

Profit shifting in the EU: evidence from Germany

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Published online: 7 March 2008
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Abstract The paper considers profit shifting behavior using data on German inbound and outbound FDI. It finds an empirical correlation between the home country tax rate of a parent and the net of tax profitability of its German affiliate that is consistent with profit shifting behavior. For profitable affiliates that are directly owned by a foreign investor the evidence suggests that a 10-percentage point increase in the parent's home country tax rate leads to roughly half a percentage point increase in the profitability of the German subsidiary. On the outbound side of German FDI, the data provides some evidence that tax rate changes in the host country lead to a stronger change in after-tax profitability for affiliates that are wholly owned, which may reflect the larger flexibility of these firms in carrying out tax minimizing behavior without interference of minority owners.

Keywords Foreign direct investment · Profit shifting · Tax avoidance · Multinational enterprise

JEL Classification H25 · F23

The hospitality and support by the Deutsche Bundesbank Research Center is gratefully acknowledged. I thank Oliver Busch, Michael P. Devereux, Ruud de Mooij, Chris Heady, Beatrix Stejskal-Passler, an anonymous referee, and participants of the IFS/ETPF conference 2006 for excellent comments and suggestions. All remaining errors are mine.

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1 Taxes and profit shifting

Tax competition between countries may be conceived of in different ways. A common conception is that countries or regions employ tax instruments to attract or keep firms. But even without firm relocation, a country may benefit from lowering taxes if this induces multinational firms to shift taxable profits to this country. Firms may achieve such income shifting by using prices for intracompany sales that depart from arms' length conditions, by agreeing on excessive management and overhead fees, setting non-market interest rates within a group, etc. There are also limits to profit shifting behavior. Governments, in particular, in high tax countries, may try to limit the allowable transfer pricing strategies and this may even lead to a double taxation.¹ In addition, firms themselves may find it difficult to set tax efficient prices if this leads to confusion in the accounts of profit centers and problems in the remuneration of managers (Caves 1982, pp. 246–247), or if minority shareholders resist.

Starting in the early 1990s, a growing literature has tried to empirically identify tax motivated profit shifting.² So far, the studies have almost exclusively concentrated on U.S. data. The debate has been stirred by Wheeler (1988) and Dworin (1990) with the simple observation that foreign-owned subsidiaries in the U.S. have a smaller profitability than genuine U.S. firms. Grubert et al. (1993) showed that at least 50% of the difference could be explained by the special characteristics of foreign-owned firms. For example, those firms on average are younger than domestic firms or may have special write-offs following a foreign takeover. The authors suggest that the remainder of the difference in profitability is due to profit shifting activities.³ Harris et al. (1993) analyze the profitability of US parent firms and find that parents with subsidiaries in low-tax countries have a significantly lower return than parents with high-tax affiliates, which is compatible with profit shifting activities. Grubert and Mutti (1991) use aggregated data from the Bureau of Economic Analysis and find that profits on sales of US subsidiaries are higher in low-tax countries than in high tax countries.⁴

One of the interesting empirical facts reported in Grubert et al. (1993) was that in 1987, 37% of all nonfinancial foreign companies had a profitability in terms of total assets that was near to zero. Conversely, only 27% of the domestic firms fell into the same zero range from -2.5% to $+2.5\%$. This issue is taken up in Collins et al. (1997) who concentrate on a sample of foreign-owned and nonforeign-owned wholesale firms. Their working hypothesis is that if foreign-controlled firms (unlike domestic firms) target zero profitability, then an (exogenous) increase in sales should go along with a smaller increase in profitability compared to domestic firms. The

¹Cf. Schjelderup and Weichenrieder (1999), Elitzur and Mintz (1996), or Mansori and Weichenrieder (2001).

²Useful surveys on profit shifting and related aspects of international tax issues are contained in recent papers by De Mooij (2005) and Eggert and Haufler (2006).

³In an unpublished revision of Grubert et al. (1993), Grubert (1997) found a considerably reduced difference between US and foreign-owned firms.

⁴US studies using mostly smaller firm samples include Klassen et al. (1993), Jacob (1996), Collins and Shackelford (1998), and Rousslang (1997).

reason is that while higher sales per se are good for profits, foreign firms would counteract by charging higher prices on intrafirm trade. The findings of Collins et al. (1997) do not support the view that foreign controlled firms have a significantly weaker correlation between sales and profits. Based on this observation, the authors suggest that systematic differences between domestic and foreign firms rather than income shifting may be the reason for the near zero profitability of many foreign-controlled US firms.⁵

Hines and Rice (1994) use 1982 country level data on US affiliates. Their profit measure approximates earnings before interest and taxes (EBIT). The empirical results suggest that a one percentage point increase in the host country tax rate reduces reported EBIT of US affiliates by some 3%. Finally, Huizinga and Laeven (2005) in a recent paper use a microdata set of European based subsidiaries. Like in Hines and Rice, they consider a cross-section (1999) of firms and study the effect of tax differentials on reported EBIT. Their findings suggest that while the estimated tax effect is considerably smaller than in Hines and Rice, profit shifting implies a significant revenue loss for high tax countries, Germany, in particular.

In this paper, the MiDi database of the Deutsche Bundesbank is used on German inbound and outbound FDI to empirically detect profit shifting. While the above discussion of the literature has made clear that there have been several attempts to empirically identify profit shifting behavior of multinationals, this paper is one of the first microbased studies with non-US data.

While there are many potential influences on firm profitability, a first hypothesis is that the lower the tax rate of a foreign parent is as compared to the rate that is applicable to its German affiliate, the more profitable it will be to shift the profits of the affiliate to the home country of the parent. Therefore, the profitability of the German affiliate may be positively correlated with the home country tax rate. The paper also looks at the effects that the foreign tax rate has on the profitability of German subsidiaries abroad. A problem here is that the database of German FDI only records net-of-tax profits of subsidiaries, which at a given pretax profitability automatically react negatively to a tax rate increase. Therefore, the paper will formulate hypotheses how coownership of foreign subsidiaries may influence profit shifting. Under certain conditions, the testable hypothesis can be formulated in which tax rate changes have a more pronounced effect on wholly-owned subsidiaries as compared to non-wholly owned ones.

The strongest evidence for profit shifting behavior is found for inbound FDI. For profitable subsidiaries that are directly owned by a foreign investor, the evidence suggests that a 10-percentage point increase in the parent's home country tax rate leads to roughly half a percentage point increase in the profitability of the German subsidiary.

The remainder of the paper is organized as follows. Section 2 formulates a stylized model of profit shifting that will formulate testable hypotheses. Section 3 will

⁵A recent study that uses a quite different approach is by Bartelsmann and Beetsma (2003). Instead of using specific data on multinationals, however, they consider aggregate industry data of OECD countries to detect tax effects on the size of value added.

briefly introduce the data used in this paper before. Section 4 will econometrically analyze German inbound FDI and Section 5 will look at German outbound investment. Section 6 concludes.

2 A stylized model of profit shifting

One characteristic of the MiDi database, which will be described in more detail in the next section, is that it collects net of tax profits, but no information on pretax profits. Another issue is that MiDi contains little information on the parent firms apart from information on their country of origin. In the light of these data limitations, the following model is set up to develop hypotheses about the observed subsidiaries that indeed can be tested with the help of the German panel data set.

Consider a multinational with a parent firm in country H that owns a single subsidiary in the destination country D . Country D taxes reported profits at rate t_D . Country H is assumed to exempt foreign profits earned in country D , but taxes domestic profits (and any profits that are shifted into country H) at the rate t_H . Since Germany uses an exemption system toward foreign dividends, this assumption is justified if we think of Germany as the home country H . In the case where Germany is acting as the host country (D), the assumption is obviously appropriate in the case of investing countries that also use an exemption system. If the investing country uses a credit system of taxation, then effective exemption still occurs if the parent in the home country is in an excessive credit position. An excessive credit position applies if the foreign taxes underlying the foreign dividends received by a parent are higher than the taxes that would apply had the parent earned the equivalent income at home. Since Germany is a high tax host country, such a situation is the norm and a credit system in the home country of the multinational may then be approximated by an exemption system.

Let there be a level of “true” profits that would prevail in H and G in the absence of profit shifting activities (f_H, f_D). The only decision variable of the multinational shall be the net amount S of profits that is shifted from D to country H . A negative amount of S then indicates profit shifting into D . Shifting profits from a high tax jurisdiction to a low tax jurisdiction may save taxes but may also imply a cost for the multinational. For example, special activities may be necessary to hide the profit shifting. I assume that this cost is incurred by the plant that reduces its profitability. This assumption reflects that legal costs that arise when inadequate transfer prices are contested by minority shareholders or tax authorities will occur in the country where profits have been diminished.⁶ That is, the cost $c_H(S)$ falls on the parent if the profit is shifting from the home country into D and $c_D(T, \lambda)$ is incurred by the subsidiary if the shifting is out of the host country. Here λ denotes the fraction of shares of the host country subsidiary that are held by other investors.⁷ The respective cost is assumed to be convex in the absolute amount of shifting.

⁶See Edwards and Weichenrieder (2004, p. 147–149) for a legal discussion of the corporate governance issues that arise when transfer pricing hurts minority shareholders.

⁷For simplicity, the fraction of ownership is assumed to be exogenously determined by firm characteristics.

If the shifting is from D to H , then the existence of other investors (who may resist the manipulations) makes profit shifting increasingly costly, while this is not the case if the other investors gain from profit shifting.⁸ Therefore, c_H , unlike c_D , is taken to be independent of λ . The assumptions on the shifting cost may be summarized as follows:

$$\begin{aligned}
 c_H(S) &= 0 \quad \text{if } S \geq 0, \\
 \partial c_H/\partial S &< 0, \quad \partial^2 c_H/\partial S^2 > 0 \quad \text{if } S < 0, \\
 c_D(S) &= 0 \quad \text{if } S \leq 0, \\
 \partial c_D/\partial S, \quad \partial^2 c_D/\partial S^2 &> 0, \quad \partial^2 c_D/\partial S \partial \lambda > 0, \\
 \partial^3 c_D/\partial S^2 \partial \lambda &> 0 \quad \text{if } S > 0, \\
 \partial c_i/\partial S|_{S=0} &= 0.
 \end{aligned} \tag{1}$$

Global net of tax profits, which are assumed to form the objective function of the multinational, are given by

$$P = (1 - \lambda) \underbrace{(1 - t_D)(f_D - S - c_D(S, \lambda))}_{\equiv \pi_D} + (1 - t_H) \underbrace{(f_H + S - c_H(S))}_{\equiv \pi_H}. \tag{2}$$

Differentiation of P w.r.t. S at $S = 0$ indicates that profit shifting from D to H (H to D) is profitable if $(1 - t_H) - (1 - \lambda)(1 - t_D) > (<)0 \Leftrightarrow t_D > (<)[t_H - \lambda]/(1 - \lambda)$.⁹ Since the cost of shifting profits depend on the direction of the profit manipulations, two cases have to be distinguished.

Case A: Incentives to shift profits home.

In this case, $(1 - t_H) - (1 - \lambda)(1 - t_D) > 0$, and the first order condition for optimal profit shifting is given by

$$\partial c_D(S, \lambda)/\partial S = (1 - t_H)/[(1 - \lambda)(1 - t_D)] - 1. \tag{3}$$

Using assumptions (1) and implicitly differentiating (3) yields the marginal effect of a change in t_H on the amount of profit shifting:

$$dS/dt_H = -1/[(1 - \lambda)(1 - t_D) \cdot \partial^2 c_D(S, \lambda)/\partial T^2] < 0. \tag{4}$$

The effect of t_H on S is as expected: the higher the foreign tax rate, the smaller the optimal profit shifting S . The role of λ for the slope dS/dt_H is less straightforward. A direct effect of a larger λ is a positive one: a higher share of coowners increases the gain from any Euro that is shifted. But since $\partial^2 c_D(S, \lambda)/\partial S^2$ increases in λ , there is also a higher cost of shifting profits home and the net effect is unclear.

⁸Coownership has been shown to be empirically important for the tax influence on related-party debt (Mintz and Weichenrieder 2005).

⁹Outside ownership has also been considered in the theoretical work by Kant (1988). The conflict of interest arising from transfer pricing and coownership has recently been emphasized by Desai et al. (2004).

The empirical parts of this paper will exploit information on the net of tax profits. Net-of-tax profits π_D and π_H in the model are defined by (2). Given the slope defined by (4), the reaction of the reported net of tax profit in D is may be rewritten as

$$\frac{d\pi_D}{dt_H} = \frac{1}{(1 - \lambda) \cdot \partial^2 c_D(S, \lambda) / \partial T^2} \cdot \left[\frac{1 - t_H}{(1 - \lambda)(1 - t_D)} \right] > 0, \tag{5}$$

From (5), the predicted impact of an increase in t_H is positive: ceteris paribus, a tax increase abroad should increase the profitability of a German subsidiary. For the later empirical investigation, it would be helpful to also have a clear testable prediction about the role of outside shareholders on the size of this tax effect. But like in (4), the role of minority shareholders is ambiguous.

Now consider the impact of a change in the tax rate t_D on the reported profits π_D . Again, let us start from the first order condition (3) to derive the tax rate effect. Differentiation w.r.t. t_D yields:

$$dS/dt_D = (1 + \partial c_D / \partial S) / [(1 - t_D) \cdot \partial^2 c_D(S, \lambda) / \partial S^2] > 0. \tag{6}$$

Since $\partial c_D / \partial S > 0$, the slope is positive: a higher host country tax rate leads to additional profit shifting to the parent. Whether this slope should be expected to differ for subsidiaries with different λ is unclear. In (7), the first term of the numerator on the r.h.s. is positive, while the second part of the numerator is negative.

$$\frac{d(dS/dt_D)}{d\lambda} = \frac{(\partial^2 c_D / \partial S^2) \cdot (\partial^2 c_D / \partial S \partial \lambda) - (\partial^3 c_D / \partial S^2 \partial \lambda) \cdot (\partial c_D / \partial S + 1)}{(1 - t_D) \cdot [\partial^2 c_D(S, \lambda) / \partial S^2]^2}. \tag{7}$$

The effect of t_D on net-of-tax profits can be derived as:

$$\frac{d\pi_D}{dt_D} = -(1 - t_D) \left\{ \frac{\partial S}{\partial t_D} \left(\frac{1 - t_H}{(1 - \lambda)(1 - t_D)} \right) \right\} - (f_D - S - c_D) < 0. \tag{8}$$

Clearly, the reported profits of the subsidiary are expected to be a negative function of t_D . The impact of λ on this slope is unclear for two reasons. First, the expression in (7), which re-enters if (8) is differentiated w.r.t. λ , cannot be signed. Second, it may be that the pretax profit $(f_D - S - c_D)$ depends on λ .

It is useful to summarize the results for case A ($S > 0$) in a nontechnical proposition.

Proposition 1 *If the profit shifting incentives lead to an upward manipulation of home country profits and a downward manipulation of profits in the host country, then an increase in the host (home) country tax rate should reduce (increase) reported profits of the foreign subsidiary. It is theoretically unclear how coownership influences the magnitudes of these effects.*

Case B: Incentives to shift profits abroad.

If the home country is a high tax country, then the incentives are to shift profits abroad ($S < 0$) as long as coownership is limited: $(1 - t_H) - (1 - \lambda)(1 - t_D) < 0$. The

first order condition in this case is $\partial c_H(S)/\partial S = 1 - (1 - \lambda)(1 - t_D)/(1 - t_H) < 0$ and implicit differentiation yields:

$$dS/dt_H = -(1 - \partial c_H(S)/\partial S)/[(1 - t_H) \cdot \partial^2 c_H(S)/\partial S^2] < 0. \quad (9)$$

As long as case B applies, an increase in the home country tax rate will make S more negative, i.e., it will increase profit shifting. Since c_H is independent of λ , so is the slope dT/dt_H . It is easy to verify, that if profits ($f_D - S$) are independent of the coownership variable λ , then the marginal effect of t_H on net-of-tax profits will also be independent of λ .

From the first order condition, $dS/dt_D = (1 - \lambda)/[(1 - t_H) \cdot \partial^2 c_H(S)/\partial S^2] > 0$. Clearly, if the profit shifting incentives are such that profits are shifted into the subsidiary, then an increased taxation of the subsidiary will reduce this incentive and make S less negative. Unlike in case A, the impact of λ can now be signed: $d(dS/dt_D)/d\lambda < 0$. An increase in the coownership abroad lowers the (absolute) marginal effect of a change in the host country tax. An intuition behind this is that a fraction of a tax decrease abroad is benefiting other shareholders of the subsidiary, which makes this increase less effective for the decisions of the multinational. What are the implications for reported net of tax profitability? From the definition of the subsidiary's net of tax profit and $c_D = 0$ it follows:

$$d\pi_D/dt_D = -(f_D - S) - (1 - t_D)(\partial S/\partial t_D) < 0. \quad (10)$$

When t_D increases net-of-tax profits fall for two reasons. First, an increase in the tax rate reduces net profitability for a given amount of profit shifting. Second, profit shifting into the subsidiary is reduced. Since net of tax profits, which will be the focus of the econometric analysis, are reduced even in the absence of profit shifting it is important to have a testable hypothesis on how the slope in (10) depends on λ . If the profit ($f_D - S$) of the subsidiary is independent of coownership, then from $d(dS/dt_D)/d\lambda < 0$, it follows that $\partial^2 \pi_D/(\partial t_D \partial \lambda) > 0$. Increased coownership in this case would reduce the impact of tax rate changes on profitability. The above results may be summarized in a nontechnical way as follows.

Proposition 2 *If the profit shifting incentives lead to a downward manipulation of home country profits and an upward manipulation of profits in the host country, then an increase in the host (home) country tax rate should reduce (increase) reported net-of-tax profits of the foreign subsidiary. Under the assumption that pretax profits are not dependent on coownership, coownership should reduce the effect of the host country tax rate on reported net of tax profitability.*

The two propositions of this section suggest an asymmetry in the effect that coownership has on the amount of shifting. Given that the profit shifting benefits the subsidiary, coownership is expected to limit the effect of a tax rate change in the host country on the amount of profit shifting. Intuitively, coownership makes this reaction to tax rate changes more expensive because coowners participate in the increased profit. Conversely, coownership does not necessarily dampen the effects of a tax rate increase in the home country of the parent if the profit shifting is benefiting

the parent's profit: while coownership per se increases profit shifting incentives, it also implies a resistance to such behavior if it comes at a cost to coowners.

3 The data

German investors owning foreign affiliates are legally required to report on their foreign operations if it meets mild size and ownership requirements. Conversely, foreign-controlled affiliates that operate in Germany have to report on these German operations. The firm reports are the basis for the FDI database of the Deutsche Bundesbank (MiDi).¹⁰ Most of the information in the data refers to a set of balance sheet items. On the liability side, there is information on paid-up plus not paid-up equity, capital reserves, loss carry-forwards, current profits net of taxes, debt, liabilities to affiliated companies, and other liabilities. On the asset side, information is collected on fixed assets plus intangibles, financial assets (shares, loans), current assets, and other assets. Important nonbalance-sheet items that are collected by the Bundesbank are sales and employees.

An unusual feature of the MiDi balance sheets is that they contain the yearly profit after taxes but before dividend distributions as a separate part of the equity of the firm. Therefore, the balance sheets provide information on profitability despite the fact that the database does not contain formal profit and loss statements.

Microdata on foreign direct investment are available for years since 1989, but firm identifiers that allow for the tracing of firms over time are available only from 1996 onward. Nevertheless, the ability to trace firms over up to 8 years is an important advantage over other data sources on FDI and can be used to avoid possible biases from cross-section estimates.

For the purpose of this study, I dropped affiliates if these were either operating in not-for-profit sectors or were not incorporated. I also excluded affiliates in the banking and insurance industries and holding companies to avoid problems connected to the very different balance sheet structure of financial firms. On the outbound side, this results in 117,254 firm-year observations during the period 1996–2003 and the data set includes 10,855 (16,745) firms in 1996 (2003). On the inbound side, the same time span is used for 55,230 firm-year observations and 5,791 (6,988) firms in 1996 (2003).¹¹ Table 1 gives an impression of the total assets involved. The first two columns summarize the inbound side, while columns 3 and 4 inform about the magnitudes on the outbound side. In both cases, the Bundesbank convention was followed to separately account for directly and indirectly held affiliates. On the inbound side,

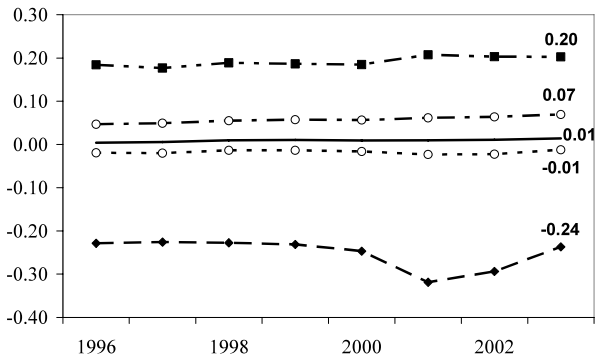
¹⁰For a detailed description of MiDi, see Lipponer (2003). Ramb and Weichenrieder (2005) use the Bundesbank data to analyze the financial structure of German inward FDI and Mintz and Weichenrieder (2005) look at the financing of outward FDI. Buettner and Ruf (2004) use the database to study taxes and location decisions of German multinationals.

¹¹A limited number of observation were dropped in which we failed to collect reliable tax rate information on the home country (host country) if the subsidiary was located in Germany (abroad). Finally, since the legally applied reporting thresholds varied between 1996 and 2003. The sample was filtered by imposing uniform size restrictions (total assets €3m for majority participations and €5.1m in the case of minority stakes) during this period.

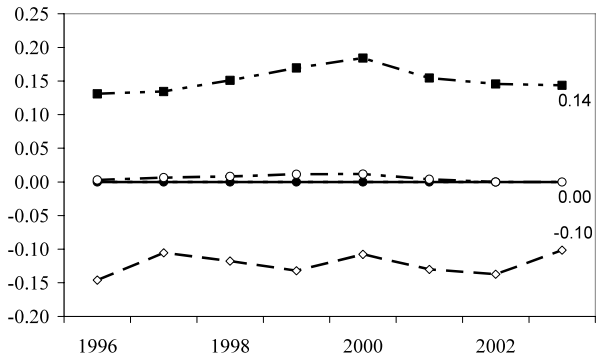
Table 1 Descriptive statistics of German inbound and outbound FDI (2003)

	Inbound FDI		Outbound FDI	
	Direct	Indirect	Direct	Indirect
No. of affiliates	3,520	3,468	11,369	5,376
Total assets (€ billion)	174	236	935	960
Total assets, average (€ million)	49.4	68.1	82.2	178.6

Fig. 1 Net-of-tax return on total assets: inbound FDI.
 Annotation: In each graph, the bold line indicates the return on assets of the median nonfinancial firm. The two lines below the median line characterize the profitability of the 5th and 25th centile firms, the two lines above the median ratio indicate the 75th and 95th centiles. The left hand diagram refers to the subsample of firms that are directly held by a foreign firm, while the graph on the right hand refers to firms in Germany that are foreign held via a German intermediate company



(a) Return on total Assets, directly-held affiliates

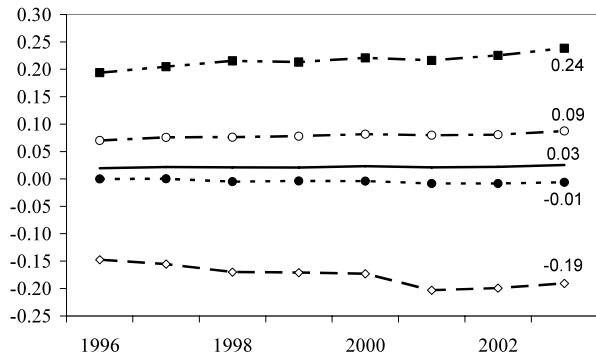


(b) Return on total Assets, indirectly-held affiliates

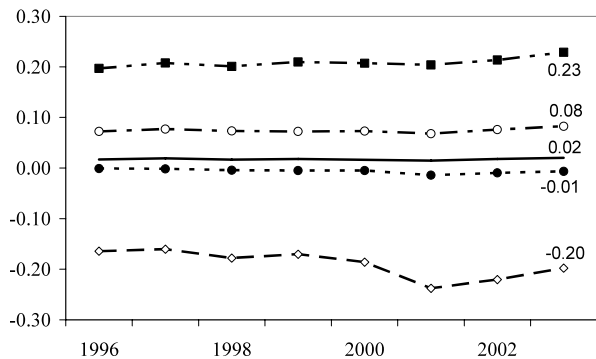
the affiliate is indirectly held if the immediate investor is a foreign-owned intermediate company that is located in Germany. An affiliate is directly held if the immediate owner is a foreign investor. The definitions differ a bit on the outbound side. Here, a German-owned foreign affiliate is defined as an indirectly held participation if the ownership chain contains at least one foreign company between the German investor and the foreign affiliate. This foreign intermediate company may or may not be in the country of the ultimate company. Conversely, the affiliate is directly held if no intermediate foreign company is used.

Figures 1 and 2 summarize the distribution of net-of-tax returns on total assets. Each of the four graphs contains 5 lines that represent the return on total assets (ROA) in the 5th, 25th, 50th, 75th, and 95th centile of firms. Again, the categories “direct”

Fig. 2 Net-of-tax return on total assets: outbound FDI. Annotation: In each graph, the bold line indicates the return on assets of the median nonfinancial firm. The two lines below the median line characterize the profitability of the 5th and 25th centile firms, the two lines above the median ratio indicate the 75th and 95th centiles. The left hand diagram refers to the subsample of firms that are directly held by a German parent firm, while the graph on the right hand refer to firms that are held via a German-owned intermediate company outside Germany



(a) Return on total Assets, directly-held affiliates



(b) Return on total Assets, indirectly-held affiliates

and “indirect” are reported separately. Indeed, firms in these categories show a sizeable difference in ROA when it comes to inbound German FDI. Indirectly held firms have a lower spread in returns and more often show near zero profitability. If we look at a “near-zero band” between -2.5% and $+2.5\%$ similar to Grubert et al. (1993), we find that in 2003 from the total of all directly held affiliates (inbound) 36% fall in this range, while for the indirectly held firms, it is even a majority of some 72%.¹²

The fact that this high fraction of firms with more or less zero profitability is pretty constant over the years may fuel the suspicion that advanced tax planning is the reason behind these figures. However, the high fraction of affiliates with zero profitability among indirectly held affiliates at least partly results from specific data problems. While the Bundesbank requests firms to report profits net of taxes but before distributions, some indirectly held firms may fail to report profits that are transferred to the owner on the basis of a corporate contract. Under such a corporate contract, the dependent company may agree to transfer all profits and losses to the upper-tier corporation in order to achieve profit and loss consolidation for tax purposes; consolidation not only requires the existence of such a contract. Germany also restricts consolidation of profits and losses within a group to cases in which a German um-

¹²Grubert et al. (1993) use taxable profits (instead of net of tax profits) to total assets to define the band.

Table 2 Descriptive statistics of German inbound sample (1996–2003)

Variable	Observations	Firms	Average	Std. deviation	Min	Max
ROA	17671	3788	5.6%	12.8%	−407.2%	321.1%
W_ROA	17671	3788	5.3%	7.1%	−5.1%	23.0%
CT	17671	3788	34.7%	7.2%	0.0%	58.6%
WHOLLY	17671	3788	70.7%	45.6%	0	1
CT_WHOLLY	17671	3788	24.6%	17.0%	0.0%	58.6%
CTGER_WHOLLY	17671	3788	33.1%	22.4%	0.0%	56.8%
DEBT_RATIO	17671	3788	59.0%	30.6%	0.0%	512.4%
W_DEBT_RATIO	17671	3788	58.2%	26.8%	8.6%	98.2%

rella company is a majority owner of the dependent firm, i.e., an ownership chain is necessary to establish a profit transfer agreement. While the Bundesbank requires firms to report their profits before distribution, strong empirical evidence was found that many indirectly held firms report figures that are net of profit transfers to the umbrella company and, therefore, decided to drop indirectly held firms in the analysis of inbound FDI. Unlike the data for indirect inbound FDI, the profit data for German outbound investment are presented in Fig. 2 show no bunching at zero profitability, and the reporting of zero profitability of indirectly held firms did only weakly correlate with the opportunity to consolidate profits in the relevant host country. For this reason, indirectly held firms were kept in the analysis of outbound investment.

4 Profit shifting and the profitability of German inbound FDI

Since during the observed period, Germany is a high tax country by international comparison, the results derived for the case A (see Sect. 2, $S > 0$) are considered relevant for the profitability of inflowing FDI. According to Proposition 1, which assumes profitable multinationals, the foreign corporate tax rate in the country of the parent is then expected to positively affect the profitability of a German affiliate. Whether this effect should be expected to be larger for wholly-owned versus partly-owned affiliates is unclear from Proposition 1.

To test these implications, a subsample of incorporated nonfinancial firms in Germany were used that on average, across all firm observations, show a positive profitability. The endogenous variable is return on assets (ROA), where the return is measured by the net-of-tax profits after interest payments (but before dividends). Because of the data problems discussed in Sect. 3, the concentration is on firms that are directly held by a foreign investor. Table 2 gives a summary statistics of this sample that contains 3,788 firms that on average are observed over 4.7 years. Despite the fact that the sample is built by excluding firms that on average show nonpositive profitability, the profitability measure shows a huge spread between −407% and 321%. To limit the impact of outliers, a winsorized variable W_ROA is used that has been derived by setting the top and the lowest 5% of the observations to the 5th and 95th percentile

of ROA, respectively. The average tax rate in the home country of the German subsidiary is 34.7%.¹³ WHOLLY is an indicator variable with value one if the foreign investor holds 100% of the German firm and zero otherwise. This variable is also used to create interactive variables. CT_WHOLLY takes on the value of the home country tax rate if the subsidiary is wholly owned, and zero otherwise. Analogously, CTGER_WHOLLY results from multiplying the German corporate tax rate with the variable WHOLLY. DEBT_RATIO is defined as the ratio of debt to total assets that in some cases exceeds 100%. This can occur if the firm under consideration has a loss carry forward. To limit the impact of those outliers, the regressions use a winsorized variable, W_DEBT_RATIO.

Since random effects models did not pass a Hausman test, the tax effects were estimated using a fixed effects model. Table 3 reports the regression results. The German tax rate could not be entered in the model as all firms are subject to the same rate in a given year and year fixed effects are also included. Model (1) starts with a parsimonious specification using the foreign tax rate, fixed firm and time effects, plus the logarithms of employment, sales, and fixed assets.¹⁴ The variable of prime interest, CT, which measures the corporate tax rate of the foreign parent, turns out significant at the 6% level. The coefficient of 0.049 implies that an increase in the tax rate of the parent by ten percentage points increases the return on assets of a German affiliate by approximately half a percentage point, which amounts to roughly 10% of the average profitability in the sample. This evidence is in line with profit shifting behavior and Proposition 1. Employment does not enter significantly, while sales enter significantly positive. The size of fixed assets enters negatively, which may result from large depreciation allowances of investing firms.

Model (2) uses the same specification, but adds the variable W_DEBT_RATIO. Since additional debt increases the interest cost of an affiliate, the significant negative coefficient is in line with expectations. Inclusion of the debt ratio leads only to a small change in the coefficient of CT. By including the leverage variable, the coefficient of CT measures the effect of the tax rate that prevailed when leverage was held constant. Therefore, changes in the profit shifting activities that are induced by a change in CT seem to result only to a limited extent from the use of debt. This is in line with the previous observation that the parent tax rate does not significantly influence the leverage decision of foreign owned affiliates in Germany (Ramb and Weichenrieder 2005).

According to Proposition 1, the effect of co-owners on the impact of a change in tax rates is unclear. Models (3) and (4) include variables that are constructed by interacting the German and the foreign tax rates with the dummy WHOLLY. The objective is to empirically investigate whether co-ownership matters for the size of the tax effects. The effect of ownership on the size of the tax effects turns out to be

¹³On average, the parent firms of the German affiliates over the observed years experienced a maximum absolute change in the home country corporate tax rate of 4.4 percentage points. In cases in which investors from different countries own a German corporation, the rate for the largest investor is used. The tax rate employed includes also average or representative local income taxes. It abstracts from tax base effects since optimal profit shifting decisions of profitable firms are independent of tax base effects.

¹⁴To be precise, the value for fixed assets also includes intangible assets as these are compounded in the Bundesbank questionnaires.

Table 3 Foreign tax rate and domestic profitability

	(1)	(2)	(3)	(4)
CT	0.049 [0.06] ^a	0.044 [0.09] ^a	0.065 [0.05] ^a	0.052 [0.10]
CT_WHOLLY			-0.025 [0.52]	-0.014 [0.71]
CTGER_WHOLLY			0.004 [0.86]	0.014 [0.52]
WHOLLY			0.014 [0.32]	0.005 [0.72]
LN_EMPLOYMENT	-0.141 [0.76]	-0.143 [0.77]	-0.139 [0.77]	-0.142 [0.77]
LN_SALES	1.206 [0.00] ^b	1.315 [0.00] ^b	1.222 [0.00] ^b	1.329 [0.00] ^b
LN_FIXEDASSETS	-2.072 [0.00] ^b	-0.994 [0.04] ^c	-2.072 [0.00] ^b	-0.997 [0.04] ^c
W_DEBT_RATIO		-0.155 [0.00] ^b		-0.155 [0.00] ^b
Observations	17671	17671	17671	17671
Firms	3788	3788	3788	3788
Adj. R-squared	0.52	0.58	0.52	0.58
Country clusters	51	51	51	51

Annotations: ^aSignificant at 10%-level, ^bsignificant at 1%-level, ^csignificant at 5%-level. P-values in brackets are based on robust t-statistics (corrected for correlations within country cells and within firm cells). Dependent variable: W_ROA. All regressions contained a full set of time and firm fixed effects; coefficients are not reported. W_DEBT_RATIO and W_ROA have been winsorized. To avoid losing firms with zero employment, sales, or fixed assets in some year, a small constant was added before taking logs. For the sake of presentation, logs have been entered in one tenth of a percent

not only theoretically undetermined, but also empirically insignificant. Finally, the insignificance of WHOLLY does not suggest that the net of tax profitability changes if firms have a change from partial to full ownership by a foreign investor and this is confirmed by employing a formal F-test using all variables in which the variable WHOLLY is included (P-values are 36% and 54% in (3) and (4)).

5 The profitability of German outbound FDI

Now turn to the outbound side of German FDI. Given the high German tax rates, a major concern is that German multinationals have an incentive to shift profits abroad to repatriate these profits as a tax free dividend. This is a concern that corresponds to the case B in Sect. 3.

Of course, a straightforward approach would be to test whether foreign taxes influence the pre-tax profitability of German owned foreign affiliates. The problem in doing so is that the Bundesbank database only contains net-of-tax profits. Therefore,

Table 4 Descriptive statistics of German outbound sample (1996–2003)

Variable	Observations	Firms	Average	Std. deviation	Min	Max
ROA	75,876	17,600	7.0%	17.8%	−210%	3699%
W_ROA	75,876	17,600	6.6%	7.5%	−3.7%	25.1%
CT_WHOLLY	75,876	17,600	23.4%	16.3%	0	58.6%
CT	75,876	17,600	33.6%	7.8%	0	58.6%
CTGER_WHOLLY	75,876	17,600	32.0%	22.0%	0	56.8%
WHOLLY	75,876	17,600	0.70	0.46	0	1
W_DEBT_RATIO	75,876	17,600	51.2%	29.8%	0	1267%

it is impossible to identify whether a reduction in a foreign affiliate's observed return is due to a change in profit shifting activities or is simply caused by higher taxation at constant pretax earnings. However, there is another prediction of the model in Sect. 3 that indeed can be tested. If the incentives are to shift profits abroad, then according to Proposition 2, coownership should lead to a reduced impact of the foreign tax rate if coownership by itself has no impact on profitability. This contrasts with the case in which coinvestors have an incentive to resist to profit shifting and the cost of profit shifting was assumed to increase in the amount of profit shifting.

Like in Sect. 5, the concentration is on affiliates that on average show a positive profitability. Table 4 gives the summary statistics for important variables. As on the inbound side, the return on total assets shows a huge variation that is obviously unrelated to taxation and the regressions below will, therefore, use the winsorized variable W_ROA. CT is now characterizing the corporate tax rate applicable to profits of the German-owned affiliate abroad. Using the dummy WHOLLY that takes on the value one if the German investor holds a 100% participation, I created the variable $CT_WHOLLY = CT * WHOLLY$ in addition to using the simple host country corporate income tax, CT. Of course, the impact CT is expected to be negative: An increased tax rate should reduce the net of tax profitability as long as a potentially accompanying tax base broadening does not overcompensate the effect of tax cuts.¹⁵ Proposition 2 suggests that the coefficient of CT_WHOLLY should also be negative reflecting that firms without coinvestors find it easier to adapt to tax rate changes than other firms.

Table 5 contains two regression results using fixed effects models. While model (2) contains a variable for the leverage of the affiliate, model (1) omits such a variable. Apart from this, there are no differences in the specifications.

Like in Sect. 5, there is no evidence regarding the fact that a firm is wholly-owned correlates with profitability. The sign of CT is consistent with expectations: an increase in the tax rate of the host country reduces profitability. The coefficient is not significant, however, suggesting that a large fraction of the effects of rate reductions may be outweighed by accompanying tax base adjustments. The main

¹⁵Information is not observed on the tax base of foreign subsidiaries.

Table 5 Differential effects of the host country tax rate

	(1)	(2)
CT_WHOLLY	-0.044 [0.08] ^a	-0.028 [0.25]
CT	-0.032 [0.39]	-0.031 [0.41]
CTGER_WHOLLY	0.027 [0.16]	0.027 [0.14]
WHOLLY	-0.001 [0.89]	-0.004 [0.69]
LN_EMPLOYMENT	5.74E-04 [0.06] ^a	0.861 [0.01] ^b
LN_SALES	2.16E-03 [0.00] ^b	2.378 [0.00] ^b
W_DEBT_RATIO		-0.109 [0.00] ^b
LN_FIXEDASSETS	-2.55E-03 [0.00] ^b	-2.008 [0.00] ^b
GDPGROWTH	0.002 [0.00] ^b	0.002 [0.00] ^b
DOMPRIVCRED	-0.006 [0.28]	-0.003 [0.53]
Observations	75,876	75,876
Firms	17,000	17,000
Country clusters	68	68
Adj. R-squared	0.57	0.61

Annotations: ^aSignificant at 10%-level, ^bsignificant at 1%-level. P-values in brackets are based on robust t-statistics (corrected for correlations within country cells and within firm cells). Dependent variable: W_ROA. All regressions contained a full set of time and firm fixed effects; coefficients are not reported. W_ROA and W_DEBT-RATIO are winsorized versions of ROW and DEBT-RATIO. To avoid losing firms with zero employment, sales, or fixed assets in some years, a small constant was added before taking logs. For the sake of presentation, logs have been entered in one tenth of a percent

variable of interest is CT_WHOLLY, which turns out to be negative and statistically significant at the 8% level in model (1). In line with Proposition 2, this suggests that wholly-owned firms indeed do react more strongly than coowned affiliates.

The German tax rate cannot be tested when time fixed effects are included as it is identical for all firms in a given year. The variable CTGER_WHOLLY measures the differential effect of the German tax rate for wholly owned affiliates as compared to nonwholly owned subsidiaries. It shows a positive sign, but is not significant at conventional levels. This is consistent with the model that has not suggested a systematic correlation.

Unlike in the inbound sample, LN_EMPLOYMENT has a positive effect on profitability, while the control variables LN_SALES and LN_FIXEDASSETS have a corresponding sign: positive for sales and negative for the amount of fixed assets.¹⁶ Finally, two variables are added that represent the macroeconomic situation in the host country. As a measure of the local performance off the real economy, GDPGROWTH enters positively: affiliates in high growth countries are enjoying a significantly higher return on assets. Besides real growth, the financial macroeconomic situation may affect profitability also. DOMPRIVCRED, which measures the domestic private credit to GDP ratio and captures the liquidity of local loan markets, does not show up to be significant.

If the negative coefficient of CT_WHOLLY is interpreted as evidence for profit shifting activities, the question arises as to what extent this profit shifting may be due to a different financial structure. Since the dependent variable is a measure of the return on total assets, interest on additional debt, which an increased local tax rate may induce, will reduce profits and decrease this measure. Inclusion of a variable for the debt to asset ratio in model (2) should control for this latter effect. Indeed, the inclusion of W_DEBT_RATIO decreases the impact of CT_WHOLLY and renders the estimated coefficient insignificant. This change suggests that some part of the profit reaction that is induced by a lower foreign tax rate CT results from a reduced leverage. These results are in line with the finding of Mintz and Weichenrieder (2005) that the foreign tax rates significantly influences the intra-company loans granted by a German parent, but much less so if the foreign affiliate is coowned by other investors. The estimated coefficient of 0.109 implies that an increase of the debt to asset ratio by one percentage point is associated with a reduction of the ROA by some 0.11 percentage points.

6 Summary

The paper has taken two approaches to identify profit shifting behavior. In the first step, it has looked at the correlation between the home country tax rate of a parent and the net of tax profitability of its German affiliate. The finding is compatible with profit shifting behavior. For profitable affiliates, the evidence suggests that a 10-percentage point increase in the parent's home country tax rate leads to roughly half a percentage point increase in the profitability of the German affiliate.

In the second step, the paper has analyzed German outbound FDI. Given the high tax rates of German parents by international standards, the profitability of German-owned affiliates abroad may benefit from profit shifting. Since pretax profits are not observed in the German FDI data, the empirical test looks at whether the local tax rates of German-owned affiliates have a stronger impact on wholly-owned affiliates. While such a differential effect seems to be present if leverage is excluded as an explanatory variable, the significance of the distinction between wholly-owned and partly-owned affiliates is blurred if leverage is entered in the regression.

¹⁶Like on the inbound side, LN_FIXEDASSETS include intangible assets as these are compounded in the Bundesbank questionnaires.

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