation.

[3] There are some papers using European aggregate data, like Bénassy-Quéré, Fontagné and Lahrèche-Révil (2005) and Stöwhase (2005). From our perspective, these studies differ considerably from those using firm-specific data, as we argue in detail in Becker, Fuest and Hemmelgarn (2006).

To the best of our knowledge our paper is the first which analyzes the tax impact on FDI using the natural experiment approach with non-US data. In the next section, we will briefly outline the main features of the German tax reform in 2000. In section 3, we discuss the main hypothesis - that taxes reduce foreign direct investment - the estimation approach and some conceptual issues. Section 4 describes the data set and reports the estimation results as well as some robustness checks. Section 5 concludes.

2 The German tax reform of 2000

The main goals of the German Tax Reform 2000 were to improve the competitiveness of firms in Germany, to foster investment, to increase Germany's attractiveness to foreign investors and to adapt the corporate tax system to the rules of the EC common market. With regard to the corporate tax system, the formerly different tax rates on retained earnings (40 percent) and distributed profits (30 percent) were replaced by a single and lower tax rate on all profits (25 percent). In addition, the reform eliminated a long list of loopholes.[4]

Including local trading taxes (Gewerbesteuer) the combined statutory tax rate of the old system was 54,3% while the new combined rate is on average 39,4%, see Spengel (2001). The corporate tax base was broadened substantially. The rules for thin capitalization of foreign companies and related party financing were tightened. Depreciation allowances were reduced in terms of expected value for tangible assets, like machines, and structures, as is shown in table 1.

Table 1: The reform of the tax depreciation allowances.

Asset type	Before 2001	Since 2001
Intangibles	5 years linear deductions (20%)	5 years of linear deductions (20%)
Machines	4 years declining balance (30%), then 3 years linear deductions (8%)	2 years declining balance (20%), then 5 years linear deductions (12,8%)
Structures	25 years linear deductions (4%)	33 years linear deductions (3%)
Inventories	-	-

Source: Spengel (2001)

The decline of the statutory tax rate ensures that both the marginal and the average effective tax rate for all assets decrease with the tax reform of 2000. The tax base broadening for investment in machines and structures, though, leads to a relative disadvantage for those assets compared to financial and inventory assets.

[4]For a complete description of the reform please refer to Keen (2002), Homburg (2000) and Schreiber (2000).

Next to the changes in the corporate tax system the reform lowered the top personal income tax rate and the imputation system for the taxation of dividends was replaced by a shareholder relief system, the so called half income method (Halbeinkünfteverfahren) which stipulates that 50% of the diovidend after corporate tax is subject to personal income taxation.

The reform of the personal income tax system and the change in the integration technique of corporate and shareholder taxation are important and probably relevant for the investment decision of foreign investors. But, as we lack appropriate data on shareholders, we cannot use these reform features for our purpose. In the following we will restrict ourselves to the reform of the corporate tax system itself, but we will discuss in how far the other reform parts might play a role in shaping the investment process.

3 The theoretical underpinning

This section develops the conceptual framework for our empirical analysis. We have to define the nature of decisions that multinational companies make and that could potentially be distorted by taxation. As pointed out by Devereux and Griffith (2003), it is helpful to distinguish three dimensions of the investment decisions of multinational firms: The first is to decide whether to export or to produce abroad (internationalization decision). The second decision is where to produce (location decision). The third decision is how much to produce, or: how much to invest (investment decision).

Correspondingly, there are two types of tax effects on FDI. First, taxes may reduce the average return of a project and thus influence the internationalization and location decisions by firms. Second, taxes may change the user cost of capital and thus have an impact on the investment decision. Our dataset does not to analyse the internationalization or the location decision of MNEs. We just observe existing capital stocks and their variation over time. Therefore, our main focus is on the choice of the optimal capital stock, i.e. the investment decision. However, discrete jumps in the balance sheet capital stock suggest that we can observe quasi-location decisions where firms decide to locate the production of new goods in one country or another. As explained further below, our analysis will therefore take into account both the marginal and the average tax burden on investment.

3.1 The main hypothesis

Assume that there is an MNE located in a country outside Germany, which has an affiliate in Germany and - potentially - in other countries as well.[5] Using a very general formulation, we can state that the MNE chooses the size of the capital stocks depending on a finite vector $\mathbf{x}$ including global, country-specific, activity-specific and firm-specific parameters:

$$\Pi = \Pi\left(K_1, ..., K_n\right) \quad \text{with } K_h = K_h\left(\mathbf{x}_h\right) \tag{1}$$

with $h = 1, ..., n$. The $\mathbf{x}$ is a $m \times 1$ vector of parameters which are candidates for influencing the investment decision. One of these parameters is supposed to be taxation. Total differentiation yields:

$$dK = \frac{\partial K}{\partial x_1} dx_1 + ... + \frac{\partial K}{\partial x_{tax}} dx_{tax} + ... + \frac{\partial K}{\partial x_n} dx_m \tag{2}$$

x_{tax} is some tax variable to be operationalized later on. Held everything else constant, i.e. $dx_g = 0 \; \forall \; g \neq tax$ with $g = 1, ..., m$, the partial effect of the tax variable on the capital stock K is:

$$\frac{dK}{dx_{tax}} = \frac{\partial K}{\partial x_{tax}} \equiv \beta_{tax} \tag{3}$$

Our main hypothesis is that taxation has a negative impact on the foreign-held capital stock, i.e. $\beta_{tax} < 0$. There are two channels through which this relation can be established.

First, consider the case in which taxes increase the cost of capital, and assume that the pre-tax cost of capital does not depend on country-specific characteristics but rather on some world capital market. In this case the size of the optimal capital stock falls because some marginal investment projects are not realized any more. Here, the capital stock of the foreign parent company and the one of the German affiliate are not systematically linked: i.e. $\frac{dK_h}{dK_{-h}} = 0$. Given that the affiliate is not liquidity-constrained, the investment is independent of any factor influencing the other affiliates, the parent company or their locations characteristics.

Second, if taxes increase the average tax burden of a given project, the probability rises that this project will be realized elsewhere, e.g. in the country of residence of the parent company: $\frac{dK_h}{dK_{-h}} < 0$. In this case, the affiliate investment depends on factors influencing the other capital stocks as well, since they change the relative

[5] This assumption is justified by the type of data that we use. We only consider foreign investors which already have affiliates in Germany. Thus, the decision is just *how much* to invest and not *if* at all, i.e. not two-fold like in Devereux and Griffith (1998) or in Razin, Rubinstein and Sadka (2004).

attractiveness of the affiliate location. These factors include, in particular, foreign taxes.

Whether FDI are better described by the first or the second model has considerable policy implications. Sinn (1990) argues that a country can immunize itself against tax competition by lowering the effective marginal tax rate to zero and by only taxing intra-marginal profits. This is true for the first model but not for the second. If firms and/or projects are mobile and not only capital, i.e. if the second model is valid, there will be no immunization strategy and even the opposite policy, a tax rate cut cum base broadening strategy, might become optimal, as is shown in Becker and Fuest (2005). It is one of the objectives of our analysis to find hints at which of the two distinct models performs better in describing the empirical investment data.

The literature often differentiates between cost-driven investment and market-entry investment, suggesting that the latter are not or only weakly tax-sensitive. The idea behind this statement is that every unit of a market-entry investment has some complementary units of production in another country. In this case, the tax effect is weaker because domestic taxes only have an impact on the domestic part of the whole investment. In contrast, cost-driven investment is part of a strategy of disentangling the production chain. If the goods are not produced in the country under consideration, they will be produced elsewhere. Proximity to consumers or market-entry reasoning do not play a role.

In principle, these two types of investment could be used as control and treatment group in order to identify the tax impact on investment. The difficulty is that the data does not directly reveal the type of investment. One often used approximation is the differentiation between horizontal investment and vertical investment, see e.g. Buch et al. (2005). Horizontal (or intra-branch) investment is supposed to be realized because of market-entry reasons, vertical (or inter-branch) investment because of cost differences. As we will outline later on we do not have any means to differentiate between these two, either, due to data limitations.

3.2 Identification problem and estimation approach

As becomes evident from figure 1, there are strong aggregate forces that push investment up (until 2000) and down (from 2001 on).[6] It is therefore helpful to separate firm-level investment into two parts, an aggregate component and a

[6] Without taking into account the aggregate impact the analysis could yield contra-intuitive results like "cutting taxes reduces investment" just because the tax reform and the aggregate downturn coincided.

firm-specific one:

$$\frac{I_{i,t}}{K_{i,t-1}} = \frac{I_t}{K_{t-1}} + E_{i,t} \quad \text{with} \quad \sum_i E_{i,t} = 0 \tag{4}$$

with $\frac{I_{i,t}}{K_{i,t-1}} = \frac{K_{i,t}-K_{i,t-1}}{K_{i,t-1}}$ where $K_{i,t}$ is the observable variable 'total assets' of firm i in period t.[7] $\frac{I_t}{K_{t-1}}$ is the aggregate component and $E_{i,t}$ is the deviation from the aggregate mean due to firm-specific characteristics. Note that the aggregate component $\frac{I_t}{K_{t-1}}$ also includes the aggregate tax effect in the post-reform years. To isolate the aggregate tax effect from other aggregate influences we would require data on many tax reforms which allow us identifying some aggregate tax variation which is orthogonal to the other aggregate variations. For example, Cummins, Hassett and Hubbard (1994) analyze an investment time series from 1962 to 1988 and observe thirteen significant changes in the tax system which allow separating an aggregate tax effect from other effects. Another method could be to establish a reliable empirical structure in times where no tax changes occur and use these structures in the reform periods. For example, Slemrod, Dauchy and Martinez (2005) have ten years prior to the introduction of bonus depreciation in order to estimate the linkage between investment and aggregate variables without any tax effect.

We only have one significant tax variation[8], from 2000 to 2001, and our pre-reform dataset only covers five years (1996-2000) which proves to be far too little in order to get this reliable empirical structure. In order to deal with this problem, we decided to employ a rather radical technique which is to employ a full set of time dummy variables.[9] That is, we cleaned the time series from every time-varying aggregate effect, the macroeconomic tax effect included. If we assume that the tax reform has a positive effect on aggregate investment, our estimation results underestimate the tax impact on investment. In other words, we overestimate the

[7] That means, we measure net investment $I_{i,t}$ because for K to be stable over time there have to be replacement investment. It is true that replacement investment is no automatic process but a strategic decision which may be influenced by taxes as well. However, we lack the data to deal with these questions.

[8] The decision on what is significant or not is necessarily somewhat arbitrary. However, the literature claims unanimously that tax reforms should have a certain amplitude to be interpreted as a natural experiment. The reason is that unobservable time-varying effects could otherwise blur the effect under consideration. Cummins et al. (1994) enumerate different criteria for a tax reform to be "major" which are met by the German tax reform of 2000.

[9] We tried different methods of detrending the time series by regressing the data on aggregate consumption, aggregate domestic investment, demand and so on. It turns out that our estimation results of the tax term are highly sensitive to the detrending method or the detrending variable, respectively. By choosing the 'conservative' method of employing time dummies we want to make sure that our results are not the outcome of some spurious correlation with some aggregate variable.

aggregate effect, given that the tax effect of an effective tax reduction is definitely positive. Thus, we will get a conservative (in the sense of biased downwards) measure of the tax impact on foreign direct investment.

Therefore, in the first-stage regression we estimate

$$\frac{I_{i,t}}{K_{i,t-1}} = \sum_t \alpha_t YEAR_t + u_{i,t} \tag{5}$$

where the variable $YEAR_t$ is a time dummy which is equal to 1 if the year is equal to t and 0 otherwise. The α_t-effect which sums up all aggregate effects of one year is equal for all firms. We then compute the difference between actual investment and the aggregate effect:

$$E_{i,t} = \frac{I_{i,t}}{K_{i,t-1}} - \sum_t \hat{\alpha}_t YEAR_t \tag{6}$$

where $\hat{\alpha}_t$ is the estimated value of α_t. Even major reforms do not have observable effects in the reform year if they were expected before. Therefore, we have to assume that the tax reform comes as a surprise. If firms do not expect the tax reform, they will start the adjustment process towards the new equilibrium stock of capital in the year in which the tax reform takes place. Due to the nature of the political process we cannot assume that firms were really surprised when the new tax law became valid in January 2001. So we adopt the approach used in the previous literature which is to ignore the year in which the tax reform is passed (here: the year 2000). That means that we consider the years 2001-2003 as the treatment group and the years 1997-1999 as the control group. Thus, in the second-stage regression we estimate equations of the following classical difference-in-difference form:

$$E_{i,t} = \beta_0 + \beta_1 \Delta TAX + \beta_2 \left(POST \cdot \Delta TAX\right) + \sum_{g=3}^{m} \beta_g X_g + \varepsilon_{i,t} \quad \text{if } t \neq 2000 \tag{7}$$

where ΔTAX is the change of the firm-specific tax variable from 2000 to 2001, $POST$ is a dummy equal to zero for 1997-1999 and equal to one for 2001-2003. The X are firm-specific control variables. We assume that the X and the tax terms are not systematically correlated. This assumption will be regularly tested. We have no prediction for the sign or the significance of β_1. But, if it is significant it seizes some unobservable firm fixed effect. We do expect β_2 to be significantly negative. This approach leads to valid results if there is no unobservable variable (other than our control variables) which is systematically correlated to the firm-specific EMTR; the existence of such an unobservable is possible but not likely, though. Moreover, this approach is in line with the recent critique by Bertrand, Duflo and

Mullainathan (2004) who show that most difference-in-difference estimators are strongly biased by serial correlation. They propose pooling the pre-reform and after-reform data in order to overcome these problems.

In principle, we should get the same results by replacing $E_{i,t}$ by $\frac{I_{i,t}}{K_{i,t-1}}$ and adding a full set of time dummies, i.e. running only one regression. However, the two alternatives do not yield the same results. The reason might be that the other control variables, especially those which do not vary much over time, seize some fraction of the year dummy effect. In this case the coefficient estimates of the control variables will be hard to interpret since they confound aggregate and firm-level effects. Therefore, we stick to the procedure described above, which - in addition - is more in line with the approach proposed by Cummins et al. (1994).

The approach presented above is based on the assumption that first, considerable variation in the tax term is required in order to identify the tax impact on investment, and second, that the adjustment process to the new equilibrium capital stock lasts more than one period due to adjustment costs. Although we are convinced that this approach is adequate, we test another approach from the literature as a robustness check which links periodical changes in the tax variable to variations in investment of the same period. The regression estimation becomes:

$$E_{i,t} = \gamma_0 + \gamma_1 \Delta TAX_t + \sum_{g=2}^{m} \gamma_g X_g + \varepsilon_{i,t} \tag{8}$$

where ΔTAX_t is now the periodical tax variation. This approach is appropriate if one assumes that firms react immediately to even small tax variations which occur in the data due to minor tax law changes and structural variation in the balance sheet capital.

Before we present the empirical analysis we should quickly outline why we do not use the so-called "capital-knowledge model" which is the standard model in the literature for analyzing foreign direct investment. First, we are interested in the variation of capital stocks as a response to tax variations, not in their absolute size. That means, that every time-constant variable determining the capital stock drops out in our analysis. Second, our data requirements reduce the data sample considerably and excludes nearly all non-OECD countries. Since OECD countries are likely to have very similar factor proportions the capital-knowledge model might not be the best model to work with.

4 The empirical analysis

4.1 The data

4.1.1 FDI data

We use the Micro Database Direct Investment (MiDi) from the Deutsche Bundesbank which contains a large sample of German inbound and outbound FDI; for a detailed description of the database see Lipponer (2003a). We only use the information on inbound FDI, i.e. the balance sheet data of foreign-held affiliates in Germany. From 1996 on, the data are available as panel data. We construct a balanced panel data set by excluding all firms which do not have full coverage from 1996 to 2003. This limits the size of the sample but allows us using the time series properties of the data. Furthermore, we exclude all state-owned companies and keep only corporations in the sample. Since our dependent variable $\frac{I_{i,t}}{K_{i,t-1}}$ uses two sequential periods we have seven observations (1997-2003) for each affiliate. These data adjustments leave us with 2830 firms and 19.810 observations. The variables investment, profitability and debt level are winsorized at the 5 percent and 95 percent values of their distributions by setting values outside those ranges to the values at those percentiles.[10] Additional information on the FDI data is given in the appendix.

4.1.2 Tax-related data

As outlined in the previous section, we can differentiate between two tax effects. The first effect is that taxes increase the cost of capital and therefore change the size of the capital stock at which the marginal investment yields a return equal to the cost of capital. The corresponding indicator is the effective marginal tax rate (EMTR), first developed by King and Fullerton (1984). See Becker and Fuest (2004) for the derivation of the following firm-specific expression of the EMTR from the representative firm framework:

$$EMTR_i = \frac{u\left(1 - A_i - r_i b\right)}{\left(1-u\right) r_i + u\left(1 - A_i - r_i b\right)} \tag{9}$$

with $r_i = \frac{\rho - \pi}{\rho - \pi + (1+\pi)\delta_i}$. ρ is the nominal interest rate, and π is the inflation rate. δ_i is the firm-specific rate of economic depreciation, which is calculated according to

$$\delta_i = \sum \phi_{i,j}\delta_j \quad \text{where} \sum \phi_{i,j} = 1 \tag{10}$$

[10] Winsorizing variables is a common method to deal with outliers in this type of data. The reason is that we observe e.g. debt levels of more than 1000% of total assets and other completely implausible values.

where $\phi_{i,j}$ is the fraction of asset j in firm i and the δ_j are estimations of economic depreciation rates (see the appendix). A_i is the expected value of tax depreciation allowances: $A_i = \mu_i \sum_i \theta_i \sum_{t=1}^{T} \frac{d_{i,t}}{(1+r)^t}$, where μ_i denotes the fraction of tangible assets in the capital stock, and the θ_i denote the fraction of the asset type in the total tangible capital stock of firm i. We can observe μ_i but we cannot observe the θ_i; instead we assume that these are equal to the average θ of the industry in which the affiliate is producing. b is the fraction of debt finance in the marginal investment; we assume throughout the analysis that $b = 0$, i.e. we have pure equity finance.[11]

The second tax effect is that taxes reduce the average profitability of discrete investment projects. Although we do not have data on the location decision of MNEs with respect to whole affiliates, the data suggest that there are discrete projects which could be realized in one affiliate or in another. Therefore, we also use the effective average tax rate (EATR), developed by Devereux and Griffith (2003), as a dependent regression variable. Since we cannot observe the marginal rate of return p^m, we run regressions with several assumed values of p^m and assume that the profitability of the project p can be approximated by the pre-reform profitability of the whole affiliate. The correspondig formula for the firm-specific EATR is:

$$EATR_i = \frac{p^m}{p_i} EMTR_i + \left(1 - \frac{p^m}{p_i}\right) T \tag{11}$$

The problem is that we cannot use firms in which $p < p^m$ which leads to a considerable reduction of the data set. For more information on data sources, see the appendix.

4.2 Descriptive Statistics

Table 1 shows the summary statistics for both the reduced balanced sample and the whole sample. We report the mean values and standard deviations (in brackets below) of the total balance sheet capital stock (in thousand Euros, including tangible, intangible and financial assets), the fraction of non-financial assets, the fraction of debt finance, profitability measured as periodical profits over total assets and the firm-specific effective marginal tax rate (EMTR).

As the total assets column shows, the firms in our data sample experienced high growth rates. Meanwhile, the share of non-financial assets remained on a surprisingly low but time-constant level. The debt level slightly decreases over

[11] This assumption is standard in the literature. It is made because the source of finance for the marginal investment cannot be observed. Taking e.g. the average financial structure as a proxy may be highly misleading. For instancew, a high average debt level may imply that additional investment has to be financed by equity. But it may also reflect good access to or a good rating in the capital market.

time. The profitability measure is relatively stable in spite of the strong business cycle impact. The tax reform in 2000 reduces the EMTR from over 50% to under 40% in the post-reform period.

Table 2: Summary statistics

Year	Total assets in 1000 Euro		Non-financial assets		Debt level		Profitability		EMTR
	balanced	whole	balanced	whole	balanced	whole	balanced	whole	balanced
1996	48 553	70 483	.20	.19	0.66	.71	.07	.09	0.5758
	(352 207)	(435 427)	(.23)	(.24)	(0.31)	(.38)	(.32)	(.39)	(0.0106)
1997	54 000	78 500	.20	.18	0.66	.70	.08	.10	0.5759
	(443 309)	(496 969)	(.23)	(.24)	(0.31)	(.38)	(.31)	(.39)	(0.0106)
1998	64 372	84 437	.20	.18	0.65	.69	.10	.11	0.5657
	(575 958)	(562 012)	(.23)	(.24)	(0.31)	(.38)	(.31)	(.39)	(0.0106)
1999	69 532	106 103	.20	.19	0.65	.69	.09	.11	0.5257
	(721 851)	(858 888)	(.23)	(.24)	(0.31)	(.38)	(.31)	(.39)	(0.0110)
2000	76 844	130 058	.20	.18	0.64	.68	.09	.10	0.5255
	(855 132)	(1 636 306)	(.23)	(.24)	(0.31)	(.38)	(.31)	(.38)	(0.0112)
2001	80 599	131 891	.20	.19	0.63	.67	.09	.10	0.3876
	(864 479)	(1 293 160)	(.23)	(.24)	(0.32)	(.39)	(.31)	(.39)	(0.0101)
2002	76 030	193 704	.20	.20	0.61	.62	.08	.06	0.3877
	(703 414)	(1 722 195)	(.23)	(.25)	(0.33)	(.37)	(.31)	(.36)	(0.0102)
2003	89 152	202 237	.19	.20	0.59	.60	.08	.07	0.4077
	(1 024 766)	(1 789 026)	(.23)	(.25)	(0.33)	(.37)	(.30)	(.33)	(0.0103)

Notes: The table reports the means for the sample under consideration and the standard deviation in brackets below.

Comparing the summary statistics of our data sample with the raw data (before reductions and balancing), it turns out that the average firm in the reduced sample is smaller than in the complete sample. We cannot compare the growth rates in a sensible way because the number of firms in the raw data varies considerably. Notably, there is a considerable reduction in the number of firms in 2002, which is due to legal changes.[12] The fraction of non-financial assets and the level of debt finance do not differ too much between the two samples. The firms in the balanced sample seem to be less profitable on average than in the raw data, but that changes in 2002. After all, we do not expect to have strong selection bias in our analysis.

4.3 Investment before and after the reform

In order to get a first impression of the differences between these subsamples, table 3 reports the investment ratio (before demeaning) at the 25th percentile, the median and the 75th percentile. For each subgroup, the pre-reform (1997-1999) and post-reform average values (2001-2003) are reported. The median firm in the total sample invested 7,5% of its capital stock before the reform and 3,7% afterwards. Investment by the median European investor fell from an average 6,9%

[12] The number of observations (including redundancies due to several investors) increases from around 15 000 in 1996 to 17 000 in 2001, but then drops to around 12 000 in 2002.

to 3,9%. American and Asian median companies invested significantly more before the reform but experienced a more accentuated fall in investment after the reform. As to branches of activity, the manufacturing branch had the lowest investment level at the median before the reform. After the reform, the median companies in all branches had investment levels around 3%-4%. Finally, as one would expect profitable firms, i.e. those with a positive average pre-reform profitability, invest more, before and after the reform. The difference, though, is not as accentuated as one might think.

There are two important features of the data which can be nicely illustrated with the help of table 3. First, there is enormous variance in the investment levels. At the 75th percentile, the companies in the sample had a pre-reform investment level of 25% whereas, at the 25th percentile, the companies disinvested (even before 2001). Second, nearly all investment levels fall after the reform which hints at the strong aggregate effect from the business cycle. Interestingly, holdings at the 75th percentile are the only subgroup to increase their investment after the reform.

Table 3: Investment before and after the tax reform.

	Total		Europe		America		Asia	
	pre-reform	post-reform	pre-reform	post-reform	pre-reform	post-reform	pre-reform	post-reform
p25	-0,0171	-0,0465	-0,0202	-0,0453	-0,0093	-0,0333	-0,0078	-0,0759
median	0,0752	0,0369	0,0683	0,0386	0,0946	0,0431	0,0782	0,0036
p75	0,2500	0,2000	0,2467	0,2164	0,2912	0,1958	0,2072	0,0947

	Manufacturing		Holdings		Wholesale		Services to Companies	
	pre-reform	post-reform	pre-reform	post-reform	pre-reform	post-reform	pre-reform	post-reform
p25	-0,0293	-0,0439	-0,0037	-0,0270	-0,0058	-0,0574	-0,0372	-0,1042
median	0,0441	0,0297	0,0726	0,0354	0,0926	0,0291	0,0584	0,0403
p75	0,1553	0,1481	0,2681	0,4271	0,2390	0,1449	0,3868	0,2188

	Financial Services		Profitable		Non-profitable	
	pre-reform	post-reform	pre-reform	post-reform	pre-reform	post-reform
p25	0,0150	-0,0760	-0,0103	-0,0362	-0,0448	-0,0737
median	0,0857	0,0366	0,0812	0,0416	0,0507	0,0137
p75	0,4653	0,2477	0,2572	0,2024	0,2302	0,1880

Notes: The pre-reform values are the average of the 1997-1999 period, the post-reform values the average of the 2001-2003 period. Profitable firms are those which have a pre-reform profitability above zero.

4.4 First approach: difference-in-difference estimation

4.4.1 Baseline estimation

Table 4 shows the results of the baseline estimation regressions. The dependent variable is the E_{it} as described in equation (6). Note that our estimation results are biased downwards due to the neglection of the aggregate effect of the tax reform.

The estimation values can therefore be regarded as a conservative bottom line. Explanations of the variable definitions in table 3 can be found in the notes below the table.

The first column in table 3 reports our baseline estimation with a treatment group of 2001-2003 and a control group of 1997-1999. We control for periodical profitability, measured as a fraction of firm equity, non-financial assets and debt finance, both measured as a fraction of total assets; sales over total assets, which can be interpreted as an indicator for the capital-intensity of production, the growth of sales, the size of the firm (i.e. the total capital stock in absolute value), the number of employees divided through total assets and, finally, the number of investors. A full set of country dummies and branch dummies is employed.

Before we analyze the results of the tax term we quickly discuss the outcomes of the control variables which are quite interesting, too. The term profitability is positive but not significant, taken apart some exceptions which are discussed later on. Firms with a high fraction of non-financial assets invest significantly less than others. High-debt firms invest more, and firms with a high sales over assets ratio invest less. The growth rate of sales has a strong impact on investment, as one would expect. Note, though, that this coefficient should be interpreted as an idiosyncratic demand impact to an individual firm, since we cleaned the data from any aggregate demand influence. The number of workers has a strongly negative and highly significant impact. Finally, the number of investors has a clear negative impact on investment: Ceteris paribus, an increase in the number of investors lowers investment.

Now, consider the tax variables. As outlined in the previous section the coefficient of the term ΔEMTR is hard to interpret in a sensible way; it is not significant, either, and shows large variation over the course of regressions. In column (1), the treatment effect of the tax reform with respect to the variation in the effective marginal tax rate (ΔEMTR*POST) is equal to -0,1034. It has the expected sign and is highly significant. If this first regression is valid, a reduction of the EMTR of 10 percentage points leads to an increase in foreign direct investment flow of 1,034 percentage points. If median investment is at 7,5% (see table 3) and the EMTR around 0,52 (see table 2), the resulting elasticity is $\varepsilon = -0,72$.

The EMTR is calculated by using the fraction of non-financial assets and total assets. One might argue that those variables and the EMTR interact and distort the estimation or that the observed tax effect is an artefact due to multicollinearity. Therefore, we repeat the baseline regression in column (2) holding constant all parameters of the EMTR term except the tax parameters. The tax effect remains virtually the same. Column (3) adds the year 2000 to the control group; the treatment effect becomes slightly stronger. Nevertheless, for all of the following regressions we stick to our approach of excluding the 2000 data because of the

methodological reasons explained above. In column (4), we repeated the baseline regression by taking pre-reform averages of all control variables that are normalized by total assets. We do so in order to check whether we might run the risk of having some endogeneity bias that results from the fact that total assets is part of the dependent variable as well as of several independent variables. The tax effect is slightly increased which makes us confident that we can use our specification without exaggerating the treatment effect of the tax reform.

Tabelle 4: Baseline regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline	Baseline constant	Including 2000	Average values	Lagged Profitability	Profitable Firms	Non profitable firms
ΔEMTR	0.8824	0.4337	1.1174	1.7658	0.8527	0.1357	2.9585
	(0.9572)	(0.3758)	(0.8744)	(0.9451)	(0.9576)	(1.1016)	(1.9073)
ΔEMTR*POST	-0.1034	-0.1018	-0.1196	-0.1472	-0.1027	-0.1306	0.0193
	(0.0437)*	(0.0437)*	(0.0410)**	(0.0445)**	(0.0437)*	(0.0496)**	(0.0942)
PROFITABILITY	0.0136	0.0138	0.0153	0.0401	0.0529	-0.0107	0.0383
	(0.0108)	(0.0108)	(0.0101)	(0.0176)*	(0.0109)**	(0.0140)	(0.0192)*
NON-FIN ASSETS	-0.2137	-0.2078	-0.2242	-0.0760	-0.2119	-0.1945	-0.2511
	(0.0215)**	(0.0176)**	(0.0198)**	(0.0219)**	(0.0215)**	(0.0251)**	(0.0424)**
DEBT	0.0501	0.0500	0.0547	0.0405	0.0496	0.0493	0.0728
	(0.0109)**	(0.0109)**	(0.0101)**	(0.0123)**	(0.0108)**	(0.0125)**	(0.0237)**
SALES	-0.0649	-0.0650	-0.0651	0.0124	-0.0654	-0.0640	-0.0721
	(0.0029)**	(0.0029)**	(0.0027)**	(0.0034)**	(0.0029)**	(0.0033)**	(0.0063)**
SALESGROWTH	0.4508	0.4509	0.4541	0.4167	0.4504	0.4649	0.4097
	(0.0136)**	(0.0136)**	(0.0124)**	(0.0138)**	(0.0136)**	(0.0156)**	(0.0275)**
SIZE	0.0000	0.0000	0.0000	-0.0000	0.0000	0.0000	0.0000
	(0.0000)**	(0.0000)**	(0.0000)*	(0.0000)	(0.0000)**	(0.0000)	(0.0000)**
EMPLOYEES	-2.4775	-2.5297	-2.6468	1.4050	-2.4256	-2.4777	-1.8312
	(0.6278)**	(0.6211)**	(0.5801)**	(0.6913)*	(0.6284)**	(0.7245)**	(1.2576)
INVESTORS	-0.0066	-0.0066	-0.0067	-0.0107	-0.0071	-0.0074	-0.0114
	(0.0029)*	(0.0029)*	(0.0027)*	(0.0030)**	(0.0029)*	(0.0031)*	(0.0105)
COUNTRY DUMMIES	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BRANCH DUMMIES	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CONSTANT	0.1924	0.1332	0.2193	0.2060	0.1908	0.0919	0.4716
	(0.1467)	(0.0851)	(0.1311)	(0.1452)	(0.1467)	(0.1861)	(0.2740)
No of Obs	14684	14684	17155	14692	14679	11334	3350
R-squared	0.20	0.20	0.20	0.16	0.20	0.20	0.22

Notes: Robust standard errors in parentheses; * significant at 5%; ** significant at 1%. Dependent variable is net investment over total assets in the preceding period. PROFITABILITY is measured by periodical profits over total assets; NONFINANASSETS is the fraction of nonfinancial assets in the total capital stock, DEBT measures the fraction of debt finance in the total capital stock. SALES are defined as sales over total assets. SALESGROWTH is equal to the growth rate of sales: (sales of t minus sales of t-1)/(sales of t-1). SIZE is the absolute balance sheet value of total assets. WORKERS is the number of employees divided through total assets. INVESTORS is the number of foreign investors as it is reported in the data set. To be included, affiliates data have to cover the whole period from 1996 to 2003. The largest and the lowest 5% of the variables NONFINANASSETS, DEBT and SALES have been winsorized. All regressions are corrected for hetereskedasticity. The robust standard errors are reported in brackets below the coefficient values. We checked for cluster specific heteroskedasticity (countries and branches) but did not find any significant impact.

In columns (5) and (6) we run two more robustness checks by employing profitability as lagged regressors. The lagged profitability has a higher coefficient than in the baseline estimation and it is significant. This could be interpreted as a hint to liquidity constraints. We will discuss the role of profitability later on. In columns (7) and (8), we split the sample in those firms that were profitable on

average in the years 1997-2000 and those which were not. That is, we introduce a second dimension of control and treatment groups. One would expect that non-profitable firms are not tax-sensitive since they do not pay any taxes or they have loss carry forwards as effective tax shields for the future. Actually, the profitable firms have a significant negative tax impact on investment and the non-profitable do not. Profitable firms increase their investment by 0,13 for every unit reduction in the EMTR.

After the first set of regressions, we feel confident to state

Result 1 A reduction of the effective marginal tax rate of 10 percentage points leads to an increase of inward FDI of 1 percentage point. This corresponds to an investment elasticity of $\varepsilon = -0,7$. Nonprofitable firms are not tax sensitive whereas profitable firms show an investment elasticity of around $\varepsilon^{prof} = -0,85$ (evaluated at the median value, as reported in table 3).

This result refers to the whole sample under consideration. As Buch et al. (2005) emphasize, FDI data is characterized by a high degree of heterogeneity. In the following subsections, we will try to reduce this heterogeneity by building adequate subsamples.

4.4.2 Regions and branches

In this subsection we split the sample into different subgroups according to regional aspects and branches of activity.

In table 5 we report the regression results for the different regional and branch subgroups. In the first four columns of table 5, we repeat the baseline estimation for investors from different regions. Surprisingly, affiliates with American and Asian investors do not show any significant reaction to the tax reform. In contrast, for European-held affiliates, in column (3), the regression yields a strong and significant tax impact of $-0,178$, which corresponds to an elasticity of $\varepsilon^{euro} = -1,38$. Column (4) reports the results for those countries which have a common border with Germany. Compared with the results in (3), the tax impact is considerably increased, up to $-0,2576$. The corresponding elasticity is $\varepsilon^{direct} = -1,30$ (median investment is at $0,10$, not reported in the tables). The results reported in columns (1) to (4) are perfectly in line with the common story saying that we should expect a higher degree of tax competition within Europe. Meanwhile, intercontinental investment is supposed to be more motivated by market entry reasons than by cost considerations.

Therefore, we state

Result 2 American and Asian investments are not tax-sensitive with respect to the effective marginal tax rate. European held affiliates show strong and

significant tax sensitivity. Investors from countries with a common border with Germany react even more strongly to variations in the EMTR.

One intuitive and often used way of building subgroups is the separation of countries with an exemption system from those with a credit system. We did not do so because Germany is the country with the highest corporate tax rate. Therefore both systems lead to the same result: The effective tax rate on corporate income in German affiliates is the German one.

In columns (5) to (9) we report the results of different branch subgroups.[13] The two largest groups are manufacturing firms and wholesale traders. Intuitively, one would expect manufacturing affiliates to be cost-sensitive and therefore tax-reagible, whereas wholesale traders follow consumers and are more market-entry driven.

Table 5: Regional aspects and different branches

	(1) America	(2) Asia	(3) Europe	(4) Direct Neighbours	(5) Manu-facturing	(6) Holdings	(7) Wholesale	(8) Services to Companies	(9) Financial Services
ΔEMTR	5.0956	0.8446	0.0461	0.7359	1.2538	16.1055	1.6306	4.9202	-13.3024
	(2.4906)*	(3.9157)	(1.0582)	(1.0919)	(1.4855)	(6.5759)*	(2.0298)	(4.2406)	(15.5386)
ΔEMTR*POST	0.1442	0.0016	-0.1780	-0.2576	-0.1905	-1.0508	-0.0262	0.5423	0.5310
	(0.1067)	(0.1044)	(0.0528)**	(0.0571)**	(0.0676)**	(0.3963)**	(0.0590)	(0.2613)*	(0.5503)
PROFITABILITY	-0.0104	0.0344	0.0174	0.0114	0.0375	-0.0887	0.0199	-0.0057	-0.0605
	(0.0261)	(0.0291)	(0.0128)	(0.0141)	(0.0184)*	(0.1018)	(0.0146)	(0.0596)	(0.1248)
NON-FIN ASSETS	-0.2901	-0.1501	-0.2047	-0.2386	-0.2095	0.1376	-0.1795	-0.3309	0.1704
	(0.0554)**	(0.0706)*	(0.0243)**	(0.0254)**	(0.0325)**	(0.2244)	(0.0354)**	(0.0990)**	(0.3020)
DEBT	0.0119	0.0578	0.0595	0.0838	0.0475	0.1706	0.0628	-0.0399	0.3051
	(0.0245)	(0.0312)	(0.0129)**	(0.0140)**	(0.0176)**	(0.0852)*	(0.0152)**	(0.0543)	(0.1602)
SALES	-0.0729	-0.0635	-0.0631	-0.0640	-0.0785	-0.1702	-0.0631	-0.0844	-0.1198
	(0.0074)**	(0.0085)**	(0.0034)**	(0.0036)**	(0.0064)**	(0.0405)**	(0.0037)**	(0.0159)**	(0.0498)*
SALESGROWTH	0.4401	0.5102	0.4454	0.4531	0.5592	-0.0993	0.5429	0.3287	0.2433
	(0.0316)**	(0.0349)**	(0.0164)**	(0.0171)**	(0.0258)**	(0.0568)	(0.0197)**	(0.0520)**	(0.1092)*
SIZE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)*	(0.0000)*	(0.0000)**	(0.0000)	(0.0000)**	(0.0000)**	(0.0000)
EMPLOYEES	-3.2067	-3.0146	-2.3190	-2.3202	-2.8056	20.2582	-4.6117	2.5815	3.8402
	(1.4293)*	(2.6640)	(0.7229)**	(0.7700)**	(0.9979)**	(22.3684)	(1.0341)**	(2.9852)	(11.8213)
INVESTORS	-0.0087	-0.0066	-0.0070	-0.0062	-0.0051	-0.0119	-0.0074	-0.0135	0.0142
	(0.0042)*	(0.0118)	(0.0039)	(0.0039)	(0.0033)	(0.0527)	(0.0068)	(0.0233)	(0.1093)
COUNTRY DUMMIES	No	No	No	No	Yes	Yes	Yes	Yes	Yes
BRANCH DUMMIES	Yes	Yes	Yes	Yes	No	No	No	No	No
Constant	0.9236	0.1283	0.0984	0.1898	0.1328	3.4519	0.3596	0.9484	-2.1266
	(0.3428)**	(0.5446)	(0.1468)	(0.1512)	(0.2129)	(0.9863)**	(0.2971)	(0.6130)	(2.2179)
Observations	2466	1583	10635	9123	4679	530	6214	701	176
R-squared	0.20	0.29	0.19	0.20	0.30	0.10	0.27	0.16	0.24

Notes: Robust standard errors in parentheses; * significant at 5%; ** significant at 1%. Dependent variable is net investment over total assets in the preceding period. For further information, see table 4.

[13] Unfortunately we cannot observe branch switchers, i.e. affiliates which have a branch of activity different from the one of their mother company, as do Buch et al. (2005) because the inbound data do not include data on the mother firms.

Actually, our data confirm this expectation, which we formulate as

Result 3 Among the two dominant groups in our data sample, only the manufacturing firms show a significant tax effect. Wholesale traders do not seem to be tax sensitive.

The treatment effect for holdings is nearly ten times higher than the one of the total sample. But, the standard error is larger, too, and the subsample of holdings is relatively small. Next, we will analyze the sample in different quartile subgroups.

4.4.3 Quartile analysis

In the following, we split the sample in quartile subgroups according to the average pre-reform profitability. Table 6a shows the results.

Table 6a: Quartile analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Average pre-reform profitability				Average pre-reform profitability (with lagged profitability)			
Quartiles	first	second	third	fourth	first	second	third	fourth
ΔEMTR	2.7468	-0.8406	-1.0626	-1.1389	2.5848	-0.7782	-0.9765	-1.0233
	(1.2259)*	(1.5599)	(1.6452)	(1.5225)	(1.2253)*	(1.5578)	(1.6424)	(1.5247)
ΔEMTR*POST	-0.1410	-0.1967	-0.0038	0.0354	-0.1481	-0.1916	-0.0107	-0.0192
	(0.0843)	(0.0981)*	(0.0802)	(0.0900)	(0.0833)	(0.0980)	(0.0800)	(0.0889)
PROFITABILITY	0.0402	0.0224	-0.0015	-0.0442	0.0555	0.0614	0.0812	0.0190
	(0.0190)*	(0.0322)	(0.0224)	(0.0181)*	(0.0189)**	(0.0329)	(0.0228)**	(0.0174)
NON-FIN ASSETS	-0.2560	-0.1235	-0.2000	-0.1887	-0.2551	-0.1253	-0.1985	-0.1932
	(0.0313)**	(0.0419)**	(0.0365)**	(0.0379)**	(0.0312)**	(0.0418)**	(0.0364)**	(0.0380)**
DEBT	0.0894	0.1414	0.0494	-0.0347	0.0948	0.1419	0.0514	-0.0443
	(0.0203)**	(0.0243)**	(0.0195)*	(0.0190)	(0.0203)**	(0.0243)**	(0.0195)**	(0.0188)*
SALES	-0.0741	-0.0577	-0.0626	-0.0717	-0.0740	-0.0578	-0.0633	-0.0729
	(0.0056)**	(0.0064)**	(0.0053)**	(0.0057)**	(0.0056)**	(0.0064)**	(0.0053)**	(0.0057)**
SALESGROWTH	0.4234	0.4218	0.4433	0.5088	0.4219	0.4219	0.4440	0.5094
	(0.0150)**	(0.0190)**	(0.0164)**	(0.0169)**	(0.0150)**	(0.0190)**	(0.0163)**	(0.0170)**
SIZE	0.0000	-0.0000	0.0000	0.0000	0.0000	-0.0000	0.0000	0.0000
	(0.0000)**	(0.0000)	(0.0000)	(0.0000)**	(0.0000)**	(0.0000)	(0.0000)	(0.0000)**
EMPLOYEES	-3.1506	-0.6664	-2.7186	-2.7107	-3.0535	-0.6245	-2.6280	-2.6893
	(1.1742)**	(1.4987)	(1.2922)*	(1.2919)*	(1.1734)**	(1.4980)	(1.2904)*	(1.2934)*
INVESTORS	-0.0143	0.0046	-0.0129	-0.0045	-0.0144	0.0044	-0.0129	-0.0053
	(0.0094)	(0.0102)	(0.0095)	(0.0067)	(0.0094)	(0.0077)	(0.0095)	(0.0067)
COUNTRY DUMMIES	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BRANCH DUMMIES	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.4494	-0.2596	0.2961	-0.1241	0.2331	0.1935	-0.0140	0.3669
	(0.1966)*	(0.2958)	(0.2986)	(0.2783)	(0.2485)	(0.2423)	(0.2479)	(0.2857)
Observations	4464	2688	3757	3775	4462	2688	3755	3774
R-squared	0.21	0.20	0.20	0.23	0.21	0.20	0.21	0.23

Notes: Robust standard errors in parentheses; * significant at 5%; ** significant at 1%. Dependent variable is net investment over total assets in the preceding period. For further information, see table 4.

Our findings are surprising, which is stated by

Result 4 Nonprofitable firms and those with an above-average profitability do not show any significant tax impact. In contrast, firms with a positive but below-median profitability[14] have a strong and significant tax impact.

This could be due to the fact that highly profitable firms do react more strongly to tax rate cuts than to variations in the size of the tax base. Since tax rate cuts are equal for all firms their impact is part of the aggregate effect which we eliminated in the first-stage regression. A second possible explanation is liquidity constraints which might play a role for firms with a below median profitability. If firms are liquidity or credit constrained, they will react to tax cuts as if they were not (and just adapting to new levels of capital costs). Therefore we face an additional identification problem, which proves to be hard to solve. In order to check whether these results are due to simultaneity effects, we instrument profitability with its lagged $t-1$ value in columns (5) to (8). In the first three quartiles lagged profitability is (at least marginally) significant and positive. It is striking that in the second quartile both the tax impact and lagged profitability are only marginally significant, which might hint at multicollinearity.

The estimations reported in table 6b allow pursuing this question further. Here we split the sample according to debt fraction quartiles and non-financial asset fraction quartiles. Columns (1) to (4) show the regression results for quartiles of debt finance which can be summarized in

Result 5 As predicted by standard tax theory, firms with a low debt level react strongly to the variation in the effective marginal tax rate, whereas firms with high debt levels - i.e. with already high tax shields - do not react significantly.

Interestingly, in the two first debt quartiles the profitability regressor is significantly positive. If low levels of debt are a hint at credit constraints, this again could nourrish the idea that liquidity constraints play an important role to explain the investment process. In columns (5) to (8) the results for the quartiles of non-financial assets are reported. In the tax reform debate in Germany some economists expected firms with a high fraction of non-financial assets to lose for the following reason. As indicated in section 2, the tax reform implied tax rate cuts and base broadening elements. The latter apply mainly to non-financial assets, which means that firms with more financial assets benefit more from the tax

[14] If one compares the number of observations in the first quartile with those in the subgroup of non-profitable firms in table 4, it is clear that there are only firms in the second quartile with a positive pre-reform profitability. The reason why the number of observations in the first and the second quartile differ so much is that there is a bunching of observations at an average profitability of zero.

reform than those with less financial assets. Via general equilibrium effects (e.g. rising interest rates and wages), firms with a high fraction of non-financial assets would lose.

Table 6b: Quartile analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Debt fraction				Non-financial asset fraction			
Quartiles	first	second	third	fourth	first	second	third	fourth
ΔEMTR	1.6652	1.2231	-0.3036	0.0276	4.5709	5.0544	0.2933	-1.5572
	(1.3829)	(1.3694)	(1.4605)	(1.5617)	(2.6947)	(1.9005)**	(1.3603)	(0.9535)
ΔEMTR*POST	-0.3066	-0.0732	-0.0642	-0.1051	-0.2174	0.0661	-0.1593	-0.2338
	(0.0858)**	(0.0768)	(0.0833)	(0.1037)	(0.1340)	(0.0804)	(0.0709)*	(0.0790)**
PROFITABILITY	0.1489	0.1330	0.0370	0.0078	0.0001	0.0245	0.0218	0.0062
	(0.0346)**	(0.0255)**	(0.0217)	(0.0152)	(0.0289)	(0.0173)	(0.0174)	(0.0168)
NON-FIN ASSETS	-0.1750	-0.1991	-0.2364	-0.1941	-4.2920	-0.2415	-0.1996	-0.1160
	(0.0353)**	(0.0330)**	(0.0363)**	(0.0401)**	(2.3505)	(0.2427)	(0.0750)**	(0.0437)**
DEBT	0.1142	0.1561	0.1402	-0.3147	0.1208	0.0213	0.0431	0.0128
	(0.0569)*	(0.0703)*	(0.1012)	(0.0534)**	(0.0289)**	(0.0189)	(0.0176)*	(0.0175)
SALES	-0.0648	-0.0714	-0.0674	-0.0746	-0.0501	-0.0725	-0.0652	-0.0644
	(0.0065)**	(0.0053)**	(0.0055)**	(0.0062)**	(0.0075)**	(0.0047)**	(0.0050)**	(0.0069)**
SALESGROWTH	0.4038	0.4629	0.4671	0.4389	0.2842	0.5083	0.5711	0.4583
	(0.0164)**	(0.0161)**	(0.0167)**	(0.0176)**	(0.0216)**	(0.0157)**	(0.0151)**	(0.0156)**
SIZE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)**	(0.0000)	(0.0000)*	(0.0000)**	(0.0000)**	(0.0000)**
EMPLOYEES	1.1523	-0.5623	-2.9574	-4.3845	-5.3129	-2.4912	-2.1794	-1.0620
	(1.3611)	(1.1684)	(1.2643)*	(1.4310)**	(2.9364)	(1.3026)	(1.0576)*	(1.1560)
INVESTORS	-0.0089	-0.0034	-0.0124	-0.0057	-0.0027	-0.0163	-0.0024	-0.0070
	(0.0066)	(0.0077)	(0.0089)	(0.0127)	(0.0198)	(0.0111)	(0.0057)	(0.0064)
COUNTRY DUMMIES	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BRANCH DUMMIES	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.2331	0.1935	-0.0140	0.3669	0.9020	0.7473	0.0302	-0.2560
	(0.2485)	(0.2423)	(0.2479)	(0.2857)	(0.4218)*	(0.2926)*	(0.2445)	(0.1887)
Observations	3556	3928	3789	3411	2635	4047	4074	3928
R-squared	0.18	0.24	0.23	0.21	0.11	0.26	0.29	0.21

Notes: Robust standard errors in parentheses; * significant at 5%; ** significant at 1%. Dependent variable is net investment over total assets in the preceding period. For further information, see table 4.

Our results show the opposite, though:

Result 6 Firms with a high fraction of non-financial assets react strongly and significantly to the tax cuts, whereas firms with a low fraction do not.

It should be noted here that the multi-equation Wald test does not reject the null hypothesis that the tax terms in all four quartiles (debt and non-financial assets) are jointly not different from zero. We also analyzed quartile subgroups according to size and employees, but we did not find any systematic pattern.

4.5 Second approach: periodical variations

In the following subsection, we rerun some of the regressions from above using the second approach outlined in the theoretical section. In contrast to the first

approach, it uses the periodical variation of the EMTR and not only the difference between the pre-reform and the post-reform era. The underlying idea is that investment adapts immediately to even small variations in the tax incentive scheme. Although we think that this approach has less power both in econometric and plausiblity terms, we use this approach as a robustness check.

Table 7 shows the results using the period to period variation in the EMTR. In column (1) the baseline specification is reported. Interestingly, the coefficient estimate is virtually the same as in the first approach. All other variables yield similar results, too, and even the data fit ($R^2 = 0,2$) is equal. In column (2) and (3) the sample is split between profitable and nonprofitable firms. Again, it turns out that profitable firms show a highly significant negative tax impact, whereas nonprofitable firms have a coefficient estimate with the wrong sign. Columns (4) and (5) report the results for the European investors and those who are located in countries which share a common border with Germany. Again, we see that the European subsample shows a higher tax impact compared to the baseline estimation; the direct neighbours have an even higher coefficient. In columns (6) and (7), we report the results for the manufacturing and the wholesale branch. In contrast to the first approach, none of the two has a significant tax term.

Tabelle 7: Periodical variation of the EMTR

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline	Profitable firms	Non profitable Firms	Europe	Direct neighbours	Manu-facturing	Wholesale
ΔEMTR(t)	-0.1173	-0.2254	0.2488	-0.1544	-0.1693	-0.0732	-0.1053
	(0.0559)*	(0.0644)**	(0.1111)*	(0.0672)*	(0.0761)*	(0.0889)	(0.0760)
PROFITABILITY	0.0152	-0.0070	0.0414	0.0160	0.0124	0.0443	0.0272
	(0.0101)	(0.0132)	(0.0178)*	(0.0118)	(0.0138)	(0.0174)*	(0.0137)*
NON-FIN ASSETS	-0.2107	-0.2069	-0.2127	-0.2120	-0.2262	-0.2016	-0.1785
	(0.0154)**	(0.0180)**	(0.0307)**	(0.0171)**	(0.0192)**	(0.0237)**	(0.0308)**
DEBT	0.0524	0.0510	0.0810	0.0598	0.0772	0.0497	0.0563
	(0.0101)**	(0.0115)**	(0.0222)**	(0.0119)**	(0.0136)**	(0.0165)**	(0.0144)**
SALES	-0.0651	-0.0645	-0.0713	-0.0622	-0.0625	-0.0755	-0.0648
	(0.0027)**	(0.0030)**	(0.0060)**	(0.0031)**	(0.0035)**	(0.0060)**	(0.0034)**
SALESGROWTH	0.4524	0.4623	0.4248	0.4428	0.4448	0.5613	0.5514
	(0.0124)**	(0.0142)**	(0.0252)**	(0.0149)**	(0.0168)**	(0.0232)**	(0.0178)**
SIZE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)**	(0.0000)	(0.0000)**	(0.0000)*	(0.0000)*	(0.0000)**	(0.0000)**
EMPLOYEES	-2.8512	-2.4435	-3.4152	-2.6920	-2.6154	-3.4766	-5.1654
	(0.5712)**	(0.6556)**	(1.1841)**	(0.6532)**	(0.7404)**	(0.9101)**	(0.9606)**
INVESTORS	-0.0068	-0.0065	-0.0191	-0.0086	-0.0084	-0.0064	-0.0029
	(0.0028)*	(0.0029)*	(0.0102)	(0.0037)*	(0.0040)*	(0.0031)*	(0.0065)
COUNTRY DUMMIES	Yes	Yes	Yes	No	No	Yes	Yes
BRANCH DUMMIES	Yes	Yes	Yes	Yes	Yes	No	No
CONSTANT	0.0693	0.0676	0.0784	0.1046	0.1053	-0.0562	0.1257
	(0.0545)	(0.0837)	(0.0744)	(0.0160)**	(0.0182)**	(0.0440)	(0.0768)
No of Obs	17155	13235	3920	12431	9561	5453	7269
R-squared	0.20	0.20	0.22	0.19	0.20	0.30	0.28

Notes: Robust standard errors in parentheses; * significant at 5%; ** significant at 1%. Dependent variable is net investment over total assets in the preceding period. For further information, see table 4.

We can therefore state

Result 7 The model with periodical variation yields virtually the same results as the first approach. The results with respect to profitability and regional aspects are replicated, while the branch differences cannot be established.

4.6 Marginal versus discrete investment

As we outline in the previous section our data only allows analyzing investment decisions after the location decision has been made. But, although location decisions themselves are not observable, one could argue that MNE make quasi-location decisions for the production of new goods. In other words, our data may allow to analyze project mobility and not firm mobility. As mentioned above, marginal investment decisions do not depend on other locations' characteristics whereas discrete investment decisions do.

As an alternative tax rate measure which is supposed to seize the incentive effects for discrete investment choices we calculate the effective average tax rate (EATR) according to equation (11). The regression variable is the difference between the EATR of the year 2000 and the year 2001. For the calculation of the EATR we need an assumption on the return to the marginal investment unit and the actual profitability of the project under consideration. We assume that the marginal return (or: cost of capital) is equal to 5% and that the project profitability can be approximated by the average pre-reform profitability of the affiliate. Consequently, we have to exclude all firms with a pre-reform profitability lower than 5% which reduces our data sample considerably. Therefore, we repeat the analysis for the EMTR in order to have a valid reference case.

First, we repeat the first approach with the EATR differential to the parent company country of residence. Unfortunately, as long as the tax systems of other locations stay constant from 2000 to 2001, the difference-in-difference estimation approach that we use here neglects the other locations' parameters. But, in a second step section we try the second approach with periodical variations in the tax system which allows us to use this information.

In columns (1) and (2) of table 8 the baseline regression is estimated for the EATR and EMTR. Both tax treatment effects are not significant, which we expected given the results of the quartile analysis of profitability in table 6. What is striking, though, is the fact that both coefficient estimates are very close, even in terms of standard errors. The estimations are repeated for the subgroup of European affiliates (where the tax term is significant) and for affiliates in the manufacturing branch. In all three cases, the EATR has a slightly lower standard error, i.e. a better fit. But the difference is too low to be interpreted in qualitative terms.

One might think that the EATR is rather important for investment from American or Asian companies. But, as we do not report here, the results are not significant, have the wrong sign and show a large variance. We further tried regressions with the EATR calculated with assumed profit rates of ten and twenty percent, rather than the pre-reform average profit rate, but the results do not differ much.

Tabelle 8: EATR versus EMTR

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline		Europe		Manufacturing	
ΔEATR	-3.4943		-3.4296		-2.3128	
	(2.8500)		(3.1676)		(3.9007)	
ΔEATR*POST	-0.0159		-0.1613		-0.0345	
	(0.0581)		(0.0707)*		(0.0922)	
ΔEMTR		-0.3527		-0.8563		-0.8535
		(1.5461)		(1.8399)		(2.2771)
ΔEMTR*POST		-0.0162		-0.1648		-0.0353
		(0.0589)		(0.0718)*		(0.0954)
PROFITABILITY	-0.0205	-0.0188	-0.0146	-0.0126	-0.0027	-0.0005
	(0.0158)	(0.0156)	(0.0184)	(0.0182)	(0.0277)	(0.0272)
NON-FIN ASSETS	-0.1870	-0.1989	-0.1692	-0.1742	-0.1835	-0.1862
	(0.0296)**	(0.0325)**	(0.0339)**	(0.0386)**	(0.0479)**	(0.0506)**
DEBT	0.0084	0.0095	0.0147	0.0159	0.0361	0.0371
	(0.0144)	(0.0143)	(0.0172)	(0.0171)	(0.0252)	(0.0251)
SALES	-0.0657	-0.0657	-0.0598	-0.0598	-0.0755	-0.0757
	(0.0039)**	(0.0039)**	(0.0046)**	(0.0046)**	(0.0093)**	(0.0093)**
SALESGROWTH	0.4792	0.4792	0.4713	0.4715	0.6029	0.6029
	(0.0184)**	(0.0184)**	(0.0229)**	(0.0229)**	(0.0384)**	(0.0383)**
SIZE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
EMPLOYEES	-2.7269	-2.6460	-2.8472	-2.7974	-4.3568	-4.3069
	(0.9049)**	(0.9069)**	(1.0525)**	(1.0563)**	(1.5697)**	(1.5632)**
INVESTORS	-0.0056	-0.0053	-0.0039	-0.0037	-0.0036	-0.0035
	(0.0035)	(0.0035)	(0.0055)	(0.0055)	(0.0033)	(0.0034)
COUNTRY DUMMIES	Yes	Yes	Yes	Yes	Yes	Yes
BRANCH DUMMIES	Yes	Yes	Yes	Yes	Yes	Yes
CONSTANT	-0.3066	0.1300	-0.3383	0.0201	-0.1118	0.0903
	(0.4193)	(0.2541)	(0.4611)	(0.2889)	(0.5785)	(0.3764)
No of Obs	7723	7723	5357	5357	2203	2203
R-squared	0.22	0.22	0.21	0.21	0.32	0.32

Notes: Robust standard errors in parentheses; * significant at 5%; ** significant at 1%. Dependent variable is net investment over total assets in the preceding period. For further information, see table 4. The EATR is calculated for an assumed capital cost of 5%. The expected profitability of the project is approximated by the average pre-reform profitability of the affiliate.

Now, we repeat the analysis with periodical variation of the two tax terms. The main advantage of this approach is that it allows taking into account variations in the effective tax parameters of other locations. In table 9 we report the results of estimations that compare the performance of the EMTR, i.e. the marginal investment model, and the EATR, i.e. the discrete investment model. For lack of better information, we assume that the alternative location is the parent company 's country of residence.

Columns (1) and (2) report the estimation results for the baseline regression using the periodical variation of the difference in the EATR between the two locations and the EMTR, respectively. Columns (3) to (8) report the results for different subgroups that proved to be relevant in the preceding analysis: European investors, the manufacturing branch, and affiliates with just one investor.

Table 9: Mobile projects versus mobile capital

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline		Europe		Manufacturing	
ΔDIFFEATR(t)	-0.1973		-0.2973		-0.1450	
	(0.0756)**		(0.0927)**		(0.1213)	
ΔEMTR(t)		-0.2354		-0.3406		-0.1440
		(0.0775)**		(0.0946)**		(0.1235)
PROFITABILITY	-0.0126	-0.0126	-0.0102	-0.0102	0.0041	0.0039
	(0.0151)	(0.0151)	(0.0172)	(0.0172)	(0.0263)	(0.0263)
NON-FIN ASSETS	-0.2194	-0.2166	-0.2044	-0.2009	-0.2106	-0.2095
	(0.0228)**	(0.0228)**	(0.0256)**	(0.0256)**	(0.0353)**	(0.0352)**
DEBT	0.0188	0.0189	0.0205	0.0211	0.0352	0.0348
	(0.0136)	(0.0136)	(0.0162)	(0.0162)	(0.0234)	(0.0234)
SALES	-0.0665	-0.0664	-0.0601	-0.0601	-0.0745	-0.0743
	(0.0037)**	(0.0037)**	(0.0043)**	(0.0043)**	(0.0088)**	(0.0087)**
SALESGROWTH	0.4805	0.4803	0.4618	0.4617	0.6179	0.6180
	(0.0172)**	(0.0172)**	(0.0215)**	(0.0214)**	(0.0343)**	(0.0342)**
SIZE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
EMPLOYEES	-2.7332	-2.7162	-2.7901	-2.7649	-3.9785	-3.9911
	(0.8407)**	(0.8408)**	(0.9809)**	(0.9809)**	(1.4443)**	(1.4428)**
INVESTORS	-0.0064	-0.0060	-0.0067	-0.0060	-0.0056	-0.0055
	(0.0032)*	(0.0032)	(0.0050)	(0.0050)	(0.0031)	(0.0031)
COUNTRY DUMMIES	Yes	Yes	No	No	Yes	Yes
BRANCH DUMMIES	Yes	Yes	Yes	Yes	No	No
Constant	0.1343	0.1315	0.1063	0.1022	0.1637	0.1631
	(0.0251)**	(0.0250)**	(0.0288)**	(0.0288)**	(0.0338)**	(0.0337)**
Observations	8602	8610	5898	5904	2476	2481
R-squared	0.22	0.22	0.21	0.21	0.35	0.35

Notes: Robust standard errors in parentheses; * significant at 5%; ** significant at 1%. Dependent variable is net investment over total assets in the preceding period. For further information, see table 4. The EATR is calculated for an assumed capital cost of 5%. The expected profitability of the project is approximated by the average pre-reform profitability of the affiliate.

This time, it does not make much sense to compare the coefficients because the scale of the two tax parameters differs. But, like in table (7), EATR term always yields a slightly better fit, measured in standard errors. However, the values seem too close to give a reliable answer to the question which model to prefer. Again we also calculated the regression estimates for American and Asian subgroups, without getting significant results. Assuming profit rates of ten or twenty percent instead of taking the pre-reform average profitability did not change the results. We sum up the results in tables 8 and 9 in

Result 8 The data yield very similar results for the discrete investment choice model and the marginal investment choice model. These results do not allow

deciding which of the two models perform better in describing the investment data.

The reason why the two tax burden indicators perform so equally could be that, first, the two are highly correlated, and second, that the tax law changes in other countries do not generate enough data variation in order to differentiate between the two.

5 Conclusions

In this paper we evaluate the German tax reform of 2000 with respect to its effect on inward foreign direct investment. We deal with the identification problem by referring to the rather radical assumption that the aggregate effect of the tax reform is equal to zero. Nevertheless, we find significant tax effects. The baseline regression indicates that a reduction in the effective marginal tax rate of 10 percentage points increases net investment by 1 percentage point. Given an investment level of around 7,5% and a pre-reform EMTR of around 52%, the elasticity of investment with respect to effective marginal taxation is approximately equal to $-0,7$. In comparison to other empirical studies this estimate is rather at the bottom line, but it should be recalled again that our results are based on an assumed aggregate effect of zero.

We employed two distinct approaches to measure the tax impact on inward FDI. The first defines the pre-reform period (1997-1999) as the control group and the post-reform period (2001-2003) as the treatment group. The second links periodical variations in the investment process to periodical variations in the tax incentive scheme. Both approaches yield virtually the same results.

The data confirm several predictions from standard tax theory. Profitable firms on average show a strong and significant tax impact while non-profitable firms do not. Firms with a high debt level are less tax-sensitive than firms with a high equity share. Tax considerations seem to be more relevant in branches in which investment is likely to be cost-driven, like manufacturing, and less so in wholesale trade activities and services, which are supposed to be complements to some foreign production units. Geographic proximity plays a major role. We can show that the tax effect is strong and significant for European investors while American and Asian investments do not show any tax effect. Among Europeans, the investors from countries with a common border with Germany show the strongest tax-sensitivity.

Besides those expected results, our data give some new and interesting insights, which deserve further testing and research. First, among the profitable firms, only the just-above-zero profitable firms show a significant tax effect. Under certain assumptions, this could be interpreted as hint towards liquidity constraints. As a

matter of fact, the reduction of the effective tax burden always has an income effect and - under the assumption of imperfect capital market - this may induce firms which are cash-flow constrained to increase investment. Analyzing this question thoroughly is beyond the scope of this paper, though, and would require better data. Second, firms with a high fraction of non-financial assets do react strongly to the tax reform while others do less so. This is surprising because predictions derived by standard tax theory said that those firms would lose relative to others from the tax reform. Third, our data fail to show significant differences between the marginal investment choice model and the discrete investment choice model. This may be due to the fact that our data sample is considerably reduced when we compare these two models and that firms with a higher profitability (i.e. those which are candidates to confirm the discrete investment choice model) do not show any tax impact. In addition, the two tax rate measures under consideration are highly correlated, so we would not expect great differences in the coefficients or standard errors. The problem is that the tax rate cut is equal for all firms, so we lack an approach to identify the impact of this feature of the tax reform, given that we cleaned the time series from any aggregate impact.

What follows from our results for tax policy? First, and most important, tax policy does matter. Tax policy-makers could learn from our data that lowering the tax burden on investment has some beneficial effect on inward foreign direct investment even though the aggregate business cycle might blur it. Note though that we have to know the cost of the tax reform, i.e. the welfare loss due to decreasing tax revenue, before stating whether this reform is part of an optimal tax policy strategy or not. Second, our data are not suitable for answering the question which of the two models - marginal choice versus discrete choice - is appropriate to describe the investment process; therefore we cannot derive a conclusion on whether a tax rate cut cum base broadening strategy is optimal or the opposite is true. A related point is, third, that our data do not show any tax-sensitivity for highly profitable MNEs. Thus, they question the assertion by Bond (2000) saying that observable corporate tax policy is driven by highly profitable and tax-sensitive MNEs choosing their location. We do show a strong and significant tax effect for marginally profitable firms. If the assumption is justified that firms with low profitability have investment projects with low profitability, this could be interpreted as an argument in favour of reducing the cost of capital instead of lowering the tax burden on intramarginal profits. Fourth, the data hint at a concentration of tax competition between European countries, and even more between countries with a common border.

To sum up, our analysis underlines the importance both of tax policy itself and of tax policy research. We hope that this paper contributes to clarifying the environmental conditions in which tax policy takes place. There are still many

open questions, though, and further research with better data is required in order to give sound advice to tax policy-makers.

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Appendix: Data sources

FDI data

The Deutsche Bundesbank carries out annual full sample surveys on inbound and outbound direct investment stocks based on the provisions of the German Foreign Trade and Payments Regulation. Due to this legal regulation, foreign companies with investments in Germany have to report selected balance sheet information of their German subsidiaries. The balance sheet data are calculated using the German accounting regulations. Similarly, German multinational companies have to report the same information about their foreign affiliates. For an extensive description of the database, see Lipponer (2003a) and Lipponer (2003b).

The data is available for the years 1989 to 2003. Time series for individual companies are available for the years 1996 to 2003. In 2002, about 6,000 domestic investors filed reports on around 22,000 foreign subsidiaries abroad. With respect to inward FDI, in 2002 data are available for about 10,000 affiliates in Germany, in which some 7,000 foreign investors had a participating interest.

For the purpose of our paper we used only the data on inbound FDI. In order to create a balanced data set, we only use data from 1996 on and exclude all firms which do not have full coverage of the whole period 1996-2003. The balanced panel dataset contains 2830 subsidiaries in Germany.

The investors are based in the following countries: France, Belgium, Netherlands, Luxembourg, Italy, UK, Ireland, Denmark, Spain, Norway, Sweden, Finland, Austria, Switzerland, USA, Canada, South Korea and Japan. If a subsidiary is owned by investors from different countried we assumed that the home country is the one where the investor with largest share in the subsidiary comes from. If two or more investors are equal in size, we choose the one from the country which comes first in alphabetic order.

The most important branches of activity in our data set are Manufacturing, Wholesale, Holdings, Services to Companies and the Financial Services. We concentrate on incorporated non-public companies that have either the legal form of a corporation (Aktiengesellschaft (AG)) or a limited liability company (Gesellschaft mit beschränkter Haftung (GmbH)).

Tax related data and other data

For the calculation of the economic depreciation rates in equation (10) we adopt the assumptions reported in Spengel (2001): Intangible assets depreciate over a period of 12.5 years, buildings over 53 years and machinery over 11 years.

To calculate A_i in equation (9), we assume a nominal interest rate of 10 percent and an inflation rate of 3.5 percent. These values are adopted from Devereux, Grif-

fith and Klemm (2002) who also provide the data on other countries' depreciation allowances and statutory tax rates.

The θ_i are taken from branch-specific aggregate data of the Deutsche Bundesbank[15] assuming that the affiliates held by foreign owners have the same tangible capital structure as the industry average.

[15] Available online at:
http://www.bundesbank.de/stat/download/stat_sonder/statso6_2000_2002.pdf

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