THE DISAPPEARING TAX BASE: IS FOREIGN DIRECT INVESTMENT ERODING CORPORATE INCOME TAXES?
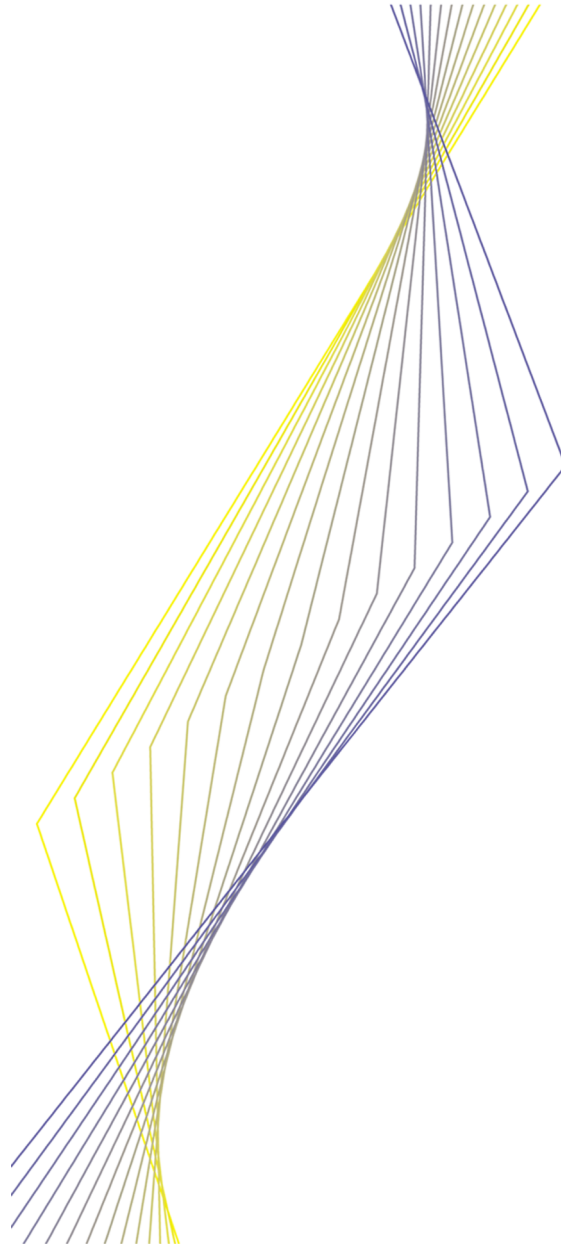
**BY REINT GROPP
AND KRISTINA KOSTIAL**

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Contents

Abstract

This paper analyzes the link between Foreign Direct Investment (FDI), corporate taxation, and corporate tax revenues. We find strong evidence that FDI in (out) flows are affected by tax regimes in the host (home) countries and FDI flows in turn affect the corporate tax base. Simulations of EU harmonization (isolating the revenue effect of FDI on the tax base from direct effects through the rate harmonization) suggest that high (low) tax countries would gain (lose) revenue from harmonization; these effects may be substantial. Our results also suggest that EU tax harmonization would significantly affect the net FDI position of some countries.

Introduction

Globalization creates many challenges in the field of tax policy and one of the most heatedly discussed issues is "harmful" tax competition.[1] Globalization provides new opportunities for minimizing and avoiding taxes, through the relocation of mobile capital. While a reduction in the tax burden on enterprises per se might not necessarily be "harmful," the difficulty to tax capital of multinational enterprises might result in distortions in the patterns of trade and investment. It may also result in a redistribution of the tax burden from mobile capital onto less mobile factors, in particular labor. Similarly, it might result in a shift of the burden of taxation from large multinational enterprises to small national ones. Thus, the ability of large multinational enterprises to reduce their tax burden significantly or escape it altogether might entail more regressive tax systems, and larger budget deficits and/or the reduction in the provision of public services.[2]

There are indications that "harmful" tax competition has already manifested itself in the sharp decline in corporate tax revenues in some OECD countries.[3] While part of the decline can be attributed to business cycle variations (and has recently recovered to some degree) or changes in tax codes, the extent and persistence of the decline suggest that there are additional factors at work. The surge in Foreign Direct Investment (FDI) in the 1980s is a possible explanation for the decline and, hence, this paper attempts to establish an empirical link between FDI and corporate tax revenues.

Past empirical work which has focused on the relationship between FDI and corporate tax rates (rather than tax revenues) has found mixed evidence whether taxes have an impact on FDI flows.[4] While most studies undertaken before 1990 conclude that FDI flows are not very sensitive to tax differentials,[5] more recent studies (both macro- and micro-based) indicate that inflows in particular are sensitive to host country taxation. For example, Slemrod (1990b) investigates the effect of both United States and home country taxation on FDI in the United States. He dis-aggregates FDI by origin to facilitate a study of home country influences. His results indicate a negative effect of United States effective tax rates on total FDI inflows. However, he does not find much support for the effect of foreign countries' tax rates on FDI in the United States. Modén (1995) shows that Swedish FDI outflows from 1965 to 1990 respond to changes in marginal effective tax rates in host countries, but did not react to the 1991 Swedish tax reform. Devereux and Freeman (1995) estimate the impact of taxation on FDI flows between seven countries for the period 1984–89, using a measure of the cost of capital. They find that the choice between domestic and outward FDI is not significantly affected by taxation, but that taxation does affect the location of outward FDI. Devereux and Griffith (1998) using United States microdata find that the effective average tax rate plays an important role in the choice of the production location of firms conditional on the decision to produce abroad.[6] However, taxes do not matter for the choice between FDI, exporting or not serving the market at all.

The empirical literature (mostly using data on United States multinationals) is generally unambiguous in finding that multinational firms use transfer pricing as a means to minimize their tax burden, once FDI is in place. Multinational firms typically can reduce their total tax liabilities by

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1 The OECD and EU have developed guidelines intended to mitigate these problems; see OECD (1998). Moreover, the European Union Commission recently published an analysis of selected tax measures of member countries (European Union Commission (1999)). Out of the 300 measures analyzed, 66 were considered harmful (i.e., significantly lowering the effective level of taxation) to location of business.
2 Tanzi (2000) argues that globalization will affect governments' ability to continue providing social protection at the level of recent decades.
3 As Tanzi (1996) points out the net effect of transfer pricing can result in a reallocation of total tax liability among countries.
4 See Hines (1996) for a detailed overview.
5 See, for example, Hartman (1984), Boskin and Gale (1987) and Young (1988).
6 Other micro-based studies using United States data find similar results (e.g., Cummins and Hubbard (1995) and Grubert and Slemrod (1994)).

lowering the prices charged by their affiliates in high-tax countries for items sold to affiliates in low-tax countries. For example, Grubert and Mutti (1991) report that high taxes reduce the after-tax profitability of United States affiliates. Harris, Morck, Slemrod, and Yeung (1993) find that the United States tax liabilities of firms with tax haven affiliates are significantly lower than those of similar firms without these kinds of affiliates. Collins, Kemsley, and Lang (1996) show that foreign profitability is higher for United States firms which invest in countries with tax rates below the United States rate.

Finally, business surveys carried out by Devereux and Pearson (1989) and for the Ruding Committee (Ruding (1992)) support the view that tax systems play a role for the firm's investment decisions. However, a more recent survey of multinationals conducted by Deloitte and Touche (1996) found that although taxes are influential in investment decision-making, a large numbers of investors are unfamiliar with many of the available beneficial tax incentives, including those in countries where they have already invested.

In this paper, we advance the literature along three main avenues. One, tax effects estimated in past empirical work may have been contaminated by non-tax factors. For example, low tax countries may also be countries with a more business friendly environment in general, may have lower overall taxes or less restrictive zoning laws. If these correlations are large, tax effects would be overstated. In this paper we use instruments unrelated to the business environment to more accurately identify tax effects. Second, this paper is the first to our knowledge to establish an empirical link between FDI and corporate income tax revenues, not just corporate income tax rates. And third, we use the estimated relationship between FDI and corporate income tax revenues to simulate corporate income tax harmonization in the European Union (EU). These simulations indicate how tax changes would affect the net FDI position and corporate income tax revenues of countries in Europe.

We proceed in four steps. First, we estimate the response of FDI inflows (outflows) to changes in host (home) country taxation. We find strong tax effects on both inward and outward FDI flows. We then proceed to split our sample into countries which credit foreign source income and countries which exempt foreign source income. This split enables us to create an instrument unrelated to the business environment which allows us to further pinpoint tax effects. Our results suggest that taxes indeed play an important role for FDI flows. In a third step, we estimate the corporate tax base as a function of FDI and find that FDI inflows (outflows) affect the profit tax base positively (negatively), controlling for factors such as growth and the real exchange rate. Finally, in order to evaluate the magnitude of these effects, we simulate the impact of corporate tax rate harmonization in the EU on the revenues of member countries, utilizing a simple log-linear model of corporate tax revenue. We find that EU tax harmonization would affect primarily three countries: Germany, Italy, and Ireland. Germany and Italy would experience a significant improvement in their net FDI position and gain revenue, while Ireland would experience the opposite. Our simulations suggest that at least some part of the corporate income tax revenue decline may be attributable to FDI flows, although the precise magnitude of the effects is sensitive to the specification of the revenue model.

The paper is organized as follows. Section 1 presents a description of the data and section 2 provides descriptive evidence to motivate our hypotheses. Section 3 contains the empirical estimates, section 4 the simulation results, and section 5 a discussion on robustness. The paper concludes in section 6.

1   Data

We use a number of different sources for our data. FDI flows and all other macroeconomic variables used in the analysis are taken from the IBRD data base; one year ahead growth forcasts were obtained from the May issue of the IMF's World Economic Outlook; and corporate tax revenues were obtained from the IMF's tax policy handbook statistics. The effective corporate tax rates and profit rates are based on a firm level microdata set of 10,000 firms compiled by Bloomberg. The statutory corporate profit tax rates stem from publications of the International Bureau of Fiscal Documentation.

In order to produce a balanced panel data set for the period 1988–97, our initial sample of all 25 OECD countries had to be reduced. First, we had to drop five countries, because FDI flows were not available over the entire sample period (Belgium, Greece, Luxembourg, Mexico, and Turkey). South Korea had to be dropped, as the WEO database did not contain an individual growth forcast for this country. In the end, we obtained a balanced sample of 19 countries for the period 1988 to 1997.[7] For the regressions on FDI components we were limited to work with a balanced data sample of thirteen countries as we had to drop countries for which a decomposition of FDI into its components was unavailable.[8] Definitions and summary statistics of the variables are provided in Appendices I and II, respectively.

2   Descriptive Evidence

Before proceeding to the econometric analysis, it is useful to identify patterns in the data, which may help identify a number of propositions that could be tested in the subsequent econometric analysis.

While the share of FDI flows to non-OECD countries has been gradually increasing (up from around 20 percent of total flows in the 1980s to 30 percent of total flows on average in the 1990s), most FDI flows are within OECD countries.[9] Chart 1 shows that among the large economies there are countries with substantial net inflows like the United States and countries with almost exclusively outflows like Japan and Germany. Other countries manage to attract about as much FDI as flows abroad (like the United Kingdom).[10]

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7   In a limited number of cases, missing values had to be imputed, using simple regressions or country specific means.

8   For the components, the remaining 13 countries in the sample are Australia, Canada, Finland, France, Germany, The Netherlands, New Zealand, Norway, Portugal, Sweden, Switzerland, United Kingdom, and the United States.

9   Virtually 100 percent of FDI flows originate in OECD countries. Overall, hence, OECD countries provide net capital to non-OECD countries.

10   Note that if the chart displayed FDI flows as a percentage of flows between OECD countries (not of total FDI flows), inflows to the United States would be about twice as high as outflows as the United States is the recipient of almost half of OECD outflows and has an overproportional share of outflows to non-OECD countries.

Chart 1

FDI Inflows and Outflows in Selected OECD Countries, Average for 1988–97
(In percent of total FDI flows)

Inflows

Outflows

Germany   Japan   UK   US
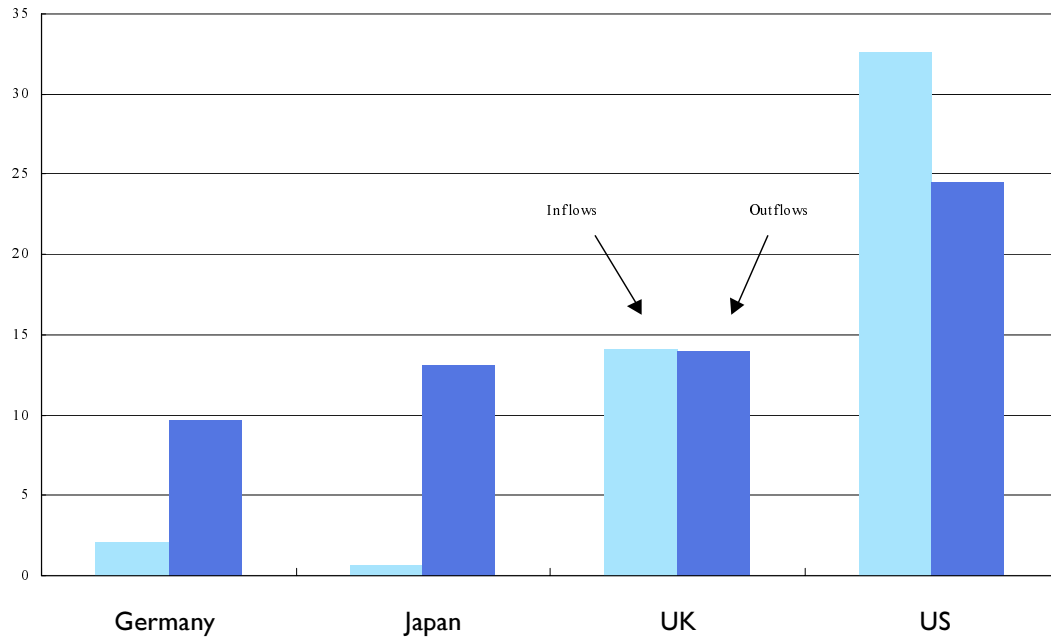
Sources: IBRD data base; and IMF staff estimates.

Chart 2

OECD: Mean and Standard Deviation of Statutory Corporate Tax Rates, 1988–97*
(In percent)

+/- one standard deviation

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Upper	52.1	49.1	45.7	44.6	43.2	42.6	41.2	41.6	41.6	41.1
Mean	44.0	40.9	39.3	38.4	37.3	36.2	35.6	35.8	36.0	35.7
Lower	35.9	32.8	32.9	32.2	31.5	29.9	30.0	30.0	30.3	30.3
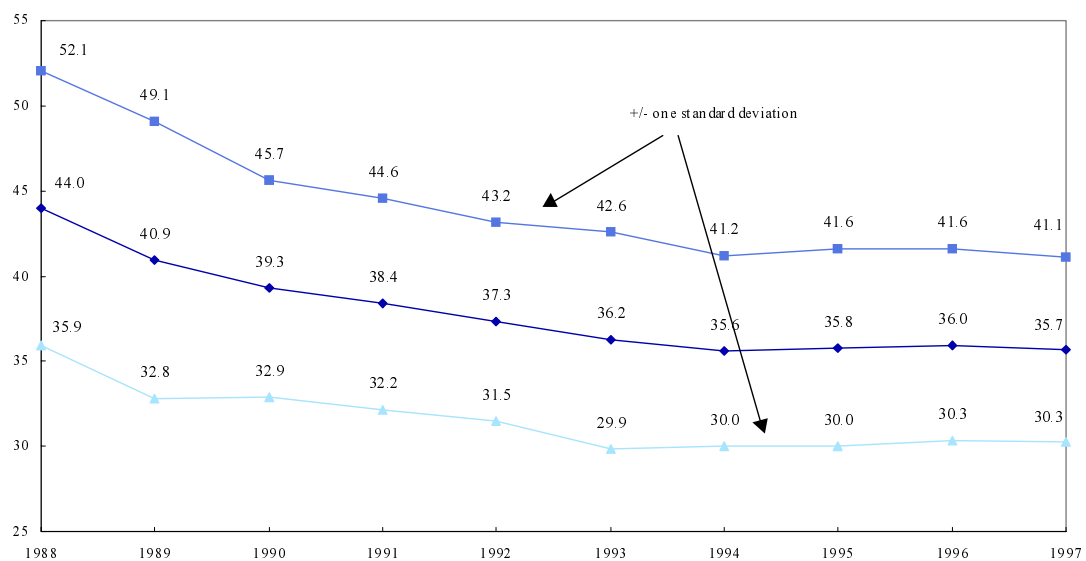
Sources: International Bureau of Fiscal Documentation; and staff estimates.

Chart 3

OECD: Mean and Standard Deviation of Effective Corporate Tax Rates, 1988–97
(In percent)
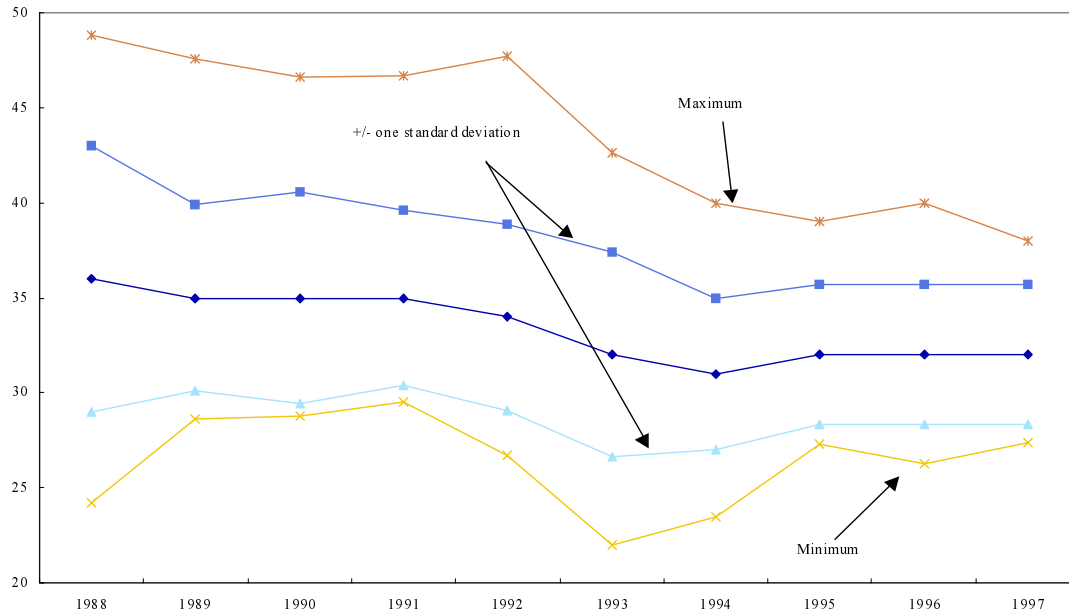
Sources: Bloomberg; and staff estimates.

Developments in FDI have been accompanied by a reduction and convergence in statutory as well as effective corporate tax rates. The OECD average statutory corporate tax rate declined from 44 percent in 1988 to 36 percent in 1997 and its standard deviation was reduced from 8 percent to 5 percent (Chart 2).[11] However, it might very well be that the effective tax burden on corporations has not changed, as the effective burden also depends on the tax base. If in conjunction with a reduction in tax rates, countries broadened tax bases, changes in the statutory tax rate alone would be misleading indicators of changes in the tax environment. Hence, in Chart 3, we have plotted effective tax rates which we calculated using the microdata.[12] The chart shows that developments in effective corporate tax rates very much mirror those of statutory rates. The reduction in the level of statutory rates with a concurrent reduction in the standard deviation in itself suggest that tax competition is important and that governments may have designed their tax policies to counter the threat of FDI outflows and to attract FDI inflows.

A   Taxes and FDI

Corporate income tax policies pursued by one government can impact in different ways on other countries. On one hand, if the domestic burden of taxation is high relative to other countries, the tax base may shift to countries with a less burdening tax regime, implying a response of outward FDI to changes in tax policies. On the other hand, countries can compete for attracting inward investment flows. Taxes also might play a major role in firms' decisions where to declare profits. In

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11 *Note that Ireland has a preferential corporate tax rate on manufacturing of 10 percent, which we will use in the econometric analysis. For further discussion see below.*

12 *Effective average tax rates were calculated as the ratio of taxes paid and pretax profits for each firm and then aggregated back to the country level (see Appendix I).*

fact, anecdotal evidence suggests that transfer pricing and other tax planning techniques involving cross-border transactions to minimize tax liabilities consume significant resources of multinational enterprises. Hence, we propose to test the following propositions:

P 1:   FDI inflows are larger in low tax countries.
P 2:   FDI outflows are smaller in low tax countries.

Charts 4 and 5 give some illustrative descriptive evidence for these propositions. Cumulative FDI flows for the five countries with the lowest tax rates ("low tax group") and the five countries with the highest tax rates ("high tax group") in each year show a strong link of FDI to the tax regime. Note that the composition of the two groups varies across years. The low tax group tends to include Switzerland, the United States and the United Kingdom (the latter particularly for the first half of the sample period). The high tax group tends to include Germany, Australia, and towards the latter part of the sample period, Canada. This type of sample split is based on the *relative* position of one country compared to all others. Hence, any given country, without changing its tax rates, might find itself in both the high tax group and the low tax group during the course of the sample period. Chart 4, which plots cumulative *gross* in and outflows, shows that since 1988 low tax countries have had both higher inflows and higher outflows relative to the high tax countries. The surprisingly high level of outflows from low tax countries can in part be explained by flows to non-OECD countries. Chart 5 plots *net* cumulative FDI flows. It is apparent that the countries in the low tax group experienced much less net FDI outflows relative to the high tax group; on a net basis, outflows in the low tax group were about half of those in the high tax group during the sample period.

Chart 4

OECD: Cumulative Gross FDI flows for Low and High Tax Countries, 1988–97*
(In percent of GDP)
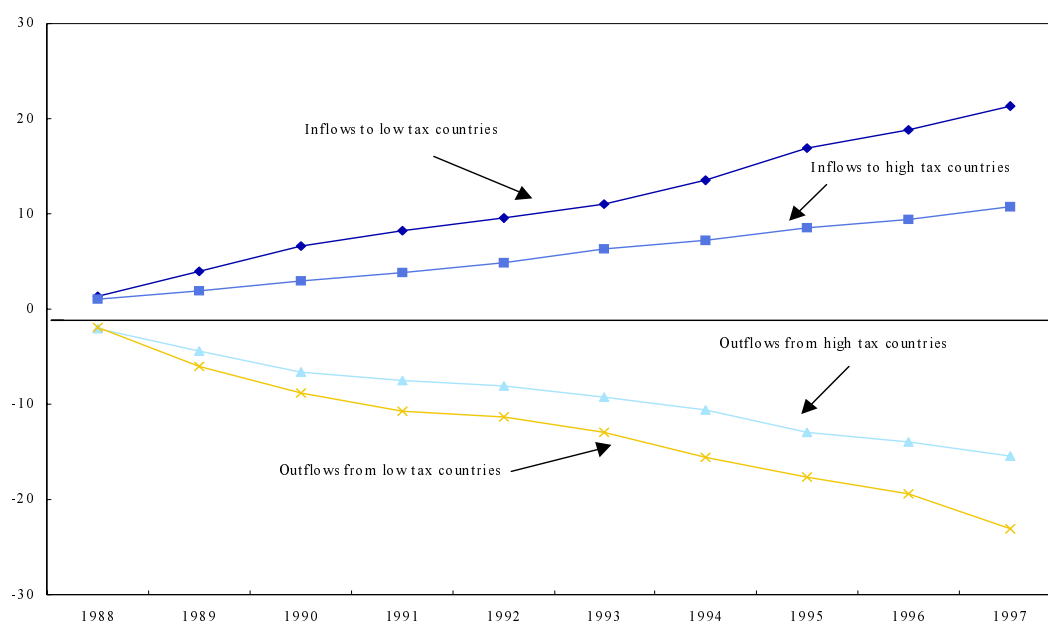
Sources: IBRD; and staff estimates.
* Country groups are defined in the text.

Chart 5

OECD: Cumulative Net FDI Flows for Low and High Tax Countries, 1988–97*

(In percent of GDP)
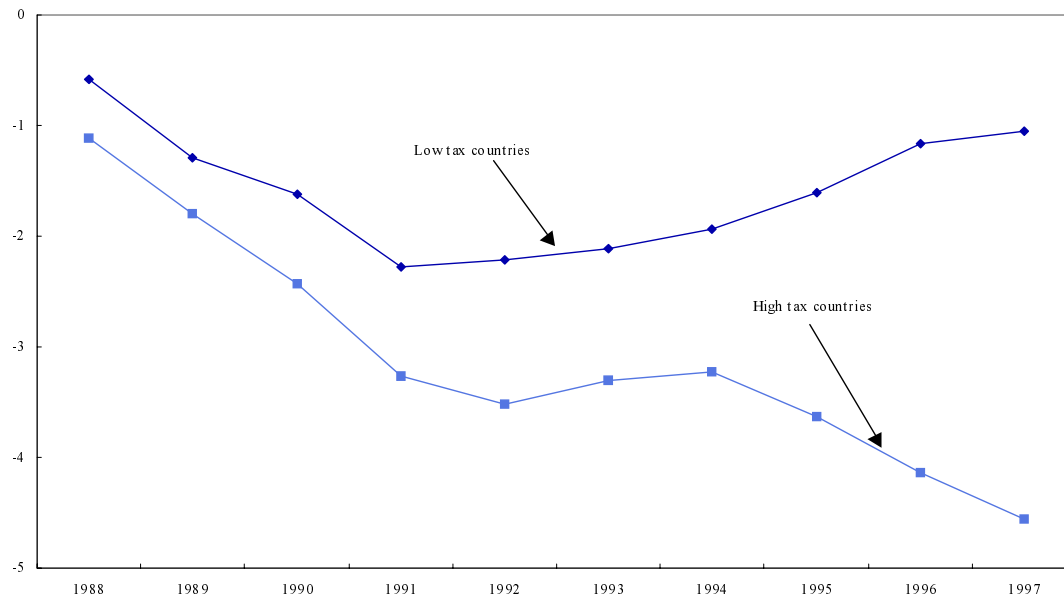
It is possible that the level of tax rates might simply proxy for other unobserved factors, which make a country more or less attractive as a recipient of FDI. Factors of this sort may include a more business-friendly legal environment or lower overall taxes, including taxes on labor. If the level of corporate income tax rates were highly correlated with these factors (e.g., a low (high) corporate tax rate were an indicator for a generally low (high) tax burden and a more (less) business-friendly environment), we would overstate the tax effects. In order to assess this question, we utilize the fact that OECD countries differ in the treatment of foreign source income. We split the sample in countries taxing worldwide income (i.e., using a credit system for foreign taxes paid; about one third of our sample; "credit countries" hereinafter) and countries exempting foreign source income ("exemption countries" hereinafter).[13] Domestic taxes should matter more for outflows in countries which exempt foreign source income, because through investing abroad firms can escape domestic taxation entirely. FDI outflows in credit countries should be less sensitive to taxes as they cannot escape domestic taxation entirely, at least insofar as profits are eventually repatriated.[14]

In order to further investigate this, we divide total FDI outflows into two components: debt and equity investment and reinvested earnings of foreign subsidiaries (retained earnings outflows). Firms residing in a country which asserts the right to tax worldwide income and only gives a credit for the foreign tax paid have a larger incentive to reinvest their earnings abroad (rather than repatriate them) relative to a firm residing in a country that exempts foreign source income. Hence, debt and equity investments are likely to be higher in high tax countries that exempt foreign source income, while earnings are more likely to be reinvested by firms residing in high tax countries with a credit system. Hence we propose:

P 3:   Exemption countries experience larger outflows than credit countries.
P 4:   The tax sensitivity of outflows is greater in exemption countries than in credit countries.

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13   *"Exemption countries" are Australia, Austria, Canada, Denmark, Finland, France, Germany, The Netherlands, Sweden, and Switzerland.*
14   *As we do not have a breakdown of FDI inflows into source countries, we can use this distinction for FDI outflows only.*

P 5: Retained earnings outflows are lower in exemption countries and unaffected, or positively related to home country taxation for credit countries.

P 6: Debt and equity outflows are higher in exemption countries and unaffected, or negatively related to home country taxation for credit countries.[15]

To illustrate the different patterns of FDI outflows for exemption and credit countries, consider Chart 6. Chart 6 depicts the annual average FDI outflows in percent of GDP for both groups of countries. It shows that exemption countries experienced much higher outflows than credit countries, which is in line with hypothesis 3. The chart also shows that the two components behave very differently with respect to the distinction between exemption and credit countries. Debt and equity outflows in exemption countries are much higher than in credit countries while retained earnings outflows show the opposite behavior, supporting propositions 5 and 6.

B   FDI and Corporate Tax Revenue

In theory, FDI inflows (outflows) may affect corporate income tax revenues through increasing (decreasing) the domestic capital stock. Moreover, this revenue effect may be confounded through transfer pricing or other strategies to minimize taxes.

This theoretical relationship can be analyzed by looking at individual country data. Looking at the OECD average, the correlation between FDI flows and corporate income tax revenue is not obvious. After a rapid decline in corporate income tax revenues during the early 1990s, the OECD average corporate tax ratio appears to have stabilized, even though the magnitude of FDI flows has further increased (Chart 7). Data for individual countries, however, reveal a different trend. For example, in Japan and Germany – both countries with relatively high corporate tax rates, low FDI inflows, and high FDI outflows – there seems to be some persistence in the decline of corporate income tax revenues. In contrast, the United States – which has been a low tax country and a recipient of substantial FDI inflows – appears to have had a steady increase in corporate tax revenues. Finally, countries, which managed to attract as much FDI as they invested abroad, like the Netherlands and the United Kingdom, have had relatively stable corporate tax-to-GDP ratios.

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15 Note that Slemrod (1990a, 1990b) formulated hypotheses similar to H 5 and H 6, but did not find supportive evidence for investment inflows in the United States from G7 countries for 1960–87.

Chart 6

FDI Outflows in Exemption and Credit Countries; Average for 1988–97
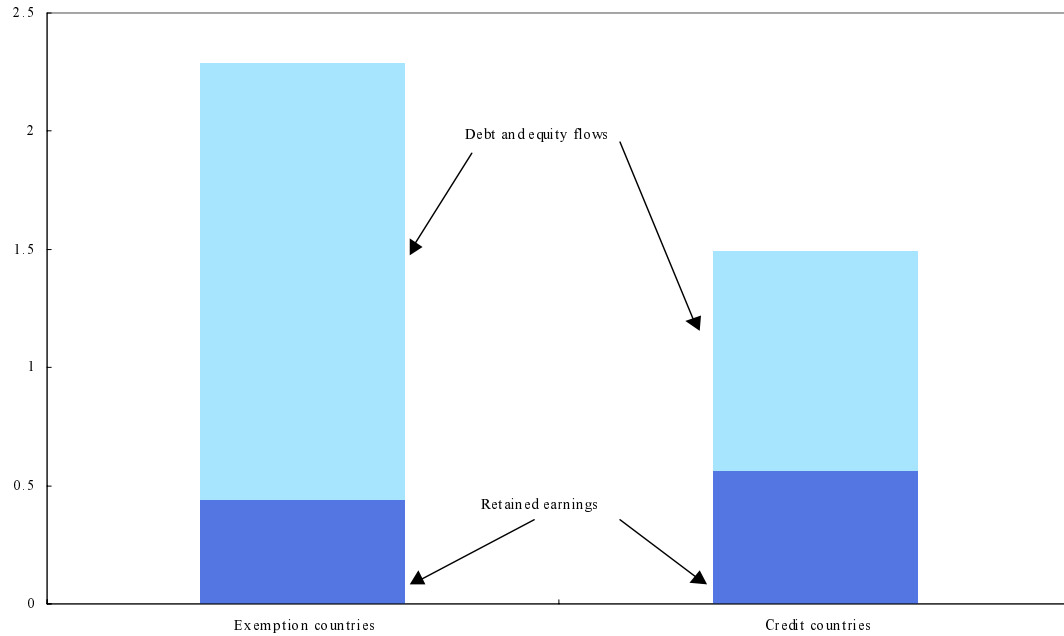
(In percent of GDP)

Source: Staff estimates.

Chart 7

Corporate Tax Revenues for Selected OECD Countries, 1988–97

(In percent of GDP)
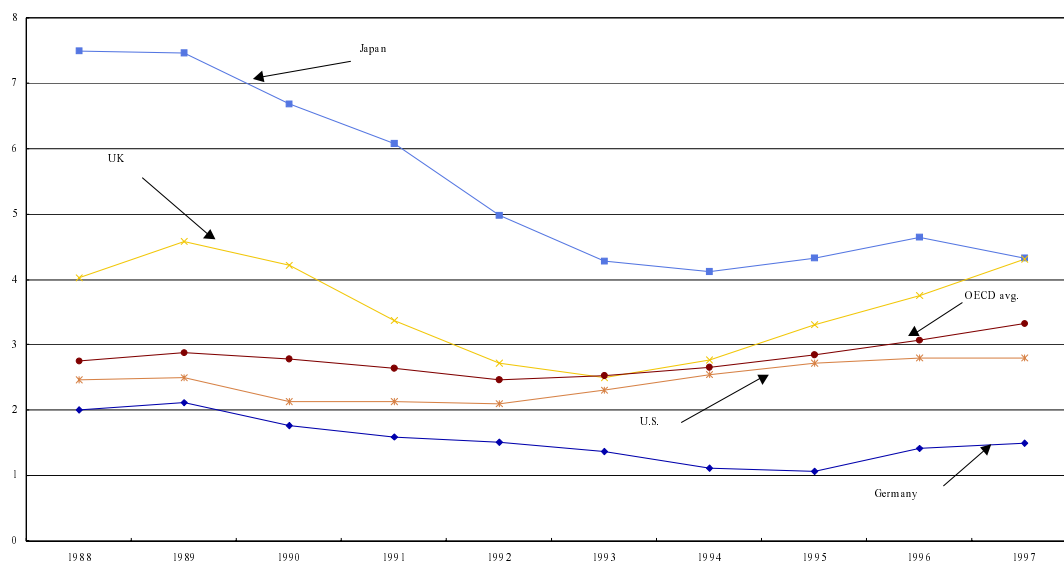
Source: Staff estimates.

3 Econometric Analysis and Results

A Taxes and FDI

To test propositions 1–6, we estimate standard FDI equations, following, for example, Slemrod (1990b) and Devereux and Freeman (1995b). We assume that both FDI inflows and outflows are a function of taxes and other macroeconomic variables:

$$FDI_{it} = \alpha_0 + \alpha_1 TAX_{it} + \mathrm{B}X_{it} + u_{it} + v_1 \tag{1}$$

where FDI_{it} represents FDI inflows (outflows) to (from) country i in period t, TAX_{it} the statutory corporate tax rate in the host (home) country, and X_{it} a vector of macroeconomic control variables. The term u_{it} allows for random or fixed effects that may be across countries, i, and/or periods, t, and v_1 is the error term.

We include a number of variables, which are intended to reflect growth prospects or other structural differences between countries. For the inflow (outflow) equations, these variables proxy for expected conditions in the receiving (originating) country. The IMF's WEO growth forcast is used as and indicator of the country's growth prospects. Higher expected growth should attract more FDI inflows. However, the same variable will have a negative effect on FDI outflows, as high growth would suggest more profitable investment opportunities at home, reducing the attractiveness of investing abroad. Further, we include an indicator of expected real exchange rate depreciation relative to the U.S. dollar (see Appendix 1 for the definition). Ex ante, the sign of the coefficient on this variable is ambiguous. Focusing on the *value* of your investment, we would argue that investors would want to invest in countries where the currency is expected to appreciate in real terms relative to investor's country of residence.[16] This would suggest that inflows should be lower in countries with an expected depreciation and, hence, suggest a negative (positive) coefficient in the inflows (outflows) equation. However, if firms view FDI as a substitute for domestic production, i.e. if they intend to export from the destination country back to the home country, we may see the opposite effect. A country with a high expected depreciation should experience a lot of inflows, i.e. a positive coefficient, because the depreciation allows to produce the goods relatively more cheaply in the destination country and sell them at a more competitive price in the home country.

We also include the *share of trade in GDP* ("openness indicator"). The expected sign of the coefficient on this variable is ambiguous for similar reasons as the expected real depreciation before. One could argue that imports and exports are substitutes for FDI inflows and outflows, respectively, or that high FDI inflows (outflows) will result in higher exports (imports). Alternatively, the variable might simply proxy for the openness of the economy; smaller countries might have closer links to their neighbors, suggesting a positive relationship between this variable and FDI flows. Finally, as the model does not seek to explain the overall increase in total FDI during the sample period, but rather the relative magnitude of gross and net FDI flows, we included *total FDI flows* as an independent variable. Following Devereux and Freeman (1995b) we instrumented for the openness indicator and total FDI flows using lagged dependent variable regressions.

We analyze the dynamics of the model by testing for lagged variable effects and autocorrelated residuals. A priori, the model might include lagged variables because of adjustment costs in investment from one year to the next. However, tests found lagged variables of higher order than one to be insignificant in the model (confirming Devereux and Freeman's (1995b) findings). The autorrelation coefficients are generally insignificant with the exception of the FDI component regressions.

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16 *The potential problem with this interpretation is that the reference currency is the U.S. dollar only, rather than a trade weighted basked of currencies.*

Table I

Effect of Taxes on FDI Inflows and Outflows

	FDI Inflows Fixed Effects	FDI Outflows Fixed Effects	FDI Inflows Random Effects	FDI Outflows Fixed Effects
Statutory Corporate Tax Rate			-0.030*** (0.009)	0.023*** (0.011)
Growth Forecast	0.16** (0.064)	-0.10 (0.077)	0.12** (0.063)	-0.069 (0.077)
Inflation (lagged)	-0.003 (0.004)	-0.010** (0.005)	0.0006 (0.004)	-0.012** (0.005)
Expected Real Depreciation	-0.011** (0.005)	-0.013** (0.007)	-0.011** (0.005)	-0.013** (0.006)
Openness Indicator (instrument)	0.010** (0.003)	0.007* (0.004)	0.003 (0.004)	0.012** (0.005)
Total FDI flows (instrument)	0.307*** (0.041)	0.516*** (0.051)	0.309*** (0.040)	0.515*** (0.051)
Constant	-0.004* (0.002)	0.002 (0.003)	0.011** (0.005)	-0.009* (0.006)
Number of observations	171	171	171	171
R^2	0.42	0.52	0.46	0.54
Wald test 1)	120.7***	188.0***	142.9***	197.7***
Hausman test 2)	1.58	5.81	1.39	9.19
Lagrange multiplier test 3)	0.43	1.98	0.48	2.34

Note: Estimated using year specific fixed effects. Estimation method: Feasible Least Squares. Robust standard errors in parenthesis. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

1) *The Wald test is asymptotically distributed as $c^2 (k)$, where k is the number of independent variables.*
2) *Significance indicates that a fixed effects model may be preferable.*
3) *Significance indicates that a random effects model may be preferable.*

In support of *propositions 1 and 2*, Table 1 shows that the statutory tax rate is estimated to be significantly negatively (positively) related to FDI inflows (outflows). As a benchmark, results without taxes are reported in the first two columns. Comparing to columns three and four in the same table (with the regressions including the tax variables), we note that the coefficients for the non-tax variables remain broadly stable in sign, magnitude and significance, which suggests that the equations do not suffer from endogeneity with respect to the tax rate. Turning to the tax coefficients in columns three and four, we see that both outward and inward FDI are sensitive to taxes: FDI inflows (outflows) are larger (smaller) in low tax countries. The tax effects are estimated to be of significant magnitude: On average a 10 percentage points increase in the statutory tax rate would reduce FDI inflows by 0.3 percentage point of GDP and increase outflows by 0.2 percentage point of GDP. While we find that the effect of taxes on FDI outflows is slightly smaller than the effect on inflows, we cannot corroborate earlier results (Devereux and Freeman (1995b) and Modén (1995)) which had suggested that taxes may matter for FDI inflows only and not for outflows. The magnitude and economic significance of the effect of taxes on the net FDI position of a country will be further elaborated upon in the context of the simulations for the EU.

Turning to the coefficients for the control variables, we find that expected *growth* is significantly positively related to inflows, and it has the expected negative effect on outflows, although the

relationship is not statistically significant. *Inflation* is significantly negatively related to outflows only. This supports the idea that outflows are linked to the degree of capacity utilization. If domestic capacities are fully utilized, the expected domestic return of investment may be relatively higher compared to the expected return of investing abroad. The coefficient on expected *real depreciation* is significantly negatively related to FDI in- and outflows. This would suggest that in the case of outflows, the argument that investors prefer a relatively more depreciated exchange rate in the destination country. In the case of inflows investors appear to prefer to invest in countries where exchange rates are expected to appreciate, increasing the value of the investment. This apparent inconsistency can possibly be explained by the fact that the real depreciation is defined relative to the U.S. dollar only, rather than a trade weighted basked of currencies. The U.S. is both a very large exporter and importer of capital. Hence, the coefficients may reveal that U.S. investors investing abroad do so with an eye to the non-U.S. market, whereas non-U.S. investors investing in the U.S. do so with an eye on their own market. While this may be plausible, the tests presented here are too crude to properly disentangle the effects.

The estimated coefficient for the *openness indicator* suggests that countries that are more open also have larger FDI flows, implying that trade and FDI are complements, rather than substitutes. Finally, as expected, *total FDI flows* pick up the overall increasing trend in FDI during the sample period and, hence, we estimate a highly significant positive coefficient both for outflows and inflows.

We also find support for *propositions 3 and 4,* relating to the type of foreign source taxation (exemption versus credit method), which is reported in Table 2. As discussed above, these results are meaningful for outflows only, as only in that case we can distinguish between the two types of foreign source taxation. Column 1 of Table 2 shows that when we introduce a dummy variable for exemption countries, the coefficient on the tax variable is reduced, although it remains significant. The dummy itself is significant and positive, suggesting that exemption countries have more outflows than credit countries (proposition 3). To measure the elasticity of FDI outflows with respect to taxes separately for countries with a credit approach and those countries that exempt foreign source income, we interact the dummies for the country groups with the statutory tax rate (reported in column 2 of Table 2). The coefficient for exemption countries is roughly twice the size than the one for credit countries, which also remains statistically insignificant. FDI outflows are more elastic with respect to domestic taxes in exemption countries than in credit countries (hypothesis 4). We can reject that the two coefficients are equal at the 1 percent level.[17]

Finally, we have some evidence in favor of *propositions 5 and 6*. FDI outflow components exhibit different patterns for exemption and credit countries.[18] The estimated coefficients in columns 3 and 5 of Table 2 suggest that firms in exemption countries invest significantly more abroad, but reinvest significantly less of their earnings that are generated abroad. Further, the question of the degree to which firms re-invest their earnings abroad is independent of the tax rate, but depends only on whether the country uses the credit or exemption principle for the taxation of foreign source income (column 4). Conversely, for debt and equity investments, the tax elasticity of FDI outflows is significantly larger for exemption countries than for credit countries (last column of Table 2; the hypothesis that the two coefficients are equal can be rejected at any conventional significance level). The results suggest that firms in credit countries have incentives to undercapitalize subsidiaries located in low-tax countries in order to provide opportunities to reinvest subsequent profits, thereby deferring home-country taxes that would be triggered by repatriation. For credit countries, this corroborates Hines' (1994) finding that lower tax rates are associated with greater use of debt finance.[19]

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17   As one would expect and further enhancing the confidence in our results, in the case of inflows, we cannot reject that the two slopes are equal.

18   For the FDI components we replaced the instrument for total FDI with instruments for total flows in the respective FDI category.

19   Hines (1994) shows that this incentives exists even when transfer price regulation effectively limits the profit rates foreign subsidiaries can earn.

Hence, overall, we find strong evidence in favor of the notion that taxes play an important role for the magnitude of FDI in and outflows. Taxes appear to be an important consideration for firms' decisions whether or not to invest abroad, as well as where to invest abroad. This is a somewhat stronger result than the evidence presented earlier (e.g., Devereux and Freeman (1995b)), in which taxes only appeared to matter for the decision of where to invest abroad, but not for the decision of whether to invest abroad.

Table 2

Effect of Taxes on FDI Outflows and Outflow Components

	FDI Outflows Fixed Effects	FDI Outflows Fixed Effects	Ret. Earnings Fixed Effects	Ret. Earnings Fixed Effects	Equity & Debt Fixed Effects	Equity & Debt Fixed Effects
Statutory corporate tax rate	0.017* (0.011)		-0.007 (0.007)		0.009 (0.014)	
Dummy variable for exemption country	0.005*** (0.002)		-0.003*** (0.001)		0.007*** (0.002)	
Exemption dummy * statutory corporate tax rate		0.025** (0.011)		-0.009 (0.007)		0.019 (0.015)
Credit dummy * statutory corporate tax rate		0.014 (0.011)		-0.001 (0.008)		0.0006 (0.015)
Growth Forecast	-0.035 (0.076)	-0.041 (0.076)	-0.005 (0.033)	-0.006 (0.033)	-0.049 (0.072)	-0.047 (0.072)
Inflation (lagged)	-0.009* (0.005)	-0.009* (0.005)	-0.040* (0.021)	-0.041** (0.021)	-0.125*** (0.039)	-0.122*** (0.038)
Expected real depreciation	-0.015** (0.006)	0.015** (0.006)	0.005* (0.003)	-0.005* (0.003)	-0.019*** (0.007)	0.018*** (0.007)
Openness indicator (instrument)	0.009** (0.005)	0.009** (0.005)	0.005 (0.004)	0.004 (0.004)	0.037*** (0.006)	0.039*** (0.006)
Total FDI flows (instrument)	0.486*** (0.050)	0.498*** (0.050)	0.523*** (0.072)	0.528*** (0.071)	0.223* (0.117)	0.218* (0.116)
Constant	-0.009* (0.006)	-0.007 (0.006)	0.006 (0.003)	0.004 (0.003)	-0.007 (0.007)	-0.005 (0.007)
Number of observations	171	171	108	108	108	108
R^2	0.56	0.55	0.70	0.70	0.60	0.60
Wald test [1]	214.8***	208.7***	129.6***	121.0***	162.4***	153.5***
Hausman Test [2]	192.3***	1.54	102.8***	95.6***	71.8***	55.1***
Lagrange Multiplier Test [3]	2.51	5.25	1.63	1.90	3.41*	3.54*

*Note: All specifications are two-factor fixed effects models (time and country specific effects) estimated using Feasible Generalized Least Squares. The FDI components were estimated with country specific autocorrelation. Robust standard errors are in parenthesis. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.*

1) *The Wald test is asymptotically distributed as $c^2(k)$, where k is the number of independent variables.*
2) *Significance indicates that a fixed effects model may be preferable.*
3) *Significance indicates that a random effects model may be preferable.*

B FDI and Corporate Tax Revenue

To establish a link between FDI flows and corporate tax revenues, we follow the literature[20] and model corporate tax revenues as a log-linear function of its tax base, the profit rate. The latter is defined as the average of the ratio of profits and total firm assets in any country i (derived from microdata) and modeled as a function of lagged growth, lagged real depreciation and predicted values of FDI obtained from equation (1). FDI inflows (outflows) may be significant in such an equation, because they reflect an increase (decrease) in the capital stock of the home country or because they proxy for tax avoidance opportunities abroad. Hence, we estimate an instrumental variable model of the form

$$PR_{it} = \delta_0 + \delta_1 F\hat{D}I_{it}^{IN} + \delta_3 F\hat{D}I_{it}^{OUT} + \delta_4 GR_{i,t-1} + \delta_5 REX_{i,t-1} + u_{it} + v_2 \qquad (2)$$

and

$$Corprev_{it} = \sum \phi_{it} + \sum \mu_i \hat{P}R_{it-1} + v_3. \qquad (3)$$

"Corprev" is the corporate tax-to-GDP ratio for country i at time t, PR the profit rate, $\hat{P}R$ the predicted value for the profit rate estimated in equation (2), GR the growth rate, REX the real exchange indicator, and v_i are the error terms. $F\hat{D}I$ inflows and outflows are the predicted values from equation (1) above. Both equations were estimated using a time trend.

The results for the first stage of the instrumental variable model (equation (2)) are presented in Table 3; as a reference point, an estimation without FDI flows is given in column 1. Even controlling for growth and the real exchange rate indicator, FDI inflows and outflows are important determinants of the profit rate and thus corporate tax revenues. Both the Wald test and the R^2 show a significant improvement in the explanatory power of the model after the inclusion of the FDI variables. While FDI inflows have a strong positive effect on the profit tax base, FDI outflows significantly depress the profit tax base. The estimates suggest that the elasticity of the profit rate with respect to changes in FDI inflows and outflows (evaluated at the sample mean) are 0.5 and -0.2, respectively.

Regarding the control variables, we note that both lagged growth and an depreciation relative to the U.S. dollar in the previous period have a highly significantly positive impact on the profit rate. Both coefficients conform to expectations. Higher growth is associated with higher profitability and a more depreciated exchange rate enhances the competitiveness of exports, also resulting in better profitability of firms.

In order to maximize the accuracy of the simulation approach for corporate income tax revenues, we employed a flexible functional form for the revenue equation, which allows for variable intercepts and slopes for individual countries and over time. Modeling corporate tax revenues as a function of its base is supported by the notion that, given a constant statutory tax rate, tax revenues should be a function of changes in the tax base. Changes in tax rates and the definition of the base in countries will be reflected in the coefficients for the variable intercepts and slopes. It turns out that a model with time-invariant country specific slopes and two dummies, one for the 1990–93 banking crisis in Finland and one for Portugal fits the data best. Using predicted values from equation (2) in the revenue equation (3), we are able to explain about 99 percent in the variation of corporate income tax revenues.[21]

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20 See, for example, Auerbach and Poterba (1988) and Douglas (1990).
21 The predicted values of equation (3) are reported in the second column of Table 6 which is explained below.

Table 3

Effect of FDI on the Profit Tax Base

	Model without FDI flows		Model with FDI flows	
FDI inflows (instrumented)			3.55***	(0.72)
FDI outflows (instrumented)			-0.89*	(0.48)
Growth$_{t-1}$	0.935***	(0.119)	0.668***	(0.123)
Real exchange rate indicator	0.042**	(0.021)	0.040**	(0.020)
Time trend	0.003***	(0.0008)	0.003***	(0.0009)
Number of observations	171		171	
R^2	0.13		0.17	
Wald test[1]	76.4***		112.3***	
Hausman test[2]	5.56		7.24	
Lagrange multiplier test[3]	323.9***		319.2***	

Note: The dependent variable is the profit rate as defined in the text. Random effects for countries. Robust standard errors in parenthesis. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels.
1) The Wald test is asymptotically distributed as $c^2(k)$, where k is the number of independent variables.
2) Significance indicates that a fixed effects model may be preferable.
3) Significance indicates that a random effects model may be preferable.

4   Simulations for the European Union

The question of tax harmonization versus tax competition is of particular relevance in the EU. Within the EU, trade is liberalized and standards are being harmonized. Consequently, competition for the location of investment within the EU is intensive, at least in part in response to the increasing certainty of introducing a common currency. This competition has triggered a political debate whether corporate tax regimes should be allowed to compete for FDI or whether corporate taxes should be harmonized.[22]

| Table 4 | | | |

European Union: Statutory Corporate Income Tax Rates from 1990–1997
(In percent)

Period	Mean	Minimum	Maximum
1990	37	10	50
1991	36	10	50
1992	36	10	52
1993	34	10	52
1994	34	10	52
1995	34	10	52
1996	34	10	53
1997	34	10	53

To assess the impact of tax rate harmonization in the EU on corporate income tax revenues, the simulation exercise presented here shows the relative revenue gains and losses, if corporate tax rates had been harmonized at the period specific, EU-wide mean corporate tax rate. Thus, the simulation will assume that in each year since 1990, the European countries harmonized corporate tax rates at the year specific mean. The simulation then proceeds to predict the implied corporate tax revenues for each EU country in the sample to present a broad picture of the relative magnitudes of such gains or losses for individual countries. Table 4 provides the average, minimum and maximum statutory corporate tax rates in the EU. It shows that the same trends, which we outlined earlier for the entire sample, are present for our sample of EU countries, namely that statutory tax rates tend to converge and decline during the sample period.[23]

We use the above simple model for corporate tax revenue to simulate the revenue effects. First, we obtain predicted FDI flows (equation (1)) to generate out-of-sample predictions assuming that the seven EU countries all introduced the prevailing mean statutory corporate tax rate in the EU of 37 percent in 1990, 36 percent in 1991 and so forth (Table 4). Then, the values for FDI flows are used to simulate profit rates (equation (2)), which in turn are used to obtain corporate tax revenues (equation (3)). It is important to stress that this approach isolates the FDI effect on revenue. The tax rate changes by themselves of course would also have a direct effect on corporate tax revenues. In order to focus on the impact of tax rates on corporate tax revenue through their effect on FDI, we have abstracted from this direct effect.

22 *Note that tax competition does not necessarily result in zero or very low tax rates. A Tibout model of competing jurisdictions might be applicable, in which firms and households chose a community that offers them the preferred bundle of public services and taxes. The issue of tax harmonization in the EU is also discussed in Devereux and Pearson (1995a), who argue that, while corporate tax systems in the EU were not consistent with production efficiency, harmonizing corporate tax bases or rates in the EU would not necessarily improve matters. Instead the authors suggest moving to a territorial system by abolishing withholding taxes on dividends and interest payments from the subsidiary to the parent and exempting foreign source dividends from corporate tax in the residence country.*

23 *Recall that there are only 12 of the 15 EU countries in the sample, as we were unable to obtain FDI data for Belgium, Greece, and Luxembourg.*

Consider first the simulated changes in net FDI flows after harmonization, which are given in Table 5. The table shows that for most countries a tax harmonization would only mildly affect their net FDI position, as it would imply only very small changes in tax rates. However, the net FDI position of three countries, Germany, Ireland, and Italy, would be very significantly affected, as tax harmonization would result in substantial tax rate reductions in Germany and Italy, and substantial tax rate increases in Ireland. The simulations suggest that Italy's and Germany's net FDI position would improve by about 0.9 and 0.7 percentage point of GDP per annum, respectively. Both countries move from a significant FDI deficit to near-balance. Ireland, in contrast, would experience a deterioration of its net FDI flows by more than 1.3 percentage point of GDP per annum.

Table 5

European Union: Simulations Results for FDI Flows
(In percent of GDP)

1990-97 Averages	Net Actual	Net Simulated Before Harmonization	Net Simulated after Harmonization	Difference	Memorandum Items: Actual Rate	Harmonized Rate
Austria	0.09	-0.03	-0.17	-0.14	32	35
Denmark	-0.17	-0.49	-0.44	0.05	36	35
Finland	-1.12	-0.15	-0.25	-0.10	33	35
France	-0.60	-0.29	-0.32	-0.03	34	35
Germany	-1.12	-0.81	-0.13	0.68	47	35
Ireland	1.79	0.69	-0.65	-1.33	10	35
Italy	-0.31	-0.74	0.13	0.87	51	35
The Netherlands	-2.35	-1.60	-1.59	0.01	35	35
Portugal	1.26	-0.44	-0.19	0.25	40	35
Spain	0.96	-0.08	-0.07	0.01	35	35
Sweden	-0.52	-0.75	-1.00	-0.25	30	35
United Kingdom	-0.47	-0.56	-0.65	-0.09	33	35

Now turn to the resulting revenue simulations. Corresponding to the findings for the FDI flows, we find that high-tax countries would benefit from a harmonization, while low-tax countries would lose revenue.[24] The magnitude of the gains and losses depends upon the magnitude of the implied tax change as well as on the revenue elasticity of the corporate income tax with respect to its base. These figures are reported in Table 6, along with the actual revenue to GDP ratios, predicted values using actual data, and simulated revenue to GDP ratios. A number of conclusions emerge regarding the magnitude of the implied tax change. As before, the changes would be small for most countries, with the exception of Germany, Ireland and Italy. Germany reducing its corporate income tax rate from an average of 47 percent during the sample period to 35 percent would gain approximately 0.5 percentage point of GDP per annum in revenue. Similarly, Italy with an even larger reduction in the corporate income tax rate from 51 percent would gain more than 1 percentage point of GDP per annum. Italy's gain is almost twice that of Germany is due to the more substantial change in the tax rate (a reduction of 16 percentage points versus Germany's reduction of 12 percentage points), and also due to the high level of corporate income tax revenues in Italy of 4 to 5 percent of GDP versus Germany's less than 2 percent of GDP. The simulations also suggest that Ireland's revenues would deteriorate by about 0.8 percentage points of GDP per annum.

The estimated effect of a change in FDI on corporate income tax revenues is very large. For example, consider Austria, which—based on our simulations on tax harmonization—has a decrease in net FDI flows of 0.3 percentage points of GDP in 1990 associated with revenue losses

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24 *Note that this makes no presumption about overall welfare gains, which might very well occur in both types of countries (see Keen (1996)).*

of about one-third in the same year. Given the tax rates and the revenue elasticity of corporate income tax revenues, this would imply a return to FDI of around 100 percent. Hence, the magnitude of the effect suggests that changes in FDI flows are highly correlated with unobservable changes in transfer pricing. In response to changes in tax rates, firms not only adjust their new FDI investment in a country, but also shift profits generated on existing FDI to minimize worldwide taxes.

It is important to stress that this is a "partial equilibrium" outcome. The revenue effect given in Table 6 does not reflect the change in overall revenue to the change in the rate, but only the change in revenue due to changes in FDI flows (resulting from the change in the rate). For example, Ireland would recuperate some or all of the revenue loss from a lower tax base due to a more negative FDI balance through an increase in revenues applying a much higher tax rate to the profits of domestic firms. Similarly lower revenues from the reduction in the rate would depress the FDI induced revenue gains of Germany and Italy.

Table 6

European Union: Simulation Results for the Corporate Income Tax Ratio

	Actual	Simulated before harmonization	Simulated after harmonization	Difference	Error	Memorandum items: Actual Rate	Harmonized Rate
Austria		(Revenue elasticity with respect to its base: 1.59)					
1990	1.46	2.17	1.87	-0.30	0.71	30	37
1991	1.49	2.07	1.82	-0.25	0.58	30	36
1992	1.74	1.82	1.60	-0.22	0.08	30	36
1993	1.53	1.47	1.33	-0.14	-0.06	30	34
1994	1.32	1.14	1.14	0.00	-0.18	34	34
1995	1.55	1.55	1.55	0.00	0.00	34	34
1996	2.07	1.22	1.22	0.00	-0.85	34	34
1997	1.58	1.37	1.37	0.00	-0.21	34	34
1990-97 Average	1.59	1.60	1.49	-0.11	0.01	32	35
Total gain/loss from harmonization					-0.91		
Denmark		(Revenue elasticity with respect to its base: 1.41)					
1990	1.50	1.72	1.87	0.15	0.22	40	37
1991	1.56	1.75	1.85	0.10	0.19	38	36
1992	1.55	2.17	2.27	0.10	0.62	38	36
1993	2.11	2.17	2.17	0.00	0.06	34	34
1994	2.03	2.31	2.31	0.00	0.28	34	34
1995	2.03	3.52	3.52	0.00	1.49	34	34
1996	2.30	2.59	2.58	-0.01	0.29	34	34
1997	1.93	2.54	2.54	0.00	0.61	34	34
1990-97 Average	1.88	2.35	2.39	0.04	0.47	36	35
Total gain/loss from harmonization					0.34		
Finland		(Revenue elasticity with respect to its base: 1.53)					
1990	2.08	3.50	4.29	0.79	1.42	46.5	37
1991	2.07	1.23	1.72	0.49	-0.84	44.5	36
1992	1.74	1.74	2.08	0.34	0	41	36
1993	1.24	0.93	0.66	-0.27	-0.31	25	34
1994	1.85	1.91	1.57	-0.34	0.06	25	34
1995	2.47	3.49	3.09	-0.40	1.02	25	34
1996	3.22	2.43	2.20	-0.23	-0.79	28	34
1997	1.97	2.69	2.47	-0.22	0.72	28	34
1990-97 Average	2.08	2.24	2.26	0.02	0.16	33	35
Total gain/loss from harmonization					0.16		
France		(Revenue elasticity with respect to its base: 1.52)					
1990	2.33	2.62	2.62	0.00	0.29	37	37
1991	1.96	2.26	2.17	-0.09	0.3	34	36
1992	1.52	1.74	1.66	-0.08	0.22	34	36
1993	1.50	1.96	1.93	-0.03	0.46	33	34

1994	1.61	1.33	1.31	-0.02	-0.28	33	34
1995	1.63	2.14	2.11	-0.03	0.51	33	34
1996	1.73	1.70	1.67	-0.03	-0.03	33	34
1997	2.52	1.76	1.84	0.08	-0.76	37	34
1990-97 Average	1.85	1.94	1.91	-0.03	0.09	34	35
Total gain/loss from harmonization					-0.20		

Germany (Revenue elasticity with respect to its base: 1.43)

1990	1.77	1.59	2.23	0.64	-0.18	50	37
1991	1.64	2.41	3.15	0.74	0.77	50	36
1992	1.55	2.06	2.74	0.68	0.51	50	36
1993	1.40	1.36	2.03	0.67	-0.04	50	34
1994	1.13	0.88	1.27	0.39	-0.25	45	34
1995	1.09	1.67	2.11	0.44	0.58	45	34
1996	1.45	1.42	1.82	0.40	-0.03	45	34
1997	1.57	1.46	1.84	0.38	-0.11	43	34
1990-97 Average	1.45	1.61	2.15	0.54	0.16	47	35
Total gain/loss from harmonization					4.34		

Ireland (Revenue elasticity with respect to its base: 1.80)

1990	1.74	2.24	1.30	-0.94	0.50	10	37
1991	2.10	2.80	1.81	-0.99	0.70	10	36
1992	2.45	1.79	1.03	-0.76	-0.66	10	36
1993	2.93	2.11	1.36	-0.75	-0.82	10	34
1994	3.24	2.01	1.30	-0.71	-1.23	10	34
1995	2.92	2.74	1.94	-0.80	-0.18	10	34
1996	3.33	3.42	2.55	-0.87	0.09	10	34
1997	2.38	3.01	2.21	-0.80	0.63	10	34
1990-97 Average	2.64	2.52	1.69	-0.83	-0.12	10	35
Total gain/loss from harmonization					-6.62		

Italy (Revenue elasticity with respect to its base: 1.02)

1990	3.93	5.42	6.37	0.95	1.49	46	37
1991	3.81	4.46	5.64	1.18	0.65	48	36
1992	4.40	3.24	4.75	1.51	-1.16	52	36
1993	4.05	2.98	4.57	1.59	-1.07	52	34
1994	3.71	3.21	4.72	1.51	-0.50	52	34
1995	3.60	4.16	5.67	1.51	0.56	53	34
1996	3.98	4.16	5.58	1.42	0.18	53	34
1997	3.86	3.03	4.36	1.33	-0.83	53	34
1990-97 Average	3.92	3.83	5.21	1.38	-0.09	51	35
Total gain/loss from harmonization					11.00		

The Netherlands (Revenue elasticity with respect to its base: 1.42)

1990	3.36	5.62	5.48	-0.14	2.26	35	37
1991	3.42	4.77	4.71	-0.06	1.35	35	36
1992	3.07	3.26	3.21	-0.05	0.19	35	36
1993	3.30	3.07	3.13	0.06	-0.23	35	34
1994	3.30	2.77	2.81	0.04	-0.53	35	34
1995	3.26	3.47	3.52	0.05	0.21	35	34
1996	4.11	3.01	3.05	0.04	-1.10	35	34
1997	5.14	3.45	3.50	0.05	-1.69	35	34
1990-97 Average	3.62	3.68	3.68	0.00	0.06	35	35
Total gain/loss from harmonization					-0.01		

Portugal (Revenue elasticity with respect to its base: —)

1990	2.40	2.46	—	—	0.06	39	37
1991	2.80	2.38	—	—	-0.42	40	36
1992	2.72	2.83	—	—	0.11	40	36
1993	2.29	2.62	—	—	0.33	40	34
1994	2.30	3.17	—	—	0.87	40	34
1995	2.66	2.09	—	—	-0.57	40	34
1996	3.14	2.16	—	—	-0.98	40	34
1997	2.40	1.76	—	—	-0.64	40	34
1990-97 Average	2.59	2.43	—	—	-0.16	40	35
Total gain/loss from harmonization					—		

Spain (Revenue elasticity with respect to its base: 1.46)

1990	3.03	3.28	3.17	-0.11	0.25	35	37
1991	2.66	2.79	2.73	-0.06	0.13	35	36
1992	2.29	2.19	2.14	-0.05	-0.10	35	36
1993	1.99	1.73	1.77	0.04	-0.26	35	34
1994	1.70	1.58	1.62	0.04	-0.12	35	34
1995	1.86	2.26	2.31	0.05	0.40	35	34
1996	1.99	1.98	2.02	0.04	-0.01	35	34
1997	2.29	2.05	2.09	0.04	-0.24	35	34
1990-97 Average	2.23	2.23	2.23	0.00	0.01	35	35
Total gain/loss from harmonization					-0.01		

Sweden			(Revenue elasticity with respect to its base: 1.48)				
1990	1.74	2.69	2.85	0.16	0.95	40	37
1991	1.87	2.60	2.31	-0.29	0.73	30	36
1992	1.46	1.60	1.36	-0.24	0.14	30	36
1993	2.22	2.22	1.90	-0.32	0.00	30	4
1994	2.74	1.74	1.51	-0.23	-1.00	28	34
1995	3.04	3.35	3.08	-0.27	0.31	28	34
1996	2.92	4.00	3.72	-0.28	1.08	28	34
1997	3.32	2.12	1.91	-0.21	-1.20	28	34
1990-97 Average	2.41	2.54	2.33	-0.21	0.13	30	35
Total gain/loss from harmonization					-1.68		
United Kingdom			(Revenue elasticity with respect to its base: 1.33)				
1990	3.89	4.67	4.46	-0.21	0.78	34	37
1991	3.26	2.84	2.67	-0.17	-0.42	33	36
1992	2.58	1.89	1.74	-0.15	-0.69	33	36
1993	2.42	2.47	2.42	-0.05	0.05	33	34
1994	2.70	3.88	3.82	-0.06	1.18	33	34
1995	3.27	3.94	3.89	-0.05	0.67	33	34
1996	3.70	3.82	3.77	-0.05	0.12	33	34
1997	3.35	3.56	3.51	-0.05	0.21	33	34
1990-97 Average	3.15	3.38	3.29	-0.10	0.24	33	35
Total gain/loss from harmonization					-0.79		

5   Robustness

How robust are these results with respect to changes in the variable specification, sample specification, and model specification? This section will explore these questions in detail.

The regressions appear to be robust to the choice of proxy variables for the tax regime. Instead of statutory tax rates, we used effective tax rates calculated on the basis of microdata[25] as well as variables measuring the relative tax position of the country (such as the difference between the statutory tax rate of the country and the mean of the tax rates in all other countries in period t or a dummy variable which is equal to one, if the country has a tax rate below the year specific mean of all country tax rates and zero otherwise). The findings derived from these variables confirmed our results.

We also suspected that the results may be significantly affected by the presence of Ireland in the sample. Ireland introduced a preferential corporate tax rate of 10 percent on manufacturing in 1981, which was used in the econometric analysis.[26] All non-manufacturing sectors were subject to the higher rate of around 39 percent (with a range of 36 percent to 43 percent during the sample period). Hence, with regard to the tax rate, Ireland can be considered an outlier in the sample as the next lowest tax rate is 25 percent (Finland from 1993-95) and Ireland's rate is more than two standard deviations lower than the mean rate of 37 percent (see Appendix II). In Table 7 we show that dropping Ireland from the sample (or alternatively using the higher non-manufacturing rate) has no effect on the revenue impact of changes in FDI flows.[27]

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25 Note that including the effective tax rate in the FDI regressions can bias the results as this variable is not exogenous with respect to FDI.

26 The preferential rate (which is also extended to certain services) applies until 2002; under the July 1998 agreement with the European Commission it will be unified at 12.5 percent in 2003. While a breakdown of FDI in different sectors is not available, anecdotal evidence suggests that most FDI inflows during the period 1988–97 availed of the preferential rate. Moreover, a total relief from corporate tax for profits on exports of goods manufactured in Ireland (applied to companies established before 1981) was terminated in April 1990.

27 Only data for Germany, Ireland and Italy are reported, as most other countries would not experience large effects on their net FDI position or on revenues.

Table 7

Robustness: Simulation Results for Germany, Ireland and Italy for Different Samples and Specifications, 1990–97 Average

(In percent of GDP)

	Sample with Ireland Log-linear	Percentage Change	Sample without Ireland Log-linear	Percentage Change	Sample with Ireland Linear	Percentage Change
Germany						
Δ Net FDI flows	+0.68		+0.50		+0.68	
Δ Corp. income tax revenue	+0.54	+36.6%	+0.55	+36.6%	+0.32	+22.1%
Ireland						
Δ Net FDI flows	-1.33		n.a.		-1.33	
Δ Corp. income tax revenue	-0.83	-31.4%	n.a.		-0.49	-18.6%
Italy						
Δ Net FDI flows	+0.87		+0.65		+0.87	
Δ Corp. income tax revenue	+1.38	+35.2%	+1.38	+35.2%	+1.30	+33.2%

The results may also be sensitive to the specification for the corporate income tax revenue equation, in particular whether the equation is specified in linear or log-linear form. The results reported in Table 6 above were obtained using a log-linear specification, which, in the literature, is generally found to provide a better fit than a linear model. We also find this to be the case, as the R^2 for a linear model is 0.92 (as opposed to 0.99 found for the log-linear specification). The linear model also implies significantly lower revenue elasticities (around 1 rather than 1.5 for the log-linear model). Given the lower elasticities, the revenue effects of the change in FDI flows are significantly reduced for Germany and Ireland, but remain virtually unchanged in case of Italy. The reason for this difference is that for Germany and Ireland the long-linear specification yielded corporate income tax elasticities much greater than one(1.4 and 1.8, respectively), whereas this elasticity in Italy's case was estimated to be around 1 in either specification (Table 7).

6   Conclusion

We find evidence for an affirmative answer to the question posed in the title of the paper: FDI flows affect corporate tax revenues, and they may have contributed significantly to the erosion of the revenue base of some countries in the EU. To establish a link between FDI and corporate tax revenues, we show that both FDI in- and outflows are significantly affected by the tax systems in the host and home countries. In a next step, we relate the FDI flows to the tax base of the corporate tax (i.e., the profit rate) and find that it is positively (negatively) affected by FDI inflows (outflows). Finally, in order to see whether a harmonization of tax rates in the EU would have prevented the sharp reduction in corporate tax revenue experienced in some countries we undertake revenue simulations. While high (low) tax countries would gain (lose) (in terms of revenue to GDP ratio) from the harmonization of corporate tax rates, the magnitude of the gain (loss) depends critically on the significance of the rate change as well as the revenue elasticity in the given country. The simulations suggest that FDI flows have possibly contributed quite significantly to the erosion in Germany and may have reduced Italy's revenue to GDP ratio by as much as 1 percent of GDP. These findings are somewhat sensitive to model specification, but even a lower bound estimate would suggest that FDI flows might have had an important effect on corporate income tax revenues. These findings are further supported by descriptive evidence presented in Section III of the paper.

The simulations also find that changes in tax rates have important effects on the direction of FDI flows in OECD countries. Tax harmonization in the EU would entail that FDI deficit countries like Germany and Italy move to a balanced FDI position. Moreover, the low tax rate on manufacturing in Ireland appears to have greatly contributed to the country's success in attracting FDI.

The impact of FDI flows on corporate tax revenues especially in countries with high tax rates suggests that further research in this area might benefit from broadening the scope of country characteristics. Based on this approach countries compete for FDI on the basis of "bundles" of public services and taxes, rather than taxes alone. This would be combined with the inclusion of other taxes, in particular taxes on labor, which were ignored in this paper, and which might play a significant role in the locational decision of FDI. It is also important to stress that while we find that the revenue effects of FDI flows may be substantial, we make no attempt to estimate the overall revenue impact of the tax changes, which in all cases would have a mitigating effect. In addition, the employment effects of FDI might be significant and may provide further motivation for tax harmonization or coordination.

Appendix I: Definition of Variables

FDI flows: FDI flow in national currency divided by nominal GDP in period t and for country i.

Profit rate: $\dfrac{\sum_{j=1}^{M_i} PBT_{jit}}{\sum_{j=1}^{M_i} TA_{jit}}$, for each country i and period t, where M_i is the number of firms in

country i in the Bloomberg sample, PBT_{jit} is profits before taxes for firm j in country i in period t. TA represents total assets of firm j, in country i, in period t.

Effective tax rate: $\dfrac{\sum_{j=1}^{M_i} TP_{jit}}{\sum_{j=1}^{M_i} PBT_{jit}}$, where TP represents tax payments of the firm and all other

variables are defined as before.

Growth: (Real GDP$_{i,t}$-Real GDP$_{i,t-1}$)/Real GDP$_{i,t-1}$.

Growth forecast: May World Economic Outlook one period ahead forecasts.

Inflation: (CPI$_{i,t}$-CPI$_{i,t-1}$)/CPI$_{i,t-1}$, where CPI is the consumer price index in period t for country i.

Real exchange rate indicator: The indicator was calculated relative to the U.S. dollar with 1988

as the base year. Hence we have $\dfrac{EXR_{it}}{EXR_{i1988}} * \dfrac{CPI_{USt}}{CPI_{it}} \forall t, i$, where EXR is the exchange rate per

U.S. dollar in domestic currency in period t of country i. The variable was first differenced and lagged for the profitability equation. The first differenced one period ahead version was used for the FDI equations, as one period ahead values under rational expectations are a consistent estimator for one period ahead expectations (Kennan [1979]).

Openness indicator: (Exports$_{i,t}$ + Imports$_{i,t}$)/GDP, all in national currency.

Total FDI flows: (FDI inflows$_{i,t}$+FDI outflows$_{i,t}$)/GDP, all in national currency.

Corporate income tax revenues: Corporate income tax revenues in country i at time t in national currency divided by nominal GDP in national currency.

Appendix II

Summary Statistics

Variable	Number of observations[1]	Mean	Standard deviation	Minimum	Maximum
FDI inflows	171	0.013	0.011	-0.005	0.065
FDI outflows	171	0.016	0.015	-0.007	0.065
Statutory corporate income tax rate	171	0.367	0.093	0.10	0.56
Tax base	171	-0.044	0.062	-0.213	0.108
Growth	171	0.027	0.027	-0.071	0.111
Growth forecast	171	0.027	0.011	-0.008	0.057
Inflation	171	0.072	0.164	-0.0009	1.062
Depreciation relative to U.S. $	171	0.0012	0.181	-0.965	1.323
Expected depreciation relative to U.S. $	171	0.0016	0.128	-0.841	0.621
Total Trade/GDP	171	0.476	0.216	0.132	1.258
Total FDI flows	171	0.029	0.022	-0.006	0.1138
Effective corporate tax rate	171	0.332	0.062	0.182	0.483
Profit rate	171	0.094	0.070	-0.009	0.418
Corporate income tax ratio	171	0.027	0.011	0.011	0.075
Retained earnings inflows	108	0.0022	0.0044	-0.011	0.013
Capital (debt and equity) inflows	108	0.013	0.010	-0.0033	0.054
Retained earnings outflows	108	0.0047	0.0068	-0.013	0.023
Capital (debt and equity) outflows	108	0.017	0.014	0.0015	0.058

1) *Recall that for the components, data were only available for a subset of countries.*

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