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The impact of taxes and public spending on the location of FDI: evidence from FDI-flows within Europe

ZEW Discussion Papers, No. 02-17

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Suggested citation: Buettner, Thiess (2002) : The impact of taxes and public spending on the location of FDI: evidence from FDI-flows within Europe, ZEW Discussion Papers, No. 02-17, <http://hdl.handle.net/10419/24789>

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Discussion Paper No. 02-17

**The Impact of Taxes and Public Spending
on the Location of FDI:
Evidence from FDI-flows within Europe**

Thiess Buettner

ZEW

Zentrum für Europäische
Wirtschaftsforschung GmbH

Centre for European
Economic Research

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Nontechnical Summary

This study reconsiders the empirical relationship between taxation and foreign direct investment (FDI), which is at the center stage in the debate on international tax competition. To some extent this reflects the scarcity of available alternative data on factor-mobility across international borders. But, the strong increase in the volume of FDI flows over the last two decades makes FDI an important phenomenon in its own right pointing to increased internationalization of the economy. And, even though FDI cannot be equated with factor mobility few economists will deny that taxation is a decisive determinant.

The empirical investigation focuses on the bilateral direct investments between the European Union states. Using place to place data it takes explicitly account of conditions in the source and in the destination country. To take account of the variety of incentives provided by the tax systems, the empirical analysis utilizes several measures of fiscal incentives including marginal effective tax rates on international investment, statutory corporation tax rates, and median company tax burdens from firm-level data. Besides tax incentives, the study directly tests for effects of the supply of public services on FDI. Since, if public service provision tends to improve locations' attractiveness for investment, tax competition might lead to an efficient outcome with company taxation basically reflecting benefit taxation. Public spending figures as well as international rankings on locational conditions related to public sector activities are employed to capture differences in the supply of public services. Finally, in order to capture the economic distance between the considered countries the study uses data on bilateral exports.

The empirical analysis of bilateral FDI flows confirms significant effects of tax incentives on the location of FDI. In particular, lower cost of capital for transnational investments relative to the cost of capital for domestic investments tend to raise FDI outflows. In addition, an increase in the difference between the statutory tax rates in the home country and the statutory tax rate of the destination country is related with an increase in FDI outflows. The additional inclusion of the difference in the median tax burden between home and destination country does not improve the predictive power of the regression. Thus, the tax incentives are sufficiently captured by the marginal tax burden and the statutory tax rates.

No strong evidence is found for a role of public expenditures in shaping locational attractiveness. Controlling for locational rankings and the expenditure structure with regard to different functions of government an increase in public consumption is associated with a significant decline of FDI outflows. However, this finding is not robust and the effects found for the rankings as well as for spending related with individual functions of government partly show rather unexpected results.

Apart from the obvious difficulties to measure the provision of public services the failure to detect a significant role of public expenditures can essentially be interpreted in two directions. On the one hand, the weak indication of a role of public spending could be taken as evidence that company taxation is not characterized by an equivalence between tax burden and locational advantages. Then, increased international competition for FDI would lead to future reductions of corporate taxation across European countries. On the other hand, the absence of clear signs for public spending effects might simply be due to the fact that locational advantages and disadvantages from differences in public sector activities cannot be distinguished from other country characteristics as they show only small variation across time. If this were the case, the results could still be compatible with an equivalence of tax burdens and the supply of public services in the long run. However, as only tax incentives do exert observable effects on FDI increased competition for FDI might nevertheless lead to reductions of company tax burdens. Since, if investors and politicians alike were not able to identify the full consequences of a reduction of public spending it would be difficult to prevent them from lowering tax rates despite of a possible deterioration of locational conditions.

The Impact of Taxes and Public Spending on the Location of FDI: Evidence from FDI-flows within Europe*

Thiess Buettner [†]

February, 2002

Abstract:

In a place to place analysis of bilateral FDI flows the average company tax burden, the statutory corporation tax rate, as well as the cost of capital are used to capture the tax incentives. In addition, indicators of public spending in general and with regard to different functions of government and rankings of competitiveness related to public sector activities are used to measure the role of public service provision. The results show significant effects of tax incentives, in particular, the marginal tax burden and the statutory tax rate prove jointly significant. However, only weak indications of a countervailing effect of public expenditures are found.

*This is a revised version of a paper presented at the conference "Corporate and Capital Income Taxation in the European Union: The *Ruding II* Report and Beyond" Mons, Belgium, December 2001. It draws on material prepared for the research project N-I-04 "Die Bereitstellung öffentlicher Güter – eine Möglichkeit zur Selbstregulierung des Steuerwettbewerbs?" carried out on behalf of the German Ministry of Finance. I am indebted to Bruno Heyndels, John Ashworth, and Lothar Lammersen for helpful comments and suggestions. Moreover, I would like to thank Martin Beck for his research assistance, as well as Ruud de Mooj, Joeri Gorter, Christoph Spengel, and Gerd Gutekunst for their kind cooperation in the calculation of company tax burdens.

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1 Introduction

Although it originates from a heterogeneous set of transactions, only part of which are related to actual location decisions, foreign direct investment (FDI) is at the center stage in the debate on international tax competition. To some extent this reflects the scarcity of available alternative data on factor-mobility across international borders. But, the strong increase in the volume of FDI flows over the last two decades make FDI an important phenomenon in its own right pointing to increased internationalization of the economy. And, even though FDI cannot be equated with factor mobility few economists will deny that taxation is a decisive determinant of FDI.

The role of fiscal conditions as incentives for direct investment has been discussed intensively in particular for the US, which recorded a strong rise of the inflow of direct investment since the late eighties. For example Scholes and Wolfson (1992) argue that the strong rise of direct investment has to be attributed to the fact that with the 1986 US tax reform the fiscal conditions for foreign companies have improved strongly relative to domestic companies. Initiated by the study of Hartman (1984) several empirical studies have tried to prove the influence of taxes on direct investment (surveys are provided by Hines, 1997, 1999, and de Mooij and Ederveen, 2001). While international differences in company taxation have probably become of particular importance within Europe in the course of significant integration steps in the nineties, there are only few empirical studies which focus on the link between FDI and taxes within Europe. In a study using firm-level data for US enterprises Devereux and Griffith (1998) establish the significance of the average tax burden for the choice of location within Europe. Devereux and Freeman (1995) examine FDI flows between seven countries, including five European countries and Gorter and Parikh (2000) provide an analysis using FDI stocks. Although the tax burden is quite differently determined, both studies find significant effects of differences in taxation while controlling for specific conditions in the target and home countries.

In difference to the research on the effects of taxes of lower level governments within federations (for a survey, see Bartik, 1991) the effect of public expenditures is rarely discussed in the context of FDI (an exception being Hines, 1996, and, Billington, 1999). This is somewhat surprising given that the workhorse models of tax competition in the tradition of Tiebout explicitly deal with a

positive impact of local public goods on the location of households and firms (*e.g.*, Wildasin, 1986, Zodrow and Mieskowski, 1986). Furthermore, empirical studies for the US show that neglecting the provision of local public services will lead to a downward bias in estimates of the effects of local taxing differentials on the local economy (Bartik, 1991). This suggests to use controls for the supply of public services in an empirical study. But, probably because of the measurement problems involved, the literature on FDI follows an alternative approach using pooled cross-sectional and time series data on FDI flows and controlling for unobserved heterogeneity by means of dummy variables (Devereux and Freeman, 1995). However, in order to assess tax competition it seems important to directly test for effects of the supply of public services on FDI. If public service provision tends to improve locations' attractiveness for investment, tax competition might lead to an efficient outcome with company taxation basically reflecting benefit taxation.

Given this background, this study reconsiders the empirical relationship between FDI and taxation in Europe. Explicitly taking account of conditions in the source and in the destination country, it analyzes the determinants of bilateral direct investments among the European Union states using place to place data. Of course, it is well known that there exist significant problems in the accounting procedure for FDI, and that even the statistics supplied by supranational bodies like Eurostat and the OECD suffer from differences in the national reporting procedures (Bellak, 1998). However, as emphasized by Hines (1997) in order to study the determinants of FDI it is sufficient to focus on the distribution of FDI flows among different countries. To take account of the variety of incentives provided by the tax systems, the empirical analysis utilizes several measures of fiscal incentives including marginal effective tax rates on international investment, statutory corporation tax rates, and median company tax burdens from firm-level data. Public spending figures as well as international rankings on locational conditions are employed to capture differences in the supply of public services. Finally, in order to capture the economic distance between the considered countries the study uses data on bilateral exports.

The paper proceeds as follows. The following section develops the investigation approach, before Section 3 provides a description of the data used. Section 4 reports the results. Finally, Section 5 provides the conclusions.

2 Investigation approach

To exploit the specific place to place feature of the bilateral flows data, the analysis makes use of the technique of the so-called gravity models, originally developed by Isard (1960,1998), which have proved quite successful in empirical studies of direct investments and exports.

The basic idea is to assume a functional form, such that without any differences between two countries the expected value of the bilateral flow is given by the size of the origin and the destination country as well as by the distance. Denoting the flow of direct investments from i to j with $I_{i,j}$ a possible specification is

$$I_{i,j} = \delta_{i,j} \cdot Y_i \cdot Y_j \cdot \left(\frac{\Omega_j}{\Omega_i} \right), \quad (1)$$

where Y_i and Y_j denote the GDP of the countries and $\delta_{i,j}$ is an inverse indicator of the distance. Ω_i, Ω_j capture the (expected) rate of return of an investment at locations i and j , respectively, and in the current context are assumed to be functions of the tax burdens and other locational characteristics at i and j .

Capturing the size of the countries in terms of their GDP might be regarded as a reasonable approximation, but with regard to distance, it seems difficult to come up with an operational indicator. As physical distance is a poor indicator of the mutual openness of pairs of countries for trade and investment, we follow an alternative approach which exploits the close relationship between FDI and trade. This approach rests on the assumption that bilateral exports follow a similar gravity model

$$X_{i,j} = \delta_{i,j} \cdot Y_i \cdot Y_j.$$

By inserting this expression into equation (1) we can use the bilateral exports as an indicator of the distance

$$I_{i,j} = X_{i,j} \left(\frac{\Omega_j}{\Omega_i} \right). \quad (2)$$

In this specification, FDI is proportional to exports and to the ratio of the rates of return at the two jurisdictions. Although the proportionality between bilateral exports and bilateral FDI is consistent with available empirical evidence (Jost, 1997), estimation is based on a log linear version applied to the

direct investment observed as of period t

$$i_{i,j,t} = \beta_0 + \beta_1 x_{i,j,t} + \beta_2 (\omega_{j,t} - \omega_{i,t}), \quad (3)$$

where small letters denote logarithmically transformed variables.

To test for the impact of fiscal conditions the rate of return ω_i is assumed to be a log-linear function of the conditions at country i , such that

$$\begin{aligned} i_{i,j,t} = & a_i^H + a_j^D + a_t^T + b_1 x_{i,j,t} \\ & + b_2 (\tau_{i,t} - \tau_{j,t}) + b_3 (g_{i,t} - g_{j,t}) + \epsilon_{i,j,t}, \end{aligned} \quad (4)$$

where $g_{i,t}$ denotes the logarithm of public spending, $\tau_{i,t}$ is the logarithm of the tax burden for investments in country i . a_t^T is a fixed time specific effect, which controls for common shocks to all countries, like for instance the creation of the Single Market or of EMU. The slope parameters b_2 , b_3 capture the relationship between fiscal incentives and FDI. If b_2 is positive, FDI outflows tend to rise with higher taxation in the home country relative to the target country. If public spending has a beneficial effect on the locational attractiveness, b_3 should be negative.

The inclusion of country specific constants for origin countries (a_i^H) removes all common effects to the outflows from a particular country. This seems important in order to control for unobserved locational characteristics of the home countries and for differences in the reporting of FDI outflows. The additional inclusion of country specific destination dummies (a_j^D) controls for unobserved characteristics in each of the destination countries. Alternatively, the analysis could assume that each home and destination country pair has an unobserved component and allow for a specific effect (Devereux and Freeman, 1995). Following standard panel data techniques one could simply condition on the average distribution of FDI by using fixed effects. But, as this would remove all time-invariant characteristics and, therefore, a considerable part of the locational conditions, a random effects approach is preferred, provided no indication is found that the individual effects are correlated with explanatory variables.

3 Data

The empirical investigation considers bilateral FDI flows within the European Union in the period 1991 to 1998 obtained from Eurostat. The data follows in principle the OECD benchmark definition for FDI. Even though Eurostat harmonizes the data and eliminates some deviations of the national statistics, figures for different countries remain not fully comparable due to differences in the underlying national statistics. But even though the level of FDI might be somewhat misleading, the current study aims at an explanation of the distribution of FDI (Hines, 1997). As the coverage of available data is much larger we focus on FDI financed with equity and other capital leaving aside investments financed with reinvested earnings. Because some of the investment flows are negative, estimation rests on an unbalanced panel made up by the positive flows.

3.1 Measurement of tax incentives

Even for a single country the computation of effective tax rates is a formidable task given the complexity and idiosyncrasy of each country's tax system. The required effort is raised considerably if one aims at getting a picture of the cross-country distribution of tax burdens. And, even worse, for a promising empirical analysis of the distribution of FDI flows over time we, moreover, need measures over a longer time period. Facing these difficulties, the empirical analysis below exploits a variety of different sources and methods.

In the tradition of the neoclassical investment literature foreign direct investment might be regarded simply as a physical investment decision where, consequently, marginal effective tax rates are a sufficient statistic of the incentives created by the tax system (Fullerton, 1984, and OECD, 1991). Of course, in the context of transnational investments the concept of marginal effective tax rates becomes much more involved as it is important to take account of parent–subsidiary relationships.

As an indicator of the tax burden on investment the study employs domestic and bilateral cost of capital provided by Devereux and Pearson (1995) and in the corresponding report of the OECD (1991). These cost of capital take account of the home country's as well as of the target country's tax system and

Table 1: Descriptive statistics on the cost of capital

Year	Mean	Std.-Dev	Min	Max
Transnational investment				
1991	.071	.016	.048	.156
1999	.065	.007	.048	.084
Domestic investment				
1991	.062	.005	.052	.070
1999	.064	.006	.049	.075

OECD (1991), Devereux et al. (2001), and own computations. Figures for domestic investment refer to 14 EU countries (Belgium and Luxembourg aggregated), figures for transnational investment refer to investments in each of the other 13 EU countries.

explicitly consider their interaction for different sources of finance. However, as the figures refer only to 1991, comparable figures for 1999 are taken from Devereux *et al.* (2000: 36-38).^{1,2} For the intervening years 1992-1998 figures are calculated by means of interpolation, assuming a gradual development over time.³ Table 1 provides descriptive statistics on the user cost of capital both for transnational as well as for domestic investment. The cost of capital for transnational investment show a slight reduction which is consistent with a reduction of the higher taxation of investment abroad. Moreover, as the standard deviation is declining the cost of capital for transnational investment tend to converge over time. Since the estimation equation (4) is focusing on the relative tax burden of a investment at location j relative to an investment at location i the empirical investigation uses the (log) ratio of the bilateral cost of capital and the domestic cost of capital.⁴

¹The figures are also reported in the EU-Commission staff paper COM(2001) 572 final: “Company Taxation in the Internal Market”.

²Actually the method is not exactly equivalent, as the recent figures are based on separate calculations for five different assets (Intangibles, Industrial Buildings, Machinery, Financial Assets, Inventories) whereas the earlier report distinguishes only three different assets (Industrial Buildings, Machinery, Inventories) each of which obtained a specific weight (28 %, 50 %, and 22 %, respectively). Note, that at least for the domestic investment case Devereux *et al.* (2001: 24pp.) do not find strong effects of differences in composition and weighting on the ranking of tax burdens.

³Calculations are based on the implied annual rate of change in the cost of capital separately for each type of the three types of finance. The overall cost of capital used in the study is simply the average figure.

⁴Formally, instead of the tax differential $(\tau_{i,t} - \tau_{j,t})$ equation (4) employs $(c_{i,j,t} - c_{i,i,t})$, where $c_{i,j,t}$ denotes

Devereux and Griffith (1998, 1999) emphasized that foreign direct investment might be related to locational decisions, where not just a marginal investment but larger projects with earnings above the cost of capital are carried out (see also Richter, Seitz, and Wiegard, 1996), and, therefore, the average tax burden might be more important for the location of FDI. Consequently, they put forward a measure of the *effective average tax rate* (EATR). Although Devereux *et al.* (2001) provide those figures even for transnational investments, these data refer to the cross-section in 1999 and thereby do not allow to assess the development of the tax burden over time. However, EATR can be regarded as a linear combination of the effective marginal tax burden and the statutory tax rate where the weights are determined by the ratio of the cost of capital to the overall rate of return (Schreiber *et al.*, 2002). This points to jointly using both marginal effective tax rates and statutory tax rates to capture the variation of tax incentives. A role of the statutory tax is also indicated by survey data as business executives consider the tax rate as being decisive for location decisions (Sørensen, 1992). Moreover, in the context of multinationals the existence of substantial intercompany transfers and financial flows opens possibilities for reducing the overall tax burden of companies (Weichenrieder, 1996). As a consequence, the statutory tax rate might be important for locations of subsidiaries if companies are involved in activities of profit shifting (Sørensen, 2000).

Table 2 presents figures for the statutory tax rates in the European countries since 1991.⁵ Despite a rather stable distribution of tax rates it documents a significant reduction in the tax rates over time for countries like Germany, Denmark, Greece, and Ireland resulting in a slight reduction of the average tax rate and a slight reduction of the variation.

Even though the joint inclusion of statutory tax rates and marginal effective tax burdens should capture a large part of the variation in tax incentives, it is not obvious that taxation is in fact operated according to the stylized consideration of the tax code. Therefore, it is tempting to compare the empirical significance with an alternative measure of the tax burden based on the actual tax payments of companies. Research often takes resort to national accounts data relying on a mixture of tax revenue statistics and company surveys.

the logarithm of the user cost of capital for an investment in country j by an investor from country i .

⁵In the empirical analysis the figure for Belgium is replaced with a weighted average of Luxembourg and Belgium.

Table 2: Statutory rates of corporate taxation

Country	1991	1992	1993	1994	1995	1996	1997	1998
Au	30.00	30.00	30.00	34.00	34.00	34.00	34.00	34.00
Be ^e	39.00	39.00	40.17	40.17	40.17	40.17	40.17	40.17
Dk	38.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00
Fi	23.00	19.00	25.00	25.00	25.00	28.00	28.00	28.00
Fr ^{a,f}	34.00	34.00	33.33	33.33	36.66	36.66	36.66	41.66
	(42.00)	(34.00)	(33.33)	(33.33)	(33.33)	(33.33)	(33.33)	(33.33)
Ge ^{a,c}	53.75	53.75	53.75	48.38	48.38	48.38	48.38	47.48
	(38.70)	(38.70)	(38.70)	(32.25)	(32.25)	(32.25)	(32.25)	(31.65)
Gr	46.00	46.00	35.00	35.00	35.00	35.00	35.00	35.00
Ir ^b	43.00	40.00	40.00	40.00	40.00	38.00	38.00	36.00
It	36.00	36.00	36.00	36.00	36.00	37.00	37.00	37.00
Nl	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Lu	33.00	33.00	33.00	33.00	33.00	33.00	32.00	20.00
Pt ^g	39.60	39.60	39.60	39.60	39.60	39.60	39.60	37.40
Sp ^d	35.50	35.50	35.50	35.50	35.34	35.31	35.27	35.26
Sw	30.00	30.00	30.00	28.00	28.00	28.00	28.00	28.00
Uk	33.00	33.00	33.00	33.00	33.00	33.00	33.00	31.00
av.	36.59	35.86	35.56	35.33	35.54	35.67	35.61	34.66
std.dev.	7.31	7.75	6.45	5.43	5.41	4.96	5.00	6.42

Au: Austria, Be: Belgium, Dk: Denmark, Fi: Finland, Fr: France, Ge: Germany, Gr: Greece, Ir: Ireland, It: Italy, Nl: Netherlands, Lu: Luxembourg, Pt: Portugal, Sp: Spain, Sw: Sweden, Uk: United Kingdom.

^a *Different tax rates on retained earnings in parentheses.*

^b *The manufacturing industry has a reduced rate of 10%.*

^c *Since 1991 there is an additional surtax of 7.5% (since 1998 5.5%).*

^d *Corporation tax inclusive of local surtax for chambers of trade and commerce (1.50% since 1995 gradually reduced to 0.75% in 1999).*

^e *Surtax of 3 % included since 1993.*

^f *Surtax of 10 % since 1995, 25% (1998).*

^g *Portugal has local surtaxes up to 10%.*

Table 3: Median of company tax burdens

Country	1991	1992	1993	1994	1995	1996	1997	1998
Au	22.9	13.9	14.9	10.6	10.9	16.8	25.5	10.3
BL	15.7	17.7	22.7	22.3	23.9	23.4	22.0	20.6
Dk	30.1	30.2	30.8	30.9	32.3	31.0	30.2	31.8
Fi	39.3	32.6	22.0	25.3	27.0	27.8	27.9	28.1
Fr	32.4	32.5	32.1	32.4	34.8	33.9	37.1	36.1
Ge	48.4	47.9	42.4	39.5	39.4	39.8	38.9	39.0
Gr	9.1	26.0	29.1	26.9	30.7	33.8	35.0	33.0
It	41.4	47.0	50.7	44.4	45.8	45.3	44.1	43.9
Ir	16.4	13.6	13.6	14.3	14.4	16.8	20.2	23.5
Nl	32.1	32.5	31.4	31.1	30.6	31.7	30.1	31.0
Pt	19.9	32.0	24.4	19.8	24.0	19.0	19.0	18.9
Sp	27.9	28.8	26.8	24.6	24.1	26.4	26.0	27.7
Sw	30.0	27.8	16.1	27.6	27.4	26.9	28.3	27.7
Uk	31.7	31.4	30.7	31.4	31.1	30.1	29.7	28.9
av.	28.38	29.56	27.69	27.22	28.31	28.76	29.57	28.61
std.dev.	10.79	10.13	10.25	9.00	9.03	8.24	7.21	8.57

Median of company specific tax to profit ratios excluding multinational enterprises. BL: Belgo-Luxembourg Economic Union. Source: Worldscope Global Database, CPB, own computations.

However, aside of other problems the data on tax revenues are in some cases seriously flawed as a source for the international comparison of tax burdens (*e.g.*, Volkerink and de Haan, 2000). Therefore, the analysis follows a different approach and employs a measure of the average tax burden based on a large survey of company accounts in all European countries. In cooperation with the CPB-Netherlands Bureau for Economic Policy Analysis company accounts of more than 6000 enterprises in all European countries provided by the Worldscope database were used to calculate firm specific tax burdens by relating the tax payments to the profit before taxes, as reported in the company accounts. From these tax burdens median figures for each country were taken to represent the tax burden. Since profits and taxes cannot be clearly assigned to individual countries (Jacobs and Spengel, 2000) multinational companies were removed from the dataset.⁶ Table 3 reports the corresponding figures. Note that the figures do not show a common trend towards a reduction. In connection with the slight reduction of statutory tax rates as documented in Table

⁶Following the suggestions of Collins and Shackelford (1995) we tried to take account of cross country differences in the tax codes related to depreciation rules, but faced intractable data limitations.

2 this points to a trend towards widening of the tax base while lowering the tax rates. Moreover, Table 3 indicates some convergence in the distribution of median tax burdens. However, at the end of the last decade still considerable variation exists.

To what extent the level of foreign taxes influences FDI depends crucially on the existence and conditions of bilateral or multilateral tax agreements. Within the European Union the so-called parent / subsidiary directive (guideline 90/435/EWG as of 23/07/1990) applies. In accordance with this directive the profit of the subsidiary is subject to tax in the target country according to the institutional regulations in the target country. In order to avoid double taxation, two options are available to the home country of the parent company: it may exempt income from foreign sources like for instance dividends received from the subsidiary (tax exemption) or it may subtract the taxes paid abroad from the tax bill on worldwide income (tax credit). While Greece, the United Kingdom, Ireland, and Spain follow the tax credit method, the remaining EU states follow the exemption method (Jacobs *et al.*, 1999: 151). If the exemption method applies, the relevant tax burden for location decisions is defined by the foreign taxes, while in case of tax credits the tax burden depends on whether or not the tax burden is higher in the home country or in the target country. Following Hines (1996) and Gorter and Parikh (2000) this institutional fact is taken into account in the empirical analysis by means of specific parameter restrictions. More specifically, in case of tax crediting the difference in statutory corporation tax rates as well as in the median of the company tax burdens is restricted to zero if the home country tax rate or tax burden is higher.

3.2 Public services and other locational conditions

The empirical study takes account of various measures of the supply of public services. As general indicators we use the levels of public consumption and public investments as obtained from the statistics of the OECD. In addition, statistics on different functions of government are taken from a variety of sources (see appendix). Expenditures on transport and communication are included as they play a key role in determining a country's public infrastructure. Among presumably important locational conditions also education is considered as a determinant of the productivity of the workforce. But, whether or

Table 4: Public spending (in % of GDP)

Country	Public consumption	Public investment	Educa- tion	Transp. & Commun.	Internal Security
Au	19.98	2.771	4.178	0.272	0.868
BL	21.31	1.760	4.627	0.538	1.317
Dk	25.91	1.788	5.684	0.646	0.951
Fi	23.52	3.074	5.895	1.125	1.236
Fr	23.76	3.323	4.982	0.534	0.886
Ge	19.61	2.404	3.690	0.508	1.561
Gr	14.54	3.293	2.477	0.354	0.863
Ir	16.02	2.347	3.022	0.573	1.665
It	17.69	2.519	4.582	0.466	1.776
Nl	23.84	2.560	4.545	1.307	1.241
Pt	17.89	3.851	5.325	0.573	1.817
Sp	18.04	3.690	3.546	0.389	1.733
Sw	27.30	2.766	5.257	0.803	1.482
Uk	19.75	1.871	4.456	0.475	2.056

Public consumption and investment: averages for 1991-1998. Source: OECD, own computations. Statistics on functions of government: averages for 1991-1998. BL, Uk, It, Pt until 1995, Sp, Ir until 1996, Fr until 1993, Nl and Sw exclusive of 1998. Source: Eurostat, UN, and national statistics, own computations.

not public education expenditures will be favorable for a country's attractiveness for investment depends among other factors on the degree of substitution between public and private education. Of course, also the judicial system and the enforcement of the law are important determinants of an attractive business climate suggesting to include spending on internal security. However, the inclusion of the spending on internal security might also pick up countries with a high crime rate, if they undertake particularly large efforts within the area of internal security.

Table 4 provides an overview on the variation of spending in these categories. Due to significant differences in the underlying national statistics the figures should be interpreted with some caution. However, there are no reasonable alternatives available. Broadly the figures conform with common beliefs, as the Scandinavian countries show comparatively large levels of spending, whereas Greece and Ireland show lower figures. The table does not reveal the fact that for most of the considered countries the level of spending and its composition

Table 5: Competitiveness rankings

Country	Science & Technology	Government	Infra-structure
Au	17.00	25.75	12.38
BL	13.50	41.00	18.25
Dk	12.63	19.63	8.25
Fi	8.38	24.13	4.75
Fr	5.38	37.38	15.25
Ge	3.13	19.25	8.75
Gr	38.38	40.00	38.75
Ir	15.13	18.88	22.88
It	28.88	44.38	27.38
Nl	9.63	25.63	12.63
Pt	40.88	27.00	33.63
Sp	30.75	28.75	24.13
Sw	8.50	34.75	3.25
Uk	13.38	14.75	14.63

Average ranking 1991 to 1998 among 47 countries. Source: International Institute for Management Development: World Competitiveness Yearbook, own computations.

into separate functions of governments is rather stable over time. A minor exception is Transport and Communication where in the nineties spending fell somewhat behind the other functions of government.

To capture the quality of public services, the empirical study takes account of indices of “competitiveness” as provided by the International Institute for Management Development (IMD) for 47 countries. Among other indicators IMD publishes rankings of individual countries to capture differences in the scientific and technological environment, in the efficiency and business orientation of the government, and in the general infrastructure. Although the indicators are rather broadly defined, they capture a variety of locational characteristics which are related to public sector activities. The government indicator for economic and fiscal policies takes account of national indebtedness, the structure and efficiency of the public administration as well as the status of internal security. For the evaluation of the scientific and technological environment the IMD ranking considers spending and employment within the area of research and development, the technology management as well as measures of intellectual property. The ranking of the infrastructure aims at summarizing the

assessment of natural and technical conditions as well as the transport and communication infrastructure.

Despite of the possible importance of taxation and public services, they certainly do not give a comprehensive picture of the determinants of the distribution of FDI flows. According to Dunning (1994) strategic motives related to regional markets account for almost half of the FDI transactions world-wide. The international competition as well as the increasing specialization would force many enterprises to intensify marketing activities and extend their sales networks. This points to a close link between exports and FDI which has been confirmed in empirical studies. For example, Jost (1997) shows that the regional structure of German FDI abroad is almost proportional to the distribution of its exports (see also Deutsche Bundesbank, Monthly Report, May 1997: 63pp). Therefore, the empirical analysis employs the bilateral exports between the respective home and target country as obtained from the OECD. As was pointed out in Section 2 a heuristic interpretation of this variable is provided by the gravity approach.

Finally, one might consider to take account of further cost differences between locations by adding measures of the real exchange rate to the set of regressors (*e.g.*, Jost, 1997). However, as available data on price indices and exchange rates can be combined only in indices of the change of the cost competitiveness, a thorough analysis requires a dynamic model. Moreover, available evidence indicates that the contemporaneous correlation between indices of cost competitiveness and exports is a poor indicator of the long-run effects (Carlin *et al.*, 2001). As the time series dimension of the data in the current study is rather short a treatment of the role of cost competitiveness is left for future research.

4 Results

Column (1) in Table 6 shows the results of a basic regression of FDI outflows on the marginal effective tax burden. This is captured by the cost of capital for a transnational investment of an investor situated in the home country and investing in the considered target country relative to the cost of capital for a domestic investment. Moreover, government consumption as well as the bilateral exports are included as explanatory variables. Note that the flow

Table 6: Basic regression results

method specification	dep. variable: logarithm of outward FDI per GDP						
	OLS (1)	OLS (2)	OLS (3)	OLS (4)	IV (5)	FE (6)	RE (7)
tax rate		0.626 *	0.565		0.568 *	-0.190	0.981 **
		(1.74)	(1.61)		(1.66)	(0.37)	(4.61)
ucc	-1.322**		-1.300**		-1.231**	-0.906	-1.382**
	(2.50)		(2.34)		(2.41)	(1.41)	(2.94)
tax burden				0.129			
				(0.67)			
bil. exp.	1.114 **	1.124 **	1.125 **	1.114 **	1.152 **	0.765 **	1.209 **
	(15.4)	(16.1)	(16.3)	(15.2)	(16.6)	(2.34)	(17.2)
pub. cons.	1.009	1.282	1.104	1.198	1.140	0.934	1.260 **
	(1.02)	(1.28)	(1.05)	(1.20)	(1.18)	(1.06)	(3.69)
nobs	898	898	898	898	898	898	898
R^2	0.662	0.661	0.663	0.659	0.663	0.779	0.523
R^2 adj.	0.648	0.647	0.650	0.645	0.649	0.732	0.517
Hausman					0.086 *		0.181

*All variables are logarithmically transformed, bilateral export is measured relative to GDP, public consumption refers to the log. difference of spending per GDP between home and target country. See text for further description. Regressions include time-specific fixed effects. (1)-(5) also employ dummy variables for each home and target country. (6) and (7) display results from fixed effects and random effects regressions, respectively. The bottom line reports the probability value of Hausman statistics. Absolute value of t-statistics in parentheses. *, **, indicate significance at levels of 10% and 5%.*

variables, FDI, exports, and public spending, are scaled using the current home country GDP.⁷

As the FDI data report the actual investments taken in the target country we expect an inverse effect of the cost of capital on FDI. The results are supportive, indicating that the relative tax burden on international direct investment in fact suppresses investment. With an average user cost of capital in the sample around 0.065 the implied tax elasticity is at -0.397.⁸ As compared to the literature this effect is not particularly strong.⁹ Bilateral exports show a strong positive effect which is somewhat larger than proportional albeit not significantly so (standard error equals .072). The coefficient of the government consumption points to a positive, although not significant, influence.

In presence of signaling effects, profit shifting, or just because tax incentives for marginal investments are not sufficient to capture the variation in the fiscal incentives, we should observe an additional impact of the difference in the statutory tax rate (taking account of tax credits, if applicable). Specification (3) however shows no significant positive effect of the difference in the statutory tax rate if jointly entered with the cost of capital variable (compare specification 2). However, as compared to specification (1) the adjusted R^2 still indicates the joint significance of the marginal effective tax burden and the statutory tax rate. This joint significance can be seen as a confirmation that the average effective tax rate is decisive for the location of FDI within Europe as found by Devereux and Griffith (1998).

For comparison, specification (4) reports results obtained from the alternative use of the median company tax burden. If only home country dummies are included, there is, in fact, a strong positive effect (results not shown). However, if the estimation takes account of specific conditions in the target country by means of a country specific dummy, the effect of the tax burden becomes insignificant as displayed in (4). The same result (not shown) is obtained if the median tax burden is entered jointly with the user cost and the statutory

⁷In terms of equation (4) i, x , and g are replaced with $\tilde{i}_{i,j,t} = \log \frac{I_{i,j,t}}{Y_{i,t}}$, $\tilde{x}_{i,j,t} = \log \frac{X_{i,j,t}}{Y_{i,t}}$, and $\tilde{g}_{i,t} = \log \frac{G_{i,t}}{Y_{i,t}}$.

⁸Table 6 reports the elasticity with respect to the user cost. To obtain the implied tax elasticity the coefficient is multiplied with $t/(1-t)$, where t is the implied tax rate $t = (c-r)/c$, r is the rate of return fixed at 0.05, and c is the average user cost of capital in the sample. Hence, the tax elasticity can be obtained approximately by multiplying the estimated coefficient of the user cost with 0.3.

⁹In his survey on the US literature Hines (1997) finds a consensus estimate of -0.5. In their recent review Mooij and Ederveen (2001) find a representative figure of -3.3 for the semi-elasticity capturing the response to a 1 % increase in the tax rate. In the current analysis the semi-elasticity can be approximated by multiplying the coefficient estimate with 1.3. The corresponding figure obtained for specification (1) is -1.719.

tax rate. Hence, the tax incentives are sufficiently captured by the marginal tax burden and the statutory tax rates.

Specifications (1) to (4) condition on the volume of bilateral exports, thereby neglecting a possible simultaneity between exports and investment. To test for the significance of a simultaneity bias specification (5) follows an instrumental variable approach, employing the bilateral exports as of period 1991 as an instrument for all subsequent years. This instrumental variable strategy would yield consistent estimates even if exports react to shocks in FDI provided the temporal variation of bilateral exports is not correlated with the unobserved component of the FDI flow. Unfortunately, as there are no overidentifying restrictions the latter assumption cannot be tested empirically. The results for the IV regression are almost the same as in (3) and a Hausman test of (5) vs. (3) indicates only weak significance. Thus, given the choice of the instrument, there seems to be no strong simultaneity bias present.

Whereas specifications (1) to (5) control for country specific effects, each bilateral flow might be affected in a different way by unobserved characteristics of target and home country. As Devereux and Freeman (1995) suggest, this could be taken into account by means of a panel data analysis. Specification (6) reports results from a standard within estimator, which differs from the basic results in particular by showing much larger standard errors. As this could be the consequence of insufficient variation across time in the variables, it seems more promising to apply a random effects estimator. This seems appropriate in particular, since the Hausman statistic of fixed vs. random effects does not allow to reject the random effects approach. The results as displayed in (7) generally support the findings from the basic regression, with the statutory tax rate being highly significant. The tax elasticity implied by the coefficient of the user cost of capital is about the same as in specification (1) (approximately -0.415). Interestingly, the elasticity with respect to the statutory corporation tax which can be directly read off the table is about twice as large.¹⁰ However, public consumption shows a significant positive effect, whereas a negative sign should be expected if public spending has effects on productivity. At this point one could only speculate about possible explanations. It could be that a higher level of spending implies an additional tax burden falling onto investors in the home country rather than an improvement of productivity. However, an alternative explanation could simply be that public consumption is a weak

¹⁰With an average statutory corporation tax of 0.356 the semi-elasticity is at -2.756.

indicator of the productivity effects of public sector activities.

As evident from Table 7 a consideration of public sector investments does not show any additional effects. Specification (1) employing country dummies and specification (2) relying on random effects both find no significant effect of public investment. Of course, the current spending could be weakly related to the actual provision of public infrastructure.

Alternatively, specification (3) relies on the relative ranking indices of the IMD. Two of the rankings show significant effects, namely those related to science and technology as well as to the infrastructure. However, in both cases the coefficient is negative, indicating that home countries with a high ranking of technology and infrastructure relative to the target countries actually show larger FDI outflows. As can be seen from specification (5) the result obtained for science and technology is robust against the inclusion of the expenditure structure, in terms of spending on education, transport and communication, and internal security, which are all insignificant even when entered without the rankings (compare specification 4). Note that since the public spending figures are available only for a subset of observations, specifications (4) and (5) use only 509 observations. This is also the case with specification (6), providing results for a random effects specification, which is preferred provided the unobserved effects are not correlated with the explanatory variables. Again, this assumption cannot be rejected on grounds of a Hausman test. Specification (6) is supportive of the joint significance of statutory tax rates and the user cost of capital. Moreover, it seems broadly consistent with a proportionality between bilateral FDI and bilateral exports. With regard to overall public consumption we now find a significant negative impact. As the regression controls for the public expenditure structure and for the ranking of locational conditions, this result indicates that higher overall spending raises locational attractiveness holding constant the quality of public services provided. The inclusion of country rankings as well as the public expenditure composition among the controls yields a larger coefficient for the tax incentive as captured by the cost of capital. This is consistent with the presumption of Bartik (1991) that when omitting locational characteristics analyses would tend to underestimate the role of tax incentives. For specification (6) the implied elasticity from the coefficient of the user cost now is obtained at -0.452. For the current sample this implies that an increase in the tax rate by 1 percentage point reduces the inflow (raises the outflow) of FDI by about 1.959 %. However, with

Table 7: Further regression results

method specification	dep. variable: logarithm of outward FDI per GDP					
	OLS (1)	RE (2)	OLS (3)	OLS (4)	OLS (5)	RE (6)
tax rate	0.546 (1.56)	0.972 (4.56)	0.496 (1.46)	0.384 (1.03)	0.161 (0.43)	0.592 ** (2.67)
ucc	-1.209 ** (2.31)	-1.399 ** (2.98)	-1.205 ** (2.38)	-0.811 ** (1.23)	-1.190 ** (1.99)	-1.507 ** (2.55)
bil. exp.	1.124 ** (16.2)	1.206 ** (17.1)	1.055 ** (14.7)	1.062 ** (12.8)	1.013 ** (11.3)	1.172 ** (15.4)
pub. cons.	1.870 (1.63)	1.388 ** (3.78)	0.839 (0.77)	-2.542 (1.23)	-1.548 (0.73)	-1.660 ** (2.37)
public inv.	-0.417 (1.53)	-0.152 (0.96)				
sci.& techn.-rnk.			-0.096 ** (2.26)		-0.180 ** (3.31)	-0.209 ** (4.07)
government.-rnk.			0.094 (1.47)		-0.096 (0.67)	0.009 (0.08)
infrastr.-rnk.			-0.146 ** (2.78)		-0.173 (1.55)	-0.148 * (1.95)
education				-0.766 (0.85)	0.708 (0.74)	0.570 (1.46)
transp. comm.				-0.204 (0.40)	-0.028 (0.06)	0.332 * (1.91)
internal sec.				0.449 (0.98)	-0.225 (0.46)	-0.738 ** (3.31)
nobs	898	898	898	509	509	509
R^2	0.664	0.521	0.670	0.664	0.680	0.595
R^2 adj.	0.650	0.515	0.656	0.639	0.655	0.582
Hausman		0.125				0.153

*Variables except of rankings are logarithmically transformed, bilateral export is measured relative to GDP, public spending variables refer to the log. difference of spending per GDP between home and target country. See text for further description. Regressions include time-specific fixed effects. (1),(3), (4), and (5) include dummy-variables for each home and target country. (2) and (6) display results from random effects regressions. The bottom line reports the probability value of Hausman statistics. Absolute value of t-statistics in parentheses. *, **, indicate significance at levels of 10% and 5%.*

regard to the statutory tax rate the results suggest a smaller elasticity than without variables capturing the ranking and the structure of public spending (compare specifications (2) of Table 7 and (7) of Table 6). Moreover, a part of the effects assigned to public sector activities object a straightforward interpretation in terms of reactions of investment to locational advantages and disadvantages as the coefficients for the ratio of the rankings as well as for spending on transport and communication seem to indicate that less public spending and less favorable conditions in the target country would raise rather than reduce investment.

5 Conclusions

The empirical analysis of bilateral FDI flows has confirmed significant effects of tax incentives on the location of FDI. In particular, lower cost of capital for transnational investments relative to the cost of capital for domestic investments tend to raise FDI outflows. In addition, an increase in the difference between the statutory tax rates in the home country and the statutory tax rate of the destination country is related with an increase in FDI outflows. The difference in the median tax burden between home and destination country proves significant only if the overall attractiveness of destination countries is not controlled for by means of country specific constants. Moreover, the additional inclusion of the median tax burden does not improve the predictive power of the regression. Hence, the tax incentives are sufficiently captured by the marginal tax burden and the statutory tax rates.

No strong evidence is found for a role of public expenditures in shaping locational attractiveness. Controlling for locational rankings and the expenditure structure with regard to different functions of government and increase in public consumption is associated with a significant decline of FDI outflows. However, the rankings as well as spending related with individual functions of government partly show unexpected results. Thus, the empirical analysis provides only weak support for a countervailing impact of public spending on locational conditions.

Apart from the obvious difficulties to measure the provision of public services this can essentially be interpreted in two directions. On the one hand, the weak indication of a role of public spending could be taken as evidence that

company taxation is not characterized by an equivalence between tax burden and locational advantages. Then, increased international tax competition would lead to future reductions of corporate taxation across European countries. On the other hand, the absence of clear signs for public spending effects might simply be due to the fact that locational advantages and disadvantages from differences in public sector activities cannot be distinguished from other country characteristics as they show only small variation across time. If this were the case, the results could still be compatible with an equivalence of tax burdens and the supply of public services in the long run. However, as only tax incentives do exert observable effects on FDI increased tax competition might nevertheless lead to reductions of company tax burdens. Since, if investors and politicians alike were not able to identify the full consequences of a reduction of public spending it would be difficult to prevent them from lowering tax rates despite of a possible deterioration of locational conditions.

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Datasources and definitions

FDI: bilateral flows of direct investment, 1991-1998, financed with equity and capital of 12 EU-countries into 14 EU-partner countries (ouflows for Greece and Ireland were not available) in ECU, Belgium and Luxembourg are aggregated to the Belgo-Luxembourg Economic Union. Source: Eurostat, European Union Direct Investment.

Data on taxation: see section 3.1.

Bilateral exports (f.o.b.). Source: OECD, Monthly Statistics of Foreign Trade. Annual figures, transformed in ECU using the average annual US \$ - ECU exchange rate. Source: Eurostat, Basic Indicators.

Public consumption as a share of GDP. Annual figures. Source: OECD, Fiscal Positions and Business Cycles (appropriation accounts).

Public investment expenditures as a share of GDP. Annual figures. Source: OECD, Fiscal Positions and Business Cycles (appropriation accounts).

Public expenditures for functions of government: as a share of GDP, annual figures. The data are basically taken from Eurostat following the COFOG Classification of the UN. Missing data are complemented with data from the UN Yearbook of National Accounts Statistics for Austria, Greece, and Sweden as well as with data from national statistics in the case of Belgium, Germany, Denmark, Greece, Netherlands, and Sweden. Where necessary, spending data were transformed into ECU using annual average exchange rates. Source: Eurostat, Basic Indicators.

GDP in ECU. Source: Eurostat, Economy and Finance.

Rankings of Competitiveness: Annual rankings of science & technology, government efficiency, and infrastructure among a group of 47 countries. Source: World Competitiveness Yearbook issued by the International Institute for Management Development (IMD), various issues.