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# Profit Shifting by Multinationals: Indirect Evidence from European Micro Data

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**Abstract**

We provide indirect empirical evidence of profit shifting behavior by multinational enterprises. This issue is analyzed in an econometric panel study for the years 1995 to 2005 and additionally in a cross–section for 2004 using a large micro database of European subsidiaries of multinationals (AMADEUS) which includes detailed balance sheet items. Our results show a decrease in the unconsolidated pre–tax profits of an affiliated company of approximately 7% if the difference in the statutory corporate tax rate of this affiliate to its parent increases by 10 percentage points. Various robustness checks support our profit shifting evidence. Furthermore, the results suggest an overall shift of profits out of the European Union. In addition, we provide evidence that a higher parent's ownership share of its subsidiary leads to intensified profit shifting behavior.

**JEL classification:** H25, H26, F23, C33

**Keywords:** corporate taxation, multinational enterprise, tax planning, profit shifting, micro level data, panel econometrics

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# 1 Introduction

The current corporate tax system in the European single market provides multinational enterprises (MNEs) with the opportunity to avoid taxation due to different national tax rates and separate taxation of profits of each foreign subsidiary (*separate accounting*). It is of fundamental importance for governments, especially those in high tax countries, to protect their shrinking national corporate tax revenue against various kinds of profit shifting activities.[1] On the other hand, shifting of profits likewise induces substantial costs for MNEs. These include implementation costs and efficiency costs due to internal management distortions, as well as compliance costs due to auditing by regulating authorities. The auditing in turn constitute costs and efficiency losses for governments. The current proposal of the European Commission (2001) aims to reduce this tax avoidance behavior by consolidating all corporate tax bases of a MNE and reallocating this profit to the different subsidiary locations according to a specific formula (*formula apportionment*).[2] This paper empirically analyzes to what extent multinationals actually shift profits to low tax countries or out of high tax countries in the enlarged European Union (EU). These results can be compared to those that have been found in the extensive literature analyzing related issues with US data. There are two reasons why profit shifting may even be higher in Europe. On the one hand, there are large differences in corporate tax rates in the EU, even among neighboring states. On the other hand, most EU countries employ the *exemption system* for taxing corporate profits, under which international tax differentials in the source country of the investment are directly relevant for the after–tax profits of companies.[3]

The empirical literature on profit shifting is large but it focuses mainly on US data (see Hines (1997), Hines (1999), and Devereux (2006) for comprehensive surveys). Most studies provide *indirect* evidence as data on internal transactions is limited even in

[1] Basically, three methods of shifting profits can be distinguished. The first is charging intercompany intermediate goods for a higher or a lower than the arm's length price (*transfer pricing*). Secondly, *overhead costs*, e.g. for R&D or headquarter services, can be allocated strategically to subsidiaries in different countries in order to bias their pre–tax profits. Third, MNEs can shift profits via the channel of intercompany *financial transactions*, for instance by granting advantageous interest rates for loans.

[2] The potential effects of such an EU tax system of *formula apportionment* on corporate tax revenues in each member state is studied by Devereux and Loretz (2007) using a large sample of international micro data.

[3] The system of foreign *tax credit* applied in the US aims to equalize international differences in corporate tax rates through compensating supplementary taxation of foreign source income in the parent country. This should induce fewer incentives to shift profits, other things being equal.

the US. The standard method used in the literature tries to explain differences in (unconsolidated) pre–tax profits of affiliated companies by the statutory corporate tax rate which is effective at the affiliate's location, while controlling for firm and country characteristics. Grubert and Mutti (1991) and Hines and Rice (1994), for example, perform this with aggregate data on affiliates by country, whereas e.g. Harris, Morck, Slemrod, and Yeung (1993) as well as Collins, Kemsley, and Lang (1998) use firm–level data. To give *indirect* evidence for profit shifting, a more precise explanatory variable for the variance of pre–tax profits is the statutory tax rate difference of an affiliated firm to its next *foreign* affiliated company if there is only one (this is, e.g. the foreign parent if the respective affiliate has no further foreign subsidiaries). In our paper, we use this tax differential, which gives the MNE the direct incentive to shift profits between these two affiliates.

So far, only a few published studies yield *direct* evidence of profit shifting by using affiliate level data on intercompany *transfer prices* (Clausing (2003), Swenson (2001), and Bernard, Jensen, and Schott (2006)). A paper that identifies profit shifting via the allocation of *overhead costs* is Grubert (2003).[4] The channel of *financial transactions* is instead rather unexplored.[5] Evidence for profit shifting with European data is still rare. Weichenrieder (2007) confirms profit shifting into and out of Germany with German panel FDI–data (MiDi database). With the same database, Overesch (2006) demonstrates for German MNEs a negative impact of the tax rate on the size of intercompany sales (*transfer pricing channel*). Huizinga and Laeven (2005), with a methodology very close to Hines and Rice (1994), perform a cross–section analysis with affiliate level data (AMADEUS) to provide evidence for profit shifting within European MNEs by explaining variations in earnings before interest and taxes (EBIT) with tax differentials, among other variables.

This paper provides indirect evidence of profit shifting using panel regressions for the years 1995–2005 while controlling for fixed firm effects. We provide a contribution to

[4]Grubert (2003) provides evidence that subsidiaries in countries with a relatively low or high tax rate engage in a significantly larger volume of intercompany transactions. These transactions consist mainly of immaterial, R&D–intensive goods (e.g. payments for royalties or patents).

[5]A study by Mintz and Smart (2004) finds some evidence for the use of this channel, as comparing their results with data from firms with a solely national organizational form which cannot shift profits internationally. Papers by Mintz and Weichenrieder (2005) and Ramb and Weichenrieder (2005), which are primarily focusing on the influence of corporate tax rates on the level of debt financing using micro data from Germany, allow similar inferences by comparing tax induced intercompany borrowing with external debt financing. More robust evidence is found in a recent paper by Buettner and Wamser (2007) who can identify the use of intercompany loans solely for profit shifting purposes.

this literature using European micro data with the AMADEUS database. Our sample of MNEs consists of profit–making affiliated firms which are owned by a foreign parent with an ownership share of at least 90%. Our results show a robust and significant negative effect of the difference in the statutory corporate tax rate of a subsidiary to its parent on the unconsolidated pre–tax profits of this subsidiary, while controlling for a range of firm and country variables. Our preferred specification give evidence that pre–tax profits decrease by 7% if the tax differential increases by 10 percentage points. Various robustness tests support our profit shifting inference.

In addition, our results suggest an overall shift of profits out of the EU. We conclude this from a separate analysis of subsidiaries located in a high tax country (relative to the tax rate of their parent) and, vice versa, of subsidiaries located in a low tax country relative to their parent's tax rate. The shifting intensity of firms in high tax countries turns out to be about three times larger than for firms in low tax countries. One explanation for this net shifting of profits out of the EU could be the higher proportion of tax havens outside the EU, as about one third of the subsidiaries in our sample exhibit a Non–EU–parent.

Finally, we provide evidence that a higher parent's ownership share of a subsidiary leads to an increase in the level of profit shifting between these two affiliates and vice versa. Empirical evidence for the positive impact of the ownership share on the intensity of shifting is, to the best of our knowledge, missing in the existing literature.

The remainder of the paper is organized as follows. In Section 2, a simple model of profit shifting is extended, taking account of the effects of the parent's ownership share of its subsidiary on the level of profit shifting. From this model we derive the hypotheses for the econometric specifications. Section 3 describes and discusses the data and the composition of the main firm sample used in the empirical analysis. Section 4 presents the estimation approach, the empirical results (Section 4.1), a range of robustness checks (Section 4.2) and an extensions to empirically analyze the influence of the ownership share on the shifting intensity (Section 4.3). Section 5 concludes.

# 2 A simple model of profit shifting

We set up a simple theoretical model to derive our testable hypotheses. For this purpose we relate to Grubert (2003) and include a parameter for the ownership share, as first introduced by Weichenrieder (2007). We assume a MNE with some degree of market power and with one foreign subsidiary. The parent, firm 1, has to bear the statutory

profit tax rate $0 \leq t_1 < 1$, the subsidiary has to bear $0 \leq t_2 < 1$. The parent and the subsidiary engage in exogenous intra–company transactions $T$, i.e. they purchase and sell a given amount of intermediate products or intra–company services. This provides the MNE with the opportunity to shift profits by deviating from the arm's length price for these intra–company sales.

Profit shifting is modeled through the shifting parameter $s$ which represents the amount of profit shifted *per* transaction. In the tax scenario $t_1 > t_2$, profits are shifted from the parent to the subsidiary, i.e. $s > 0$, and a higher $s$ means more shifting. The opposite is true for a reversed tax scenario. The parameter $\rho$ represents all expected costs of shifting, including the probability of detection, the penalty, image loss, costs of distorted management incentives, etc.

The parameter $0 < \delta \leq 1$ denotes the parent's share of ownership of its subsidiary, with $\delta = 1$ indicating a wholly owned affiliate. We incorporate a major effect that the parent's ownership share of its foreign subsidiary can have on the level of profits shifted from or to this affiliate. A lower ownership share results in a limited enforceability of profit shifting strategies due to opposed management interests from other parties involved. We call this the *management effect* of the ownership share on the shifting intensity and model this effect by an increase in the costs of shifting if the ownership share declines.

The output of the parent, $F_1(K_1, L_1)$, is produced with mobile capital and immobile labor with cost $r$ and $w_1$, respectively. We assume no depreciation of capital. The deductibility of the tax penalty is fully embodied in $\rho$. Hence, the after–tax profit of the parent is given by

$$\begin{aligned} \pi_1^{net} &= (1 - t_1)\left[F_1(K_1, L_1) - rK_1 - w_1 L_1 - s\,T\right] \\ &\quad - (\rho/2)(s/\delta)^2\, T \end{aligned} \tag{1}$$

The last term gives a quadratic specification of the expected shifting costs which is frequently used in the literature. We also assume that these costs are solely borne by the parent.[6] The respective after–tax profit of the subsidiary is

$$\pi_2^{net} = (1 - t_2)\left[F_2(K_2, L_2) - rK_2 - w_2 L_2 + s\,T\right] \tag{2}$$

[6]We do not assume any effect of the ownership share on the probability of detection, i.e. we expect that a parent with a partly owned affiliate (e.g. 51% of the shares) is treated equal by the tax authority as if the affiliate is wholly owned (same intensity of investigation and penalty).

Summing up these two affiliates' profits yields the overall after–tax profit of the MNE:[7]

$$\begin{aligned}\Pi^{net} &= (1-t_1)\left[F_1(K_1,L_1) - rK_1 - w_1L_1\right] \\ &\quad + (1-t_2)\left[F_2(K_2,L_2) - rK_2 - w_2L_2\right] \\ &\quad + (t_1-t_2)s\,T - (\rho/2)(s/\delta)^2\,T \end{aligned} \tag{3}$$

The *shifting term* (first term in the last row of Eq. (3)) reflects the tax gain from shifting profits (before penalties). Maximizing overall net profits of the MNE holding *all* input factors fixed yields the optimal level of shifting:

$$s^* = \frac{(t_1-t_2)\,\delta^2}{\rho} \tag{4}$$

Thus, in the optimum, $s^* > 0$ if $t_1 > t_2$, i.e. the MNE shifts profits from the parent to the subsidiary. Vice versa, $s^* < 0$ if $t_1 < t_2$ and profits are shifted *to* the parent. The optimal level of shifting has the following comparative static properties:

$$\frac{\partial s^*}{\partial(t_1-t_2)} > 0 \tag{5}$$

$$\begin{aligned}\frac{\partial s^*}{\partial \delta} = \frac{(t_1-t_2)\,2\,\delta}{\rho} &> 0 \qquad \text{if } t_1 > t_2 \\ &< 0 \qquad \text{if } t_1 < t_2\end{aligned} \tag{6}$$

The optimal level of shifting increases with the tax differential (and decreases with the expected cost of shifting parameter $\rho$). A rise in the ownership share $\delta$ intensifies the optimal level of shifting $s^*$ via the *management effect*, independent of the direction of shifting. We test this hypothesis from Eq. (6) empirically in Section 4.3. If $t_1 > t_2$, profits are shifted to the subsidiary and thus, $s^* > 0$. Hence, an increase in $\delta$ leads to a higher level of shifting. The same results if $t_1 < t_2$, as profits are shifted to the parent and $s^* < 0$.

Holding again all inputs fixed, we get our main theoretical hypothesis which will be tested throughout our econometric analysis to find indirect evidence for profit shifting:

$$\begin{aligned}\frac{\partial \pi_1^{gross}}{\partial(t_1-t_2)} &= \left(\frac{\partial \pi_1^{gross}}{\partial s^*}\right)\left(\frac{\partial s^*}{\partial(t_1-t_2)}\right) \\ &= -T(1+t_1-t_2)\left(\frac{\partial s^*}{\partial(t_1-t_2)}\right) < 0\end{aligned} \tag{7}$$

[7] We do not model the relevance of the ownership share for the overall profit of the MNE, i.e. we do not incorporate the effect, that a lower ownership share gives the incentive to shift profits from the partly owned affiliate to the (wholly owned) parent and vice versa, as this effect is independent of tax differences between these two affiliated companies. In our analysis we want to focus on profit shifting resulting solely from tax differentials. See Grubert (2003) for a similar procedure.

In the tax scenario $t_1 > t_2$ (tax scenario $t_1 < t_2$), a rise (decline, i.e. getting more negative) in the tax differential results in a higher level of shifting and yields a decrease (increase) in the gross profit of the parent (and finally, a rise in the overall net profit of the MNE). In addition, a rise in the ownership share leads to more shifting (Eq. (6)) which further reduces (increases) the pre–tax profit of the parent.

# 3 Data description and sample construction

The paper uses the European micro database AMADEUS provided by Bureau van Dijk which contains standardized annual accounts for up to 14 years, consolidated and unconsolidated, for up to 1.6 million companies in 38 European countries. The database involves detailed descriptive information, numerous balance sheet and profit & loss account items as well as information on the ownership structure.

There is no legal commitment for firms to give out information for the database. However, the real source of the AMADEUS data is 'Creditreform'. The purpose of this institution[8] insures a strong incentive for firms to participate and additionally insures an adequate quality of the data.[9] However, a general selection problem remains. Firms can self–select into the sample or stay out. By assuming that (more intransparent) firms which refuse the inclusion in the database, are more willing to engage in (illegal) profit shifting activities, our estimation results should be biased downwards. Thus, with significant coefficients evidence for profit shifting can still be made.

The unbalanced sample we use in this paper consists of a cross–section of 22991 MNEs from 24 EU member states (enlarged EU–25 without Malta, 'EU–24' in the remainder) for the time period of 1995–2005. In the construction of our sample, we consider a firm in Europe to be multinational if there exists a corporate immediate shareholder with totally at least 90% of the ownership shares (parent) located in a foreign country worldwide. In this baseline sample, 72% of the affiliates own no subsidiaries, 19% own solely domestic subsidiaries, and 9% exhibit at least one wholly owned foreign

[8] 'Creditreform International' traces active commercial enterprises worldwide and checks their creditworthiness to provide credit reports and debt collection services to creditors.

[9] As in reality the calculation of arm's length prices for transfer pricing auditing of the authorities is difficult, time intensive and sometimes even impossible, other methods are usually applied. Mostly, this is the so called 'Transaction Based Net Margin Method', which compares the net margin of the respective affiliate with similar firms of the same branch with the help of a database. For this, both sides, many transfer pricing consultants (e.g. Deloitte) as well as more and more tax authorities (e.g. Germany and France), use the AMADEUS database.

**Table 1: Descriptive Statistics**

| Variable | Description | Mean | Std. Dev | Min | Max |
|---|---|---|---|---|---|
| Profit (Loss) before Taxation | in thousand US-$, current prices | 4215.01 | 166500.7 | -7498068 | 52000000 |
| Fixed Assets | in thousand US-$, current prices | 52373.2 | 571304.9 | 0 | 77400000 |
| Cost of Employees | in thousand US-$, current prices | 11619.8 | 891456.7 | 0 | 2,94E+08 |
| Employees | | 188.15 | 812.64 | 1 | 62784 |
| Financial Leverage Ratio | = (Total Liabilities / Total Assets) | 0.6207 | 0.2644 | 0 | 1 |
| Direct Ownership Share of the Parent | Parent = Immediate Shareholder | 0.9298 | 0.1606 | 0.3347 | 1 |
| STR of the Subsidiary | STR = statutory tax rate | 0.3474 | 0.0873 | 0.1000 | 0.5676 |
| STR of the Parent | | 0.3545 | 0.0787 | 0 | 0.5676 |
| Difference in STR | = (Subs.STR - ParentSTR) | -0.0067 | 0.1145 | -0.4676 | 0.4676 |
| Dummy High Tax Country (D-HTC) | =1 if (Difference in STR)>0 | 0.4677 | 0.4990 | 0 | 1 |
| Dummy Low Tax Country (D-LTC) | =1 if (Difference in STR)<0 | 0.5055 | 0.5000 | 0 | 1 |
| Difference in STR, if D-HTC=1 | | 0.0887 | 0.0756 | 0.0001 | 0.4676 |
| Difference in STR, if D-LTC=1 | | -0.0899 | 0.0735 | -0.4676 | -0.0001 |
| GDP | in billion US-$, current prices | 1047.7 | 820.96 | 3.76 | 2791.7 |
| GDP per Capita | in PPP, EU-25=100 | 107.32 | 21.51 | 29.70 | 247.50 |
| GDP Real Growth Rate | in %, relative to previous year | 2.79 | 1.83 | -1.50 | 16.00 |
| Globalization Index | from KOF Swiss Econ. Institute | 84.69 | 6.81 | 42.02 | 93.21 |
| Corruption Index | Corruption Perceptions Index (CPI) from Transparency Intern. | 7.54 | 1.58 | 2.70 | 10.00 |

subsidiary.[10] Moreover, 30% of the firms in this MNE–sample are owned by a parent company that is located outside of the EU–24. Thus, for 70% of the cases there exists an immediate EU–parent, which, however, does not exclude the possibility that the global ultimate owner of these MNEs is located outside of the EU–24.

The descriptive statistics of the micro and macro data are presented in Table 1.[11] The mean of the statutory tax rate (STR) of a subsidiary and of a parent is nearly 35%, respectively. Thus, the mean of the difference of both STRs is almost zero (-0.67%), with a standard deviation of 11.5 percentage points. Compared to the STR of the respective parent, 46.8% of our firms are located in a high tax country, 50.6% in a low tax country, and for 2.6% of our firms both STRs are equal. For the 'high (low)

[10]The average number of subsidiaries in the entire sample is 1.1, in the group of affiliates with solely domestic subsidiaries is 2.5, in the group of affiliates with at least one foreign subsidiary is 6.4.

[11]Data on GDP per capita and GDP real growth rate comes from the European Statistical Office (Eurostat), data on GDP comes from the IMF as Eurostat solely provides data in the eurocurrency. Data of the globalization index is from the KOF Swiss Economic Institute (http://globalization.kof.ethz.ch), data of the corruption index (Corruption Perceptions Index – CPI) is from 'Transparency International' (http://www.icgg.org/corruption.cpi.html).

tax country firms' the average difference in the STR is about 9% (-9%).

# 4 Empirical analysis

In this section, we start with discussing the estimation approach and the baseline specification. Then, Section 4.1 presents our main empirical results for a panel and a cross–section study. In Section 4.2, a range of robustness checks are undertaken. In an extension in Section 4.3, the influence of the ownership share on the shifting intensity is empirically analyzed.

The applied specification is the regression of unconsolidated pre–tax profits[12] of profit–making subsidiaries of MNEs on various firm and country characteristics and additionally on the statutory corporate tax rate differential. This bilateral differential is the difference of the STR of an affiliated company in the EU–24 to the STR of its worldwide immediate foreign shareholder who owns at least 90% of the shares (parent). Taking tax differentials is a more precise procedure in capturing the extent of the profit shifting incentive for a MNE than just working with STRs of the subsidiary. Quantitative interpretations of purely tax *rate* coefficients have to be taken with care. Calculated tax rate effects on pre–tax profits might not be confined to profit shifting activities, as the incentive to invest in a given country also decreases with the corporate tax rate.[13]

Thus, based on our main hypothesis from Eq. (7) of the theoretical model[14], the econometric model for the empirical analysis is

$$PBT_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Y_{jt} + \delta DIFFSTR_{it} + \mu z_i + \varphi v_j + \epsilon_{ijt} \tag{8}$$

with subindex $i$ denoting the observational unit on the micro level, i.e. a subsidiary, and subindex $j$ denoting the macro level, i.e. a member state of the EU–24. Subindex

[12]Pre–tax profits are taken form the balance sheet item 'Profit (Loss) before Taxation' which is net of all costs but before taxation. Using EBIT, which includes interest payments, as dependent variable would blur the effect of the tax differential as these payments can also serve as a profit shifting channel.

[13]By constructing the tax differential, the *statutory* tax rate is the relevant tax measure for an analysis of profit shifting (see e.g. Devereux (2006)). Furthermore, a MNE can define its own tax base by the shifting of profits. Thus, using effective (marginal or average) tax rates instead of statutory rates would be misleading in this application. We will discuss this general identification problem of the tax rate further at the end of Section 4.2.

[14]Note that to confer the theoretical model on our empirical specification the status of the parent and of the subsidiary have to switch. Hence, from the perspective of the subsidiary, the cost of shifting term is irrelevant which further simplifies the derivative in Eq. (7).

$t$ indicates the time period. $PBT_{it}$ is the log of profit before taxation and $X_{it}$ is a vector of firm characteristics. These control variables on the micro level are fixed assets as a proxy for the installed capital, the cost of employees as a proxy for the use of labor, and the financial leverage ratio. All firm variables are calculated per employee to control for economies of scale and are transformed in logarithmic form. $Y_{jt}$ is a vector of country characteristics. These control variables on the macro level are GDP, GDP per capita, GDP growth rate, and indices for the degree of globalization and corruption of a country. $DIFFSTR_{it}$ stands for the statutory tax rate differential of affiliate $i$ in year $t$ to its foreign parent. Unobserved variables on the firm level are represented by $z_i$ and on the country level by $v_j$, the error term is denoted by $\epsilon_{ijt}$. We will include industry and country dummy variables in the cross–section analysis and year dummies in the panel regressions.

The panel structure of our sample allows the application of fixed–effect methods (FE) on the micro level which alleviates the serious problem of unobservable firm–specific factors in explaining variations in profits, e.g. management quality or special product popularity. Unfortunately, as data on the ownership structure is, till now, only available for the cross–section of the year 2004, the last reported date in most cases, an additional assumption has to be made to get the advantage of the FE model. We have to assume that the country of a firm's immediate shareholder has not changed within the time period of 1995–2005 and is the same as in the year 2004. Additionally, we have to assume that a parent's ownership share does not fall below 90% throughout this period.[15]

## 4.1 Empirical results

The first set of regressions is shown in Table 2 and 3. Table 2 displays the FE regressions for the years 1995–2005 of our baseline specification from Eq. (8) for up to 13741 subsidiaries with on average 4.6 observations per firm. The log of fixed assets per employee and the log of costs per employee are throughout highly significant at the 1%–level. The coefficients of these firm variables are quite stable in all different specifications and sum to about 0.64 which would denote decreasing returns to scale. The contribution of labor to pre–tax profits is about four times higher than that of capital and an increase in the labor input of 1% leads to a rise in pre–tax profits of 0.51%. Controlling for fixed firm effects we can explain about 75% of the variation of

[15]We have compared our 2004 ownership data with that of the year 1998 and found that for 87% of our subsidiaries the country of the immediate shareholder is the same for both years.

**Table 2: Indirect Evidence of Profit Shifting**

**Fixed-Effects, panel 1995-2005**

Dep. Var: PROFIT BEFORE TAXATION

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| FIXED ASSETS | 0.1169*** | 0.1167*** | 0.1213*** | 0.1341*** | 0.1389*** |
| | (11.16) | (11.14) | (10.90) | (12.59) | (12.20) |
| COST of EMPLOYEES | 0.5050*** | 0.5071*** | 0.5041*** | 0.5084*** | 0.5139*** |
| | (23.83) | (23.78) | (22.83) | (22.50) | (21.68) |
| financial leverage ratio | | | | -1.3370*** | -1.3489*** |
| | | | | (-26.32) | (-25.17) |
| difference stat. tax rate | -0.7504*** | -0.7824*** | -0.6513*** | -0.8273*** | -0.6900*** |
| | (-4.78) | (-5.01) | (-4.07) | (-5.26) | (-4.32) |
| GDP | | -0.5122*** | -0.2956*** | | -0.5479*** |
| | | (-4.32) | (-2.76) | | (-5.04) |
| GDP per CAPITA | | 0.7933*** | | | |
| | | (3.32) | | | |
| gdp growth rate | | | 0.0228*** | | 0.0160** |
| | | | (3.43) | | (2.40) |
| GLOBALIZATION INDEX | | | 2.0953*** | | 2.0885*** |
| | | | (5.22) | | (5.18) |
| CORRUPTION INDEX | | | 0.1503** | | 0.2430*** |
| | | | (2.11) | | (3.38) |
| Year dummies | Yes | Yes | Yes | Yes | Yes |
| Observations | 66045 | 66045 | 61226 | 60929 | 56374 |
| Firms | 13741 | 13741 | 13389 | 13208 | 12855 |
| Avg. years per firm | 4.8 | 4.8 | 4.6 | 4.6 | 4.4 |
| Countries | 24 | 24 | 24 | 24 | 24 |
| Adjusted $R^2$ | 0.7371 | 0.7372 | 0.7431 | 0.7533 | 0.7594 |

Note:
Variables in capital letters calculated in logarithmic term. All firm variables calculated per employee and in logarithmic term, besides of the leverage ratio. t-values in parentheses based on robust standard errors adjusted for firm clusters. *,**,*** = significance at the 10%, 5%, 1% level. Adjusted $R^2$ values calculated from a dummy variables regression equivalent to the fixed-effects model.

profits before taxation.[16]

The influence of the tax difference is consistently negative and highly significant which confirms our theoretical expectations from Eq. (7) and, thus, gives indirect evidence for profit shifting. On average, our results suggest a decrease in pre–tax profits of 7.4% if the statutory tax rate difference of an affiliated firm to its parent increases by 10 percentage points. Our most preferred specification, regression (5) of Table 2, yields a coefficient of the tax differential of 0.69. All time–constant country effects are controlled for by the FE approach, as these country effects are the same for all firms of a country. However, to control for time–varying country effects, we include GDP as a proxy for the market size and GDP per capita, both in logarithmic terms, in specification (2). Surprisingly, the coefficient of GDP turns out significantly negative. An explanation could be that big markets are characterized by a high degree of competition which results in lower profits. GDP per capita as a proxy for the overall economic

[16]The presented adjusted $R^2$ values of all FE regressions done in this paper are calculated from a dummy variables regression equivalent to the FE model.

development of a country has a significantly positive influence on firm profits which indicates that richer countries possess the more advanced technologies with a more profitable production. The inclusion of country or industry dummy variables is not feasible in FE regressions as these variables do not change over time.

To control for further macro effects which are not constant over time, in specification (3) we additionally include the GDP growth rate as a proxy for the economic situation and (logarithmized) indices for the degree of globalization and corruption as proxies for the institutional framework of a country.[17] All of these variables show a positive and significant effect. In specification (4) and (5) we incorporate the financial leverage ratio of a subsidiary which results in a highly significant and large negative coefficient of -1.3. This is not surprising as the balance sheet item 'profit (loss) before taxation' is minus all deductible costs which includes interest payments, in contrast to EBIT or EBITDA. The coefficients of all other explainable variables stay stable and significant and the adjusted $R^2$ value rises to 0.76 in regression (5).

We have also run the regressions from above in an OLS cross–section for the year 2004, results are presented in Table 3. This is done for a fundamental robustness test because of the data restrictions of the ownership information mentioned at the end of the last section. However, with the cross–section analysis we cannot control for fixed firm effects which consequently results in higher coefficients of the tax differential and in a small $R^2$ value of about 0.30, less than the half of the value from the FE regressions. Though, all decisive effects are still significant with the right sign. In the cross–section analysis we can now include 59 industry dummy variables (NACE Rev.1 2–digit level). In regression (6) and (7) we leave out the macro control variables but instead include country dummies. This inclusion is feasible as the tax differential varies across firms. Basically, the coefficient of the tax differential decreases substantially if macro variables or instead country dummies are included.

For the FE regressions presented in Table 4 we construct two separate samples of subsidiaries located in a high tax country (HTC) relative to the tax rate of their parent, and, vice versa, of subsidiaries located in a low tax country (LTC) relative to their parent's STR, to distinguish between respective shifting intensities. The coefficient of the tax difference turns out to be about three times higher for firms in a HTC (-1.23 in specification (3)) than for firms in a LTC (-0.40 in (6)) which indicates a much

[17] We leave out GDP per capita in specification (3) because of its high correlation with the index of globalization and with the index of corruption.

**Table 3: Indirect Evidence of Profit Shifting**

**OLS, cross-section 2004**

Dep. Var: PROFIT BEFORE TAXATION

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| FIXED ASSETS | 0.2831*** | 0.2825*** | 0.2855*** | 0.2685*** | 0.2689*** | 0.2853*** | 0.2678*** |
| | (8.05) | (8.18) | (8.29) | (8.93) | (9.06) | (8.31) | (9.15) |
| COST of EMPLOYEES | 0.5940*** | 0.6198*** | 0.6269*** | 0.6035*** | 0.6377*** | 0.6511*** | 0.6539*** |
| | (11.75) | (10.01) | (10.08) | (11.00) | (9.13) | (10.15) | (9.50) |
| financial leverage ratio | | | | -1.4086*** | -1.4182*** | | -1.4257*** |
| | | | | (-8.77) | (-8.35) | | (-8.13) |
| difference stat. tax rate | -2.1127*** | -1.9458*** | -1.7628*** | -1.5252*** | -1.3136*** | -1.3027*** | -0.9595*** |
| | (-5.07) | (-7.33) | (-5.88) | (-3.43) | (-4.64) | (-5.38) | (-4.19) |
| GDP | | 0.0230 | 0.0373* | | 0.0359 | | |
| | | (0.74) | (1.76) | | (1.64) | | |
| GDP per CAPITA | | -0.2470* | | | | | |
| | | (-1.86) | | | | | |
| gdp growth rate | | | 0.0684** | | 0.0386 | | |
| | | | (2.32) | | (1.23) | | |
| GLOBALIZATION INDEX | | | -0.4843 | | 0.1960 | | |
| | | | (-0.83) | | (-0.35) | | |
| CORRUPTION INDEX | | | 0.0101 | | -0.1758 | | |
| | | | (0.08) | | (-1.19) | | |
| 59 industry dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country dummies | No | No | No | No | No | Yes | Yes |
| Countries | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Observations | 9104 | 9104 | 9104 | 8412 | 8412 | 9104 | 8412 |
| $R^2$ | 0.2619 | 0.2626 | 0.2632 | 0.3092 | 0.3105 | 0.2676 | 0.3149 |

Note:
Variables in capital letters calculated in logarithmic term. All firm variables calculated per employee and in logarithmic term, besides of the leverage ratio. t-values in parentheses based on robust standard errors, clustered within 18 country cells. *,**,*** = significance at the 10%, 5%, 1% level.

more elastic tax base in HTCs than in LTCs in Europe.[18] Together with the fact that almost the half of the firms from our main sample are located in a HTC of this definition (see Table 1), the empirical findings suggest that the net effect of profits shifted in and out of the EU–24 is negative. Overall, profits seems to be shifted out of the EU–24. One explanation could be the higher appearance of tax havens outside of the EU because 31.2% (29.1%) of our HTC–firms (LTC–firms) exhibit a Non–EU–parent. These Non–EU–parents are potentially located in tax havens and shift high levels of profits from their EU–subsidiaries to this tax haven. Otherwise, some EU–parents additionally have Non–EU–subsidiaries which could be located in tax havens outside of the EU. These parents shift profits possibly increasingly or solely to their tax–haven–subsidiaries although their EU–subsidiaries (our observational units) are LTC–firms.

[18]Note that for firms in a HTC (LTC) the difference of the STR to its parent is positive (negative).

**Table 4: Profit Shifting in High Tax vs. Low Tax Countries**

**Fixed-Effects, panel 1995-2005**

Dep. Var: PROFIT BEFORE TAXATION

| | (1) HTC | (2) HTC | (3) HTC | (4) LTC | (5) LTC | (6) LTC |
|---|---|---|---|---|---|---|
| FIXED ASSETS | 0.1493*** | 0.1485*** | 0.1667*** | 0.0780*** | 0.0774*** | 0.1045*** |
| | (7.54) | (7.52) | (7.63) | (6.50) | (6.44) | (7.99) |
| COST of EMPLOYEES | 0.5976*** | 0.6016*** | 0.5955*** | 0.4539*** | 0.4531*** | 0.4577*** |
| | (14.93) | (15.01) | (13.58) | (17.15) | (17.07) | (15.15) |
| financial leverage ratio | | | -1.4243*** | | | -1.2558*** |
| | | | (-15.16) | | | (-18.24) |
| difference stat. tax rate | -1.5273*** | -1.5185*** | -1.2337*** | -0.4661** | -0.4653** | -0.3990* |
| | (-4.18) | (-4.21) | (-3.34) | (-2.10) | (-2.09) | (-1.72) |
| GDP | | -0.6521*** | -0.6660*** | | -0.3894*** | -0.3983*** |
| | | (-2.83) | (-3.08) | | (-2.49) | (-2.75) |
| GDP per CAPITA | | -0.5677 | | | 1.1724*** | |
| | | (-1.30) | | | (3.57) | |
| gdp growth rate | | | 0.0107 | | | 0.0101 |
| | | | (0.87) | | | (1.15) |
| GLOBALIZATION INDEX | | | 0.3566 | | | 3.3728*** |
| | | | (-0.48) | | | (6.27) |
| CORRUPTION INDEX | | | 0.3175*** | | | 0.1868 |
| | | | (-3.00) | | | (1.61) |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 25948 | 25948 | 22872 | 37676 | 37676 | 31659 |
| Firms | 6450 | 6450 | 5959 | 9077 | 9077 | 8248 |
| Avg. years per firm | 4.0 | 4.0 | 3.8 | 4.2 | 4.2 | 3.8 |
| Countries | 24 | 24 | 24 | 24 | 24 | 24 |
| Adjusted $R^2$ | 0.7577 | 0.7579 | 0.7733 | 0.7509 | 0.7511 | 0.7735 |

Note:
Regressions (1)-(3) done solely with affiliates in high tax countries (HTC) regarding their parent's tax rate, regressions (4)-(6) done solely with affiliates in low tax countries (LTC). Variables in capital letters calculated in logarithmic term. All firm variables calculated per employee and in logarithmic term, besides of the leverage ratio. t-values in parentheses based on robust standard errors adjusted for firm clusters. *,**,*** = significance at the 10%, 5%, 1% level.
Adjusted $R^2$ values calculated from a dummy variables regression equivalent to the fixed-effects model.

## 4.2 Robustness checks

At first, we vary the method of normalization. Instead of dividing by the number of employees, we alternatively calculate our firm variables in ratios of operating revenue/turnover and of total assets. In both FE regressions analogous to specification (5) of Table 2 we get the same qualitative results of all explainable variables but a smaller coefficient of the tax differential of -0.54. A firm's number of employees is likely to be less influenced by tax rates than monetary values which makes a division by the number of employees a more suitable way to control for economies of scale.[19] Instead of using the cost of employees as a proxy for the labor input, we alternatively took the number of employees. Again, we find no significant change in our results and obtain a slightly larger coefficient of the tax differential of -0.65.

The fact that some firms in our sample have the same parent could possibly bias the

[19]Without any normalization, our results again do not change qualitatively. The effect of the tax differential is very similar, -0.65, and the adjusted $R^2$ value rises to 0.84.

standard errors or overestimate the effect of the tax differential. To manage this problem, we randomly deleted observations with a duplicated firm–parent–interconnection to exclusively keep firms with unique parents in the sample. With 11421 subsidiaries this sub–sample reduces to roughly the half of our original sample. All repeated regressions of Table 2 and 3 yield very similar quantitative results. The coefficient of the tax differential turns out to be even slightly larger (-0.75), compared to our preferred specification (5) of Table 2, and again significant at the 1%–level.

A fundamental robustness check to confirm our profit shifting inference is to compare the tax rate elasticities of MNEs with those of purely nationally organized companies (cf. Mintz and Smart (2004)). In such an analysis, we obviously have to revert to the STR as tax rate differences to a foreign parent do not exist for Non–MNEs. In the first approach, we construct a separate sample of nearly 110000 individual *domestic* firms with no shareholders and no subsidiaries (Domestic–sample) to compare these regressions with those done with our initial MNE–sample.[20] These regressions are shown in Table A1 in the Appendix. For the purpose of a qualitative robustness test, in this comparison and in the following, we focus on cross–section analysis for the year 2004 with OLS to get undoubted ownership information necessary for correctly separating a multinational from a domestic company.[21] It is inappropriate to include country dummy variables additionally to the STR as then, the effect of the STR would not be identified. We find no significance of the STR with the Domestic–sample (regressions (1)–(3)) but highly significant negative coefficients of the STR with the MNE–sample (regressions (4)–(6)). This underlines the relevance of the STR for companies with at least one connection to a foreign country via its shareholder or via one or more subsidiaries in explaining variations in pre–tax profits. This in turn supports our prior profit shifting findings.[22]

In the second approach, we merge two samples and do cross–section regressions for the year 2004 on the whole sample of 77591 firms. The first sample (NonMNE–sample, 70% of all firms) contains firms with a purely *national structure*, i.e. they are *all* owned by a *domestic* shareholder (with at least 90% of the shares) and also

[20]For this analysis, our initial MNE–sample is broadened by firms with no or no *foreign* immediate shareholder but with *at least one* foreign subsidiary owned with minimum 90% of the shares.

[21]See the beginning of Section 4 for a discussion on the ownership data restrictions.

[22]Specification (3) and (6), respectively, of Table 5 are added because of a high correlation between the STR and GDP and between the STR and GDP growth rate in the Domestic–sample which could result in an insignificance of the respective coefficients due to multicollinearity problems.

have solely domestic subsidiaries, if any.[23] The second sample (MNE–sample, 30% of all firms) consists of our initial MNE–sample used in the regressions of Table 2 and 3. These two samples contain firms which all are very similar and comparable in their ownership structure but with the fundamental difference that the NonMNEs have no direct access to foreign countries and therefore cannot exploit differences in international STRs to shift profits. According to this, we set the difference in the STR of a firm to its parent equal to zero for all NonMNE–firms. Regression results are presented in column (1)–(5) of Table A2 in the Appendix. The coefficient of the MNE–dummy suggests that MNEs make significant higher pre–tax profits per employee than national structured firms. The impact of our designed tax differential on profits before taxation is significantly negative despite of the large share of NonMNEs in the whole sample whose tax differential is equal to zero. In regressions (3)–(5) the STR enters additionally to capture the tax rate effect segregated. The STR shows a significant and large negative effect which reduces the coefficient of the tax differential. However, the supplemental effect of the tax differential remains negative and significant which supports our initial qualitative results on the profit shifting evidence.

Finally, in regressions (6) and (7) of Table A2 in the Appendix we solely use our MNE–sample and additionally control for the STR. The two specifications are identical to (1) and (5) of Table 3, only the STR is appended. This last robustness check mitigates the potential identification problem discussed in the next paragraph. The effect of the tax differential, which gives MNEs the incentive to shift profits, is still negative and significant at the 1%–level. The cross–section results for the year 2004 suggest that a decrease in the STR of a firm's foreign parent of 10 percentage points leads to a drop in the firm's reported pre–tax profits of nearly 10%, other things being equal.

The empirical literature on indirect evidence of profit shifting potentially suffers from a general identification problem of the STR effect on pre–tax profitability, as mentioned recently by Becker and Fuest (2007). They argue that high tax countries are likely to attract investment projects which yield low profits and contribute little to the host countries' corporate tax revenue whereas low tax countries can expect 'good' investments with high profits. They call this the composition effect of corporate taxation on foreign direct investment. Potentially, the empirical effect of the STR on pre–tax profits does not represent profit shifting but rather the result of the selection process in the 'portfolio–decision' of the MNE where to locate their foreign subsidiaries, as suggested by Becker and Fuest (2007). Devereux (2006) discusses this identification

[23] 80% of these NonMNEs have no subsidiaries and 20% own one or more domestic subsidiaries.

problem and gives a comprehensive literature overview (e.g. p. 12-13 or p. 25-26). He argues that the location decision conditional on producing abroad (the incentive to invest in a foreign country) is predominantly influenced by the *effective average tax rate (EATR)* and that the optimal level of investment conditional on the location should be determined by the *effective marginal tax rate (EMTR)*. The decision of location is, e.g., analyzed by Devereux and Griffith (1998) who provide evidence that the EATR is highly significant in this discrete decision (see also Stöwhase (2002)). At the final stage, the location of profits should be determined mainly by the STR or, in the more strict sense, by the STR *differential*, as used in our paper.[24]

## 4.3 Influence of the parent's ownership share

The theoretically stimulating effect of the parent's ownership share of its subsidiary on the level of shifting is described in Section 2. An increase in the ownership share leads to a boost in profit shifting activities via the *management effect* as the feasibility of implementing more shifting strategies improves due to more share voting rights or more management influence at the subsidiary.

To test this hypothesis from Eq. (6) empirically, we construct a new sample of MNEs with the same criteria as our initial MNE–sample except for the fact that the parent's minimum direct ownership share of its foreign subsidiary is relaxed to 25%. The average ownership share in this new sample is 93% with a standard deviation of 16 (see Table 1). To capture the additional effect of the ownership share we generate an interaction term between the STR difference and the parent's direct ownership share. Based on our hypothesis from Eq. (6) in combination with our indirect approach of profit shifting evidence from Eq. (7), we would expect a significantly negative coefficient of this interaction term to represent *more* shifting via an additional impact of the tax differential on pre–tax profits for a higher ownership share.

Regression results of a cross–section analysis for the year 2004 with OLS are shown

[24]The endogenous choice of a MNE to establish a foreign subsidiary is incorporated in the empirical analysis of Egger, Eggert, and Winner (2007). They control for this bias of self–selection by applying the procedure of *propensity score matching*. Hence, they can provide strong evidence that foreign–owned subsidiaries exhibit about half as much profit tax payments than affiliates with solely domestic owners, using also the AMADEUS database. Our paper proposes profit shifting as one of the main reasons for this gap in tax payments.

**Table 5: Parent's Ownership Share and Profit Shifting**

**OLS, cross-section 2004**

Dep. Var: PROFIT BEFORE TAXATION

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| FIXED ASSETS | 0.2477*** | 0.2485*** | 0.2738*** | 0.2725*** | 0.2477*** | 0.2485*** |
| | (9.72) | (9.76) | (8.70) | (8.42) | (9.72) | (9.76) |
| COST of EMPLOYEES | 0.6460*** | 0.6541*** | 0.6755*** | 0.6538*** | 0.6460*** | 0.6541*** |
| | (9.12) | (9.36) | (9.78) | (12.81) | (9.12) | (9.36) |
| financial leverage ratio | -1.4799*** | -1.4739*** | | | -1.4799*** | -1.4739*** |
| | (-8.14) | (-8.13) | | | (-8.14) | (-8.13) |
| statutory tax rate | | -2.1246* | | -2.5427*** | | -2.1246* |
| | | (-1.83) | | (-2.96) | | (-1.83) |
| difference stat. tax rate | -1.1852*** | -0.7518*** | -1.0691*** | -1.1768*** | 1.7904 | 2.1906 |
| | (-5.06) | (-3.10) | (-4.73) | (-4.71) | (1.16) | (1.62) |
| interact.(diff.STR)x(Ownership-MeanOwnership) | -3.2003* | -3.1645** | -3.5380*** | -3.1657*** | | |
| | (-2.00) | (-2.48) | (-3.15) | (-3.26) | | |
| interact.(diff.STR)x(Ownership) | | | | | -3.2003* | -3.1645** |
| | | | | | (-2.00) | (-2.48) |
| parent's ownership share | 0.1734 | 0.1288 | -0.0997 | 0.0800 | 0.1734 | 0.1288 |
| | (1.41) | (1.16) | (-0.88) | (0.63) | (1.41) | (1.16) |
| Macro Control Variables | Yes | Yes | No | No | Yes | Yes |
| 59 industry dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Country dummies | No | No | Yes | No | No | No |
| Countries | 17 | 17 | 17 | 17 | 17 | 17 |
| Observations | 8107 | 8107 | 8815 | 8815 | 8107 | 8107 |
| $R^2$ | 0.3165 | 0.3173 | 0.2731 | 0.2667 | 0.3165 | 0.3173 |

Note:
'interact.(diff.STR)x(Ownership-MeanOwnership)' is the interaction term between the difference in the statutory tax rates and the deviation of the parent's direct ownership share from its mean (correlation of these two variables is 12.8%). 'interact.(diff.STR)x (Ownership)' is the interaction between the tax difference and the ownership share (correlation of these two variables is 98.95%). Macro control variables are: GDP, gdp growth rate, GLOBALIZATION and CORRUPTION INDEX. Variables in capital letters calculated in logarithmic term. All firm variables calculated per employee and in logarithmic term, besides of the leverage ratio. t-values in parentheses based on robust standard errors, clustered within 18 country cells. *,**,*** = significance at the 10%, 5%, 1% level.

in Table 5.[25] The familiar control variables on the macro level are not listed. Due to the large number of firms with a parent that fully owns the affiliate (73% of the firms), the tax differential and an interaction term with the ownership share is highly correlated (98.95%) which reduces the significance of both coefficients due to multicollinearity reasons (see regressions (5) and (6) in Table 5). The interpretation of such an interaction effect is also not straightforward. For this reason, to get a more clear-cut interpretation, we calculate the interaction term by multiplying the tax differential with the *deviation of the ownership share from its mean* ('centering'). The correlation between these two variables is at the moderate level of 12.8%. Results are presented in regressions (1)–(4) of Table 5. Basically, the coefficient of the tax differential describes the effect of the tax difference on pre–tax profits for an *average ownership share of 93%*. For an ownership share above this mean, an increase in the STR difference has a stronger

[25]The cross–section analysis for the year 2004 is again preferred to the FE panel study due to the data restrictions on the ownership structure addressed in the last paragraph.

negative impact on pre–tax profits than for ownership shares below the mean.[26] Thus, an increase in the ownership share, holding the tax differential fixed, strengthens profit shifting in the sense that the sum of both coefficients decreases further. This is in line with our hypotheses from Eq. (6) and (7). In specification (3) and (4) of Table 5 we leave out the leverage ratio and the macro controls but include country dummy variables in specification (3). In these regressions the coefficient of the interaction term is significant at the 1%–level. To conclude, our results provide (indirect) evidence that firms with a higher parent's ownership share are engaged in a higher level of profit shifting.

Robust results can also be inferred without 'centering' the ownership share in the interaction term. Results with this interaction term are presented in regression (5) and (6) of Table 5.[27] As mentioned above, multicollinearity leads now to higher standard errors which strongly reduces the significance but leaves the estimators unbiased. Nevertheless, the negative and large effect of the interaction term stays significant.[28]

# 5 Conclusions

The paper provides indirect evidence for profit shifting by multinationals owning subsidiaries within the EU using the European micro database AMADEUS. We explain variations in pre–tax profits of profit–making subsidiaries located in the EU with the statutory tax rate difference of these affiliates to their respective foreign parents, while controlling for a range of firm and country variables. Whereas the qualitative results of our profit shifting evidence mainly come from a cross–section analysis for the year 2004, the quantitative results are derived from a panel analysis of 1995–2005 with fixed–effects regressions controlling for unobserved firm effects. Our regressions indicate a

[26]This results as the coefficient of the interaction term multiplied with the respective (positive or negative) deviation from the ownership mean has to be added to the original coefficient of the tax differential.

[27]It is evident that with this modification all coefficients of regression (5) and (6) are equal to the respective results in regression (1) and (2), except for the tax differential.

[28]Now, the coefficient of the tax differential gives the effect of the tax difference on pre–tax profits for an ownership share of *zero*. Thus, with an increasing ownership share the total effect of the tax differential (the sum of both coefficients) decreases, and gets negative at an ownership share of 69% (for regression (6)). Above this share, the effect of the tax differential on pre–tax profits is negative. Focusing on this group, a further increase in the ownership share, holding the tax differential fixed, intensifies profit shifting in the sense that the sum of both coefficients decreases further.

highly significant negative impact of the tax differential on profits before taxation. The results suggest a decrease in pre–tax profits of about 7% if the tax rate difference of a subsidiary to its immediate shareholder increases by 10 percentage points.

The coefficient of the tax differential of affiliates in high tax countries (relative to the tax rate of the parent) turns out to be about three times higher than for subsidiaries located in low tax countries. This indicates for Europe a much more elastic tax base in high tax countries. We interpret this as an overall shift of profits out of the EU. Furthermore, we provide empirical evidence that a higher parent's ownership share of a subsidiary leads to an increase in the level of shifting between these two affiliates and vice versa. We include this ownership effect of enhanced or reduced shifting possibilities in our simple theoretical model. Several fundamental robustness checks to confirm our profit shifting inference were undertaken. Two comparisons of the tax effects of MNEs with those of domestic individual enterprises and with those of purely national organized companies support our results.

Future research should aim at identifying specific channels for profit shifting with European micro data. For example, data on intangible assets could serve as a proxy for R&D expenditures, which in turn could be used to provide indirect evidence of profit shifting via the *overhead costs* channel. A R&D intensive MNE benefits from the higher intransparency that came along with its products as it is much more difficult to estimate arm's length prices for unique (high–tech) products (e.g. pharmaceuticals, semiconductors as well as patents, royalties or advertising). This leads to a lower probability of detection and, thus, to lower shifting costs, which should result in a higher level of shifting. Furthermore, while empirically explaining the potential net shifting of profits out of the EU, future research on this issue should analyze the relevance of international tax havens.

# 6 Appendix

**Table A1: Robustness 1 - MNEs vs. Domestic Individual Firms (Dom.)**

**OLS, cross-section 2004**

Dep. Var: PROFIT BEFORE TAXATION

| | (1) Dom. | (2) Dom. | (3) Dom. | (4) MNEs | (5) MNEs | (6) MNEs |
|---|---|---|---|---|---|---|
| FIXED ASSETS | 0.2649*** | 0.2591*** | 0.2600*** | 0.3243*** | 0.3285*** | 0.3234*** |
| | (14.97) | (13.10) | (13.10) | (10.08) | (10.70) | (10.01) |
| COST of EMPLOYEES | 0.7512*** | 0.7859*** | 0.7507*** | 0.6127*** | 0.6283*** | 0.6317*** |
| | (30.27) | (18.92) | (17.05) | (10.27) | (9.19) | (9.36) |
| financial leverage ratio | -1.5576*** | -1.5921*** | -1.6104*** | -1.4403*** | -1.4486*** | -1.4479*** |
| | (-7.83) | (-7.37) | (-7.20) | (-9.88) | (-9.63) | (-9.69) |
| statutory tax rate | 0.7485 | 2.3379 | -1.0493 | -2.2563*** | -3.0518*** | -2.3672*** |
| | (0.61) | (1.08) | (-0.79) | (-2.78) | (-8.16) | (-2.81) |
| GDP | | -0.0240* | | | 0.0936*** | |
| | | (-1.99) | | | (7.05) | |
| GDP per CAPITA | | | 0.7268 | | | 0.0077 |
| | | | (1.45) | | | (0.03) |
| gdp growth rate | | -0.1112 | | | 0.0277 | |
| | | (-1.11) | | | (1.55) | |
| GLOBALIZATION INDEX | | 0.4132 | -0.0215 | | -0.3658* | 0.1172 |
| | | (0.41) | (-0.02) | | (-1.83) | (0.12) |
| CORRUPTION INDEX | | -0.0154 | -0.5229* | | -0.1341* | -0.1897 |
| | | (-0.05) | (-1.76) | | (-1.76) | (-1.57) |
| 59 industry dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Countries | 18 | 18 | 18 | 18 | 18 | 18 |
| Observations | 108646 | 108646 | 108646 | 12933 | 12933 | 12933 |
| $R^2$ | 0.3813 | 0.3847 | 0.3833 | 0.4009 | 0.4034 | 0.4014 |

Note:
Regressions (1)-(3): Exclusively firms with no subsidiaries and no sharholders (Domestic-sample). Regressions (4)-(6): Firms with a foreign immediate shareholder *or at least one* foreign subsidiary (MNE-sample). The correlation between STR and GDP and between STR and GDP growth rate is 0.86, respectively, in regression (2). Variables in capital letters calculated in logarithmic term. All firm variables calculated per employee and in logarithmic term, besides of the leverage ratio. t-values in parentheses based on robust standard errors, clustered within 18 country cells. *,**,*** = significance at the 10%, 5%, 1% level.

## Table A2: Robustness 2 - MNEs & National Structured Firms (NonMNEs)

**OLS, cross-section 2004**

Dep. Var: PROFIT BEFORE TAXATION

| | (1) | (2) | (3) | (4) | (5) | (6) MNEs | (7) MNEs |
|---|---|---|---|---|---|---|---|
| FIXED ASSETS | 0.2838*** | 0.2639*** | 0.2870*** | 0.2862*** | 0.2650*** | 0.2848*** | 0.2695*** |
| | (14.26) | (17.44) | (14.58) | (14.53) | (17.05) | (8.24) | (9.09) |
| COST of EMPLOYEES | 0.7494*** | 0.7351*** | 0.8255*** | 0.8020*** | 0.7438*** | 0.6284*** | 0.6439*** |
| | (10.69) | (16.81) | (11.37) | (12.13) | (16.76) | (11.36) | (9.01) |
| financial leverage ratio | | -1.5140*** | | | -1.4989*** | | -1.4128*** |
| | | (-10.12) | | | (-10.04) | | (-8.28) |
| statutory tax rate | | | -3.6750*** | -3.6351*** | -2.6735** | -2.0830** | -1.6333* |
| | | | (-2.75) | (-2.73) | (-2.37) | (-2.38) | (-1.74) |
| difference stat. tax rate | -2.5711*** | -1.7755** | -1.7409*** | -1.3057** | -1.3816* | -1.3915*** | -0.9942*** |
| (=0 for NonMNEs) | (-4.30) | (-2.31) | (-2.80) | (-2.43) | (-1.76) | (-5.33) | (-4.63) |
| GDP | | -0.0153 | | | 0.0111 | | 0.0436* |
| | | (-0.55) | | | (0.53) | | (1.85) |
| gdp growth rate | | 0.0151 | | | -0.0509 | | 0.0046 |
| | | (0.39) | | | (-0.93) | | (0.12) |
| GLOBALIZATION INDEX | | 3.4464*** | | | 2.8477*** | | -0.1514 |
| | | (2.89) | | | (4.13) | | (-0.27) |
| CORRUPTION INDEX | | -0.2691 | | | -0.2300 | | -0.1848 |
| | | (-1.23) | | | (-1.17) | | (-1.28) |
| dummy MNE | 0.1981** | 0.1619*** | | 0.1911*** | 0.1561*** | | |
| | (2.54) | (2.87) | | (3.38) | (2.88) | | |
| 59 industry dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Countries | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Observations | 45469 | 41828 | 45469 | 45469 | 41828 | 9104 | 8412 |
| $R^2$ | 0.3168 | 0.3628 | 0.3205 | 0.3221 | 0.3639 | 0.2635 | 0.3110 |

Note:
Regressions (1)-(5): Sample consists of 2 sub-samples: 70% of the firms are in the NonMNE-sample (=firms with a purely national structure: owned by a domestic shareholder with at least 90% shares and own solely domestic subsidiaries, if any), 30% of the firms are in the MNE-sample (=original sample of MNEs used in the initial regressions of table 2-4). The difference in the STR of a subsidiary to its parent is set equal to zero for all NonMNE-firms. 'Dummy MNE' is equal to 1 if a firms is allocated to the MNE-sample and zero if allocated to the NonMNE-sample. Regressions (6) and (7): Solely the MNE-sample is used. Variables in capital letters calculated in logarithmic term.
All firm variables calculated per employee and in logarithmic term, besides of the leverage ratio. t-values in parentheses based on robust standard errors, clustered within 18 country cells. *,**,*** = significance at the 10%, 5%, 1% level.

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