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# Corporate Tax Reforms and Tax-Motivated Profit Shifting: Evidence from the EU

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This version: December 2019

## ABSTRACT

This paper examines whether the profit-shifting trend in Europe during 2003–2013 can be explained by tax policy changes. Consistent with prior literature, we find that affiliates' profits are sensitive to tax rate changes. However, we document that tax base–broadening reforms have mitigated the incentives for both inward and outward profit shifting. In particular, we find that anti-avoidance rules prevent multinational companies from shifting profits out of their foreign affiliates, whereas other tax base–broadening rules, such as restrictions on the deductibility of tax losses or on group tax relief, reduce the incentives for multinational companies to shift profits into foreign affiliates. Furthermore, we find evidence of a downward trend in profit shifting across European countries, especially when the tax enforcement is stricter. Overall, these results suggest that broader tax bases and stricter tax enforcement have successfully curbed this particular tax strategy.

**Keywords:** Tax policy, profit shifting, tax avoidance, tax enforcement, multinational firms

**JEL Classifications:** F23; H25; H26; M41

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## 1. Introduction

Multinationals' tax avoidance and profit shifting have drawn the extensive attention of policymakers, the media, investors, and the academic literature over the past two decades. Despite the global downward trend of corporate tax rates (OECD, 2011), anecdotal evidence suggests that multinational firms still take advantage of different tax rates across countries to avoid taxes (Toplensky 2017). By now, tax avoidance and income shifting<sup>1</sup> have reached a global scale and the extent of the problem is vast, such that the OECD's Base Erosion and Profit Shifting (BEPS) project has estimated that countries could lose as much as US\$240 billion annually in corporate tax revenues (OECD 2013a, 2015).

In the attempt to curb the phenomenon, policymakers all over the world have responded by enacting several countermeasures over the years. In particular, in Europe over the last decade, several tax reforms have tightened anti-avoidance rules (Lohse and Riedel 2013),<sup>2</sup> broadened the tax base,<sup>3</sup> and lowered the statutory tax rate (Devereux et al. 2008), leading Dharmapala (2014) to posit that these tax reforms could have reduced profit shifting. Despite the relevance of this claim for European Union (EU) regulators (Brunsdon 2016), surprisingly, the empirical literature has so far neglected to test this conjecture.

In this paper, we fill this gap and examine whether corporate tax reforms enacted across European countries over 2003–2013 have constrained multinationals' profit shifting. Examining profit shifting helps us understand 1) which tax strategies multinational companies implement to achieve their tax avoidance targets (Wilde and Wilson 2018) and 2) which countermeasures enacted by policymakers have been successful at curbing this tax strategy. In this regard, the variety and heterogeneous implementation of BEPS countermeasures across

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<sup>1</sup> Throughout the paper, we use the terms *profit shifting* and *income shifting* interchangeably.

<sup>2</sup> Anti-avoidance rules are those measures in the tax code (e.g., transfer pricing rules, thin capitalization rules) that prevent firms from putting in place legal arrangements with only the intent of reducing the tax due.

<sup>3</sup> Base-broadening reforms are those measures that broaden the definition of income subject to tax.

EU countries and over time make Europe a powerful setting to investigate whether corporate tax reforms have constrained income shifting over the past decade.

To answer our research question, we use an approach that differs from that of most previous studies (e.g., Dischinger et al. 2011; Karkinsky and Riedel 2012) in two dimensions. First, we identify profit shifting not only through variation in the tax rate but also through variation in the tax base. Second, we consider multiple tax base items (i.e., transfer pricing documentation requirements, thin capitalization rules, tax consolidation rules, loss carryback and carryforward, accelerated tax depreciation allowances, and group tax relief) that *jointly* target profit shifting, instead of examining *selected* tax base items in isolation (i.e., transfer pricing and/or thin capitalization rules; see Bartelsman and Beetsma 2003; Buettner et al. 2012; Beer and Loeprick 2015). Analyses that neglect to consider changes in the tax base or that consider only *selected* changes would be incomplete, because governments trade off between low tax rates and multiple tax base–broadening measures to counteract profit shifting (Haufler and Schjelderup 2000; Devereux et al. 2008; OECD 2010). Thus, the novelty of our method lies in taking into account both changes in the tax rate and changes in a broad set of tax base items to measure the extent of profit shifting across countries and over time.

Our empirical approach proceeds in three steps. First, we estimate the tax rate sensitivity of profit shifting conditional on several changes in the tax base elements that occurred in Europe during 2003–2013. Specifically, we follow Goncharov and Jacob (2014) and combine the tax base elements into one overall index that ranges from zero (very narrow tax base) to six (very broad tax base) to estimate the joint tax rate and tax base effect on profit shifting. Consistent with prior literature (Dischinger et al. 2014a), we find that multinational companies shift profits into (or out of) their affiliates following a decrease (increase) in the tax rate of the host country (country where the subsidiary is located) or an increase (decrease) in the tax rate of the parent country (country where the headquarters are located). Most importantly, we show

that the income flowing between the host and parent countries is significantly lower when we account for policy changes aimed at broadening the tax base (e.g., the introduction of transfer pricing documentation requirements and/or thin capitalization rules, restrictions on the usage of tax losses). In economic terms, we find that the profit-shifting incentive decreases by 25%. To put this figure into perspective, the average income flowing into (or out of) an affiliate following a change in the tax rate difference of 10 percentage points is 1.3 million euros. This amount decreases by about 0.24 million euros because of a broader tax base.

Second, we dig deeper into the *direction* of profiting shifting and provide evidence that tax base–broadening reforms matter for both inward profit shifting (i.e., shifting income into a foreign affiliate) and outward profit shifting (i.e., shifting income out of a foreign affiliate). Interestingly, though, we find that tax base items have a differential effect on multinationals’ income shifting. Consistent with prior literature (e.g., Bartelsman and Beetsma 2003; Buettner et al. 2012; Beer and Loeprick 2015), anti-avoidance rules (i.e., transfer pricing and thin capitalization rules) prevent multinational companies from shifting profits *out* of their foreign affiliates. However, we also find that other tax base–broadening rules, such as restrictions on the deductibility of tax losses or on group tax relief, are equally relevant to profit shifting. In particular, these rules reduce the incentives for multinational companies to shift profits *into* a foreign affiliate.

Motivated by this evidence, we finally test whether corporate tax reforms have changed the trend in profit shifting in Europe over the past decade. The analyses reveal an interesting and novel pattern. In particular, we find a downward trend in profit shifting across European countries. More specifically, in the second half of our sample period (2007–2013), profit shifting decreased significantly, by more than 40%. Consistent with prior literature (Haufler and Schjelderup 2000; OECD 2010), we explain this finding as broader tax bases having successfully constrained profit shifting over the years. Furthermore, we supplement this trend

analysis by additionally exploiting cross-country variation in tax enforcement, since prior literature (De Waegenare et al. 2006; Atwood et al. 2012; Hoopes et al. 2012; Beuselinck et al. 2015; Joshi 2019) and policy recommendations (OECD 2015) suggest tax rules and tax enforcement complement each other. When accounting for tax enforcement, we find that multinationals' income shifting decreased significantly more, which is consistent with tax enforcement strengthening the effectiveness of tax rules.

This study has important implications for the academic literature and policymakers alike. Our analysis is the first to show that multinational companies are responsive not only to changes in the tax rate but also to multiple changes in the tax base. Therefore, future research could consider controlling for our tax base index when gauging the extent of profit shifting across countries and over time. Further, our analysis provides a stark contrast to the conventional wisdom and empirical evidence, which suggest that the tax avoidance (Dyreng et al. 2017) and income shifting (Grubert 2012; Klassen and Laplante 2012) of U.S. multinationals have *increased* over time. Our findings show that the income shifting of European multinationals—the key cross-border tax avoidance tool—has instead *decreased* during 2003–2013, suggesting that single-country results from the United States cannot be extrapolated to Europe. Our findings thus provide an argument why Thomsen and Watrin (2018) find that the effective tax rates of European multinationals are closer to the statutory corporate tax rates compared to those of their U.S. counterparts over the past decade.<sup>4</sup> In this regard, our results also answer the call of Dharmapala (2014, p. 439) for more research on “changes in BEPS over time using a variety of different data sets and settings to help shed further light on this important issue.”

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<sup>4</sup> As Thomsen and Watrin (2018, p. 42) state, “our findings should be interpreted with caution in the context of the ongoing debate over BEPS. [...] Income shifting is a specific technique that companies may employ to avoid taxes, but our proxies are not valid measures of income shifting. Therefore, we are not able to draw strong conclusions about income shifting or make policy recommendations regarding the BEPS project based on the findings of our study.”

Finally, our results speak directly to the ongoing debate among OECD and EU countries over whether to harmonize the tax rate and the tax base of all countries in such a way that would “level the playing field” for multinational companies (OECD 2015; EU 2016). Despite several discussions over the years, no agreement has been reached yet, and multinational firms still exploit tax differences across countries to save on taxes. However, until such a coordinated agreement is reached, countries can still tackle profit shifting on their own. As our results suggest, policymakers should continue enacting countermeasures that broaden the tax base while improving enforcement capabilities aimed at strengthening the effectiveness of tax rules. More specifically, to prevent the outflow of income, policymakers could consider enacting effective anti-avoidance rules, whereas other tax rules, such as group tax relief or tax allowances, could serve to attract the inflow of income into their jurisdictions.<sup>5</sup> Taken together, our findings outline a path forward for countries to successfully curb profit shifting.

## **2. Literature Review and Theoretical Background**

Multinational firms have dramatically increased the scale of their operations over the last three decades (Desai 2009). In addition to reallocating real economic activities in response to value creation opportunities, these firms also exploit international differences in corporate income tax rates by engaging in profit shifting (e.g., for reviews, see Dharmapala 2014; Heckemeyer and Overesch 2017). Several empirical studies have documented multinationals’ income shifting. For example, prior work has exploited cross-sectional variation in corporate tax rates on multinational subsidiaries’ profitability (Gruber and Mutti 1991; Hines and Rice 1994; Huizinga and Laeven 2008). Other studies focus on specific profit-shifting channels, particularly in intra-firm trade activity (Bartelsman and Beetsma 2003; Clausing 2003) and debt shifting (Desai et al. 2004; Buettner and Wamser 2013; Dharmapala and Riedel 2013).

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<sup>5</sup> Our results have also implications for tax practitioners, who should consider not only the tax rate but also the tax base rules when providing their clients with tax services. For example, other tax base–broadening rules, such as group taxation or loss offset rules, should be taken into account when setting up certain group tax structures.



Another stream of literature examines profit-shifting incentives stemming from the tax rate differential between the country of the parent company and that of the subsidiary. In particular, Dischinger et al. (2014a) use this approach to investigate the peculiar role of the parent company in setting up a profit-shifting strategy within a multinational group. Their findings suggest that income shifting between a parent company and its subsidiaries is biased toward the parent company (the so-called headquarters bias). In line with this result, Weichenrieder (2009) finds a negative correlation between the tax rate of the host country and the reported profits at the multinational affiliate level. However, results are only weakly significant, leading the author to speculate—without testing this conjecture empirically—whether tax base-broadening reforms have compensated for the tax rate effect over the author’s sample period.

The studies above all share the same empirical approach and measure the extent of profit shifting by exploiting variations in tax rates across countries. Starting with Bartelsman and Beetsma (2003), the literature on profit shifting has also investigated whether other tax regulations beyond the corporate tax rate play any role in facilitating or discouraging profit shifting. Notably, though, these studies focus on only one anti-avoidance regulation at a time, either transfer pricing or thin capitalization rules. For example, Lohse et al. (2012) and Lohse and Riedel (2013) have developed an index to capture the stringency of transfer pricing regulations across European countries. In a similar vein, Beer and Loeprick (2015) assess the effect of transfer pricing rules and find that imposing documentation requirements on multinational companies mitigates income-shifting behavior. Furthermore, Buettner et al. (2012) and Blouin et al. (2013) analyze several thin capitalization regimes and conclude that these rules deter debt shifting.

In this study, we employ a broader approach. In particular, we take into account both changes in the tax rate and changes in a larger set of tax base rules to measure the extent of profit shifting across countries and over time. Our methodology is grounded in theoretical

evidence (Haufler and Schjelderup 2000) and policy recommendations (OECD 2010) that suggest that governments trade off lower tax rates with a broader tax base to counteract profit shifting. Crucially, our approach considers multiple tax rules that *jointly* target all profit-shifting channels for two reasons. For one, multinational companies use several tax strategies to lower their tax burden (e.g., transfer pricing, debt shifting, strategic use of tax losses). For another, countries respond not only by changing the tax rate but also by enacting an array of tax regulations that *collectively* constrain those tax strategies by broadening the definition of income subject to tax (i.e., so-called tax base–broadening reforms). Put differently, no single rule can alone curb profit shifting but it is a combination of several measures altering the cost–benefit tradeoff of profit shifting. In this regard, it is worth pointing out that anti-avoidance rules also fall under the umbrella of tax base–broadening reforms (OECD 2018).<sup>6</sup> Taken together, all these tax measures reduce the marginal benefit of profit shifting. Thus, based on the above arguments, we expect multinationals’ profit shifting to be lower when governments broaden the tax base. We formulate our first hypothesis as follows.

**H1:** *Multinational companies engage in less profit shifting into (or out of) countries with broader tax bases.*

Next, we examine more closely the *direction* of profit shifting, as well as the role of each tax base item on profit shifting. Specifically, we analyze whether any particular rule plays a major role in reducing profit shifting into or out of countries. Prior literature has examined the role of transfer pricing (Bartelsman and Beetsma 2003; Lohse and Riedel 2013; Beer and Loeprick 2015) and thin capitalization rules (Buettner et al. 2012; Blouin et al. 2013) on profit shifting and has concluded that these regulations are particularly suited to prevent multinational companies from shifting income out of foreign affiliates. On the contrary, little is known on

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<sup>6</sup> In the 2018 tax policy reforms report, the OECD (p. 76) states, “A significant number of base broadening reforms have been introduced. The base broadening reforms have focused on anti-avoidance and the implementation of base erosion and profit shifting (BEPS) counter-measures as well as on additional restrictions to loss carryover provisions [..., which] compensate for the revenue losses from the corporate income tax rate reductions.”

whether other tax base–broadening rules, such as restrictions on the deductibility of tax losses or on group tax relief, reduce the incentives for multinational companies to shift profits into foreign affiliates. In this regard, Buettner et al. (2011) argue that group tax relief can incentivize multinational companies to shift profits across countries, since in most jurisdictions the group definition hinges on a combination of legal and economic criteria that allow multinational firms great leeway to cherry-pick which affiliates are consolidated for tax purposes. Put differently, there is significant scope for manipulation and profit-shifting opportunities into foreign affiliates when group taxation regimes are in place.

However, the ability to offset intra-group losses or to use tax credits and depreciation allowances to lower the group tax burden can be severely impaired when there are restrictions on group taxation. In such a case, multinational companies could no longer find it optimal to shift profits into foreign affiliates. Discussions with practitioners<sup>7</sup> confirm that, for income-shifting purposes, even low-tax jurisdictions are deemed useless if they do not allow group taxation or, equally important, if they do not offer generous loss offsets rules, tax credits, and depreciation allowances with which to compensate the parent company’s taxable income.<sup>8</sup> The above arguments lead us to propose our second hypotheses, as follows.

**H2a:** *Multinational companies engage in less profit shifting into countries when there are restrictions on group tax relief, tax loss offsets, and depreciation allowances.*

**H2b:** *Multinational companies engage in less profit shifting out of countries when transfer pricing and thin capitalization rules are in place.*

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<sup>7</sup> In particular, we interviewed one international tax lawyer and one tax partner at two major law and accounting firms. We asked which tax base–broadening rules they consider when advising multinational companies on tax planning strategies.

<sup>8</sup> Consistent with our discussions with practitioners, Allevato (2019) also argues that “as a response to aggressive tax planning, governments reacted through unilateral twofold measures: on the one hand, they strengthened their anti-avoidance rules and their tax audit and assessment activities; on the other hand, they also introduced tax incentives for new investments by MNEs. [...] These incentives are provided to MNEs in the form of tax credits and depreciation of capitalized tangible and intangible assets, which can be used to offset, and thus lower, the tax due” (available at [https://www.legalbusinessworld.com/single-post/2019/04/04/Multinational-enterprises-and-design-of-a-tax-aligned-global-supply-chain?utm\\_source=linkedin&utm\\_medium=social&utm\\_campaign=law\\_&utm\\_term=arropa](https://www.legalbusinessworld.com/single-post/2019/04/04/Multinational-enterprises-and-design-of-a-tax-aligned-global-supply-chain?utm_source=linkedin&utm_medium=social&utm_campaign=law_&utm_term=arropa), last accessed August 21, 2019).

Subsequently, we examine whether tax base–broadening reforms have had an impact on the trend in profit shifting in Europe over the past decade. While some studies using U.S. data (Grubert 2012; Klassen and Laplante 2012; Dyreng et al. 2017) argue that tax avoidance and profit shifting have grown over the past two decades, the empirical evidence for Europe is scant. Besides, as pointed out above and in prior literature (Dharmapala 2014), the majority of European countries introduced several tax rules into their tax systems aimed at curbing multinationals’ income shifting over the same period. As long as these tax measures have achieved their intended effect, we expect to observe a declining trend in profit shifting in Europe over the past decade. Hence, we state our third hypothesis, as follows.

**H3:** *The profit shifting activity of multinational companies in Europe declines after countries implement tax base–broadening reforms.*

In the final step, we exploit another important feature of the tax system that could theoretically also play a role in explaining the profit-shifting trend in Europe over the past decade, that is, the strength of a country’s tax enforcement. The reason is twofold. First, prior literature documents that tax rules and tax enforcement complement each other both analytically (e.g., De Waegenare et al. 2006) and empirically (e.g., Atwood et al. 2012; Joshi 2019). Closely related to this, Beuselinck et al. (2015) show that multinational companies engage in more (less) income shifting when tax enforcement is weaker (stronger). Similarly, Hoopes et al. (2012) document that firms undertake less tax avoidance when tax enforcement is stricter. Second, as a policymaker, the OECD (2015, p. 199) also emphasizes the importance of considering the role of tax enforcement when evaluating the effect of tax rules, because “weaker enforcement could render a good policy measure ineffective if taxpayers can easily avoid paying the taxes due.” To sum up, we expect the decline in profit shifting to be more pronounced if the tax base–broadening rules have been effectively enforced over the sample period. We thus propose the following hypothesis.

**H4:** *The decline in profit shifting is more pronounced when tax enforcement is stricter.*

Finding evidence consistent with this prediction would support the idea that tax enforcement acts as an additional constraint that increases the marginal cost of profit shifting by strengthening the effectiveness of these tax measures (OECD 2015). However, to provide evidence of this hypothesis, we first need to document that 1) tax base–broadening reforms have constrained multinationals’ profit shifting and that 2) these tax measures have also led to a downward trend in profit shifting in Europe over the past decade.

### **3. Empirical Setting**

#### *3.1 Variation in Corporate Tax Rates, Tax Base Elements, and Tax Enforcement*

The taxation of corporate income in Europe has changed considerably over the past 20 years. A number of countries have reformed their corporate tax systems by lowering the statutory tax rate and broadening the tax base to address competitive pressure from neighboring countries (e.g., Devereux et al. 2008) or to set incentives for firms to invest. We exploit this variation in tax rates and examine its effect on profit shifting. For this purpose, we use the corporate tax rates from *Taxation Trends in Europe 2014*, provided by Eurostat, and additionally cross-check the tax rate information with the OECD corporate and subcentral income tax database. We employ the corporate tax rate that is applicable in the top tax bracket and identify 68 corporate tax changes (11 increases and 57 decreases in the statutory tax rate) over 2003–2013. Note that, in the case of local differences in statutory corporate tax rates due to additional regional business taxes, as, for example, in Italy or Germany, we use the sum of the top marginal corporate tax rate and the average corporate regional tax, as well as supplementary charges (i.e., the so-called adjusted corporate tax rate).<sup>9</sup>

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<sup>9</sup> Our approach strictly follows that of the OECD (2014), because the statutory corporate tax rate that multinational companies are subject to includes both the corporate tax at the federal level and that at the regional level (available at <https://www.oecd.org/ctp/tax-policy/Table%20II.1-May-2014.xlsx>, last accessed March 14, 2019).

In Figure 1, we plot the yearly average of the corporate tax rate across EU countries and find a decreasing trend over the sample period<sup>10</sup> consistent with tax competition putting downward pressure on the corporate tax rate (Devereux et al. 2002). Specifically, we find that the median tax rate decreased by about 15% from 29.5% in 2003 to 25.25% in 2007 and dropped further to 23.75% in 2013. Further, we observe that the largest drop in corporate tax rates occurred from 2003 to 2009. From 2010 onward, tax rate changes still occurred but were smaller.

Figure A.1 and Table A.1 of the Online Appendix list our sample countries and the corporate tax rates in each sample year. A total of 18 countries changed their tax rate more than once during the sample period and only three (five) experienced one (no) corporate tax rate change.<sup>11</sup> Changes in corporate income tax occurred in almost all countries and were staggered over time. Given the high number of tax rate changes and potential host and parent countries, we have meaningful tax variations with which to examine the effect of corporate tax reforms on multinational firms' profit-shifting behavior. More importantly, these changes do not cluster around certain years and/or countries. One potential concern is that country-level economic conditions could drive tax rate changes. In untabulated univariate analysis, we find that the average tax change during economic downturns (-0.2%) is statistically indistinguishable from the average change during upturns (-0.5%). This result reassures us that, in our sample, the tax rate changes are not related to the business cycle (see also Section 4.7).

In addition to estimating the effect of corporate tax rate changes on profit shifting, the novelty of our study consists in accounting for a broad set of tax base changes in the tax code that could outweigh the tax rate effect. We rely on the Ernst & Young Corporate Tax Guides from 2003 to 2013 and collect data on the following tax base items: transfer pricing

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<sup>10</sup> We follow the methodology of Eurostat and mirror graph No. 17 reported in Taxation Trends in Europe 2014.

<sup>11</sup> The countries that experienced one (no) reform are Austria, Poland, and Romania (Belgium, Croatia, Ireland, Malta, and Norway).

documentation requirements, thin capitalization rules, loss carryback and loss carryforward, tax consolidation, and accelerated tax depreciation. First, we include transfer pricing documentation requirements, since the preparation of comprehensive documentation mitigates multinationals' profit shifting (e.g., Beer and Loeprick 2015; Beuselinck et al. 2015). Second, we follow Buettner et al. (2012) and collect information on thin capitalization rules to account for restrictions on the tax deductibility of interest payments. Third, previous literature also documents that corporate losses and their provisions in the tax code play a role in inducing intertemporal income shifting (Maydew 1997; Erickson et al. 2013) and profit shifting across affiliates. In this respect, loss-making affiliates could reverse profit shifting from a low- to a high-tax country to save on taxes (De Simone et al. 2017; Hopland et al. 2018; Koethenbueger et al. 2018). Therefore, we gather information on loss carryback and loss carryforward rules from Bethmann et al. (2018) and add the missing data for our sample countries. Fourth, we collect data on the tax consolidation rules in European countries, since such regimes make it easier to transfer profits and/or losses between group affiliates. Finally, since tax relief on depreciable assets affects the tax base, we collect data on accelerated depreciation allowances over our sample period to proxy for changes in the tax deductibility of investment expenditure.

Figure A.2 and Table A.2 of the Online Appendix list our sample countries and their respective tax base items. Five countries had already enacted rules on transfer pricing documentation by the early 2000s (i.e., Denmark, Germany, the Netherlands, Poland, and Portugal), with 13 more following later during the sample period. However, eight countries never required any transfer pricing documentation during the sample years (i.e., Austria, Belgium, Bulgaria, Croatia, Czech Republic, Iceland, Luxembourg, and Malta). A total of 18 countries had provisions to restrict debt shifting within multinational firms, that is, thin capitalization rules. While the debt-to-equity rule seems to be the most common rule in place,

there were three notable switches to the earnings-stripping regime,<sup>12</sup> in Germany and Italy in 2008 and in Spain in 2012. Furthermore, 19 countries allowed for tax consolidation over the sample years, thereby permitting the transfer of profits and/or losses across group companies. Nearly all countries (24 out of 26) allowed accelerated depreciation provisions to defer corporate income taxes at some point during the sample period. Finally, all countries allowed firms to carry forward tax losses (with several differences in the carryforward time windows), while six had loss carryback provisions in place (i.e., France, Germany, Great Britain, Ireland, the Netherlands, and Norway; see also Bethmann et al. 2018).

Next, to estimate the joint effect of the tax rate and the tax base on profit shifting, we adopt a comprehensive approach. More specifically, we follow the methodology of Goncharov and Jacob (2014)<sup>13</sup> and combine all the tax base items into an overall index (*Tax Base Index*) that measures the breadth of the tax base in a given host country  $j$  or parent country  $k$  in year  $t$ . As discussed earlier, we use a joint measure of several rules instead of single rules because tax base elements *jointly* indicate how broad the tax base is according to the tax code in the country and year. The index theoretically ranges from zero (very narrow tax base) to six (very broad tax base with transfer pricing documentation requirements, thin capitalization rules, no tax consolidation, no accelerated depreciation allowances, no loss carryback rule, and loss carryforward up to a maximum of five years). In our sample, the actual empirical distribution of *Tax Base Index* ranges from zero to five, as shown in Table 1. Figure 2 shows that the yearly average of *Tax Base Index* has an increasing trend across the EU countries over 2003–2013.

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<sup>12</sup> The debt-to-equity and earnings stripping rules substantially restrict the amount of interest expenses from intra-company borrowing that a multinational affiliate can deduct in its tax return. Under the debt-to-equity (earnings stripping) rule, the deductibility of interest expenses is allowed up to a certain amount of the affiliate's debt-to-equity ratio (earnings before interest, taxes, depreciation, and amortization).

<sup>13</sup> It is worth noting that, in the accounting literature, this approach was originally adopted by Hung (2000).



We take this finding as preliminary evidence that our index conceptually captures the tax rate cut *cum* base-broadening reforms over the past decade in Europe.<sup>14</sup>

Finally, to analyze whether tax enforcement along with tax base–broadening reforms has also played a role in the trend in profit shifting in Europe over the past decade, we condition our profit-shifting trend analyses on the strength of a country’s tax enforcement, which arguably captures differences in the marginal cost of profit shifting across EU countries. Specifically, we rely on the 2006 OECD Tax Administration Guide coupled with the 2013 update<sup>15</sup> and collect data on tax enforcement, which is measured as the ratio of citizens to tax staff at the central government tax agency. Subsequently, to facilitate the interpretation, we follow De Vito et al. (2019) and convert this ratio into tax staff per 1,000 inhabitants, with higher scores indicating stronger tax enforcement. As shown in Table A.3 of the Online Appendix, we only observe tax enforcement at two points in time over the sample period (i.e., in 2003 and 2011). Although we lack the data to track any potential change in tax enforcement over time, we are also aware that prior literature finds that tax enforcement is relatively sticky over time. This stickiness allows us to extrapolate tax enforcement for the full observation period and still obtain meaningful results (Beuselinck et al. 2015). Therefore, we follow the methodology of Beuselinck et al. (2015) and replace the missing tax enforcement data over 2004–2010 with the 2003 value. Similarly, we replace the missing tax enforcement data from 2012 to 2013 with the updated 2011 value. Figure 3 depicts the variation in tax enforcement across 26 EU countries over 2003–2013. We sort countries into quartiles, with darker areas indicating stronger tax enforcement. We note that the sample countries are fairly distributed

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<sup>14</sup> In Table 10, we further investigate the relation between corporate tax rates and tax bases by means of panel regression models at the country level, with country and year fixed effects. We find that the corporate tax rate and the tax base index are negatively correlated with each other (i.e., a one-unit increase in *Tax Base Index* corresponds to a decrease of about 0.3 percentage points in the corporate tax rate).

<sup>15</sup> The OECD Tax Administration Guides (2006, 2013b) are available at [https://read.oecd-ilibrary.org/taxation/tax-administration-in-oecd-and-selected-non-oecd-countries\\_9789264064904-en#page113](https://read.oecd-ilibrary.org/taxation/tax-administration-in-oecd-and-selected-non-oecd-countries_9789264064904-en#page113) and [https://read.oecd-ilibrary.org/taxation/tax-administration-2013\\_9789264200814-en#page187](https://read.oecd-ilibrary.org/taxation/tax-administration-2013_9789264200814-en#page187).

across all quartiles. In particular, eight (three) countries are in the top (bottom) quartile, whereas the remaining 14 countries are equally distributed in the second and third quartiles.<sup>16</sup>

### *3.2 Sample Selection*

To examine the effect of corporate taxation on profit shifting in Europe, we use unconsolidated firm-level data from the commercial database Amadeus, compiled by Bureau van Dijk, over 2003–2013. This data set comprises both European private and public companies. The key advantage of using Amadeus is that it enables us to link accounting data to information on the ownership structures of parent firms and their subsidiaries (see also Huizinga and Laeven 2008; Dischinger and Riedel 2011; Karkinsky and Riedel 2012). On the other hand, the disadvantage is that it only provides ownership information for the last reported date. This could cause misclassifications and create a bias against finding significant results if the ownership structure changed over the observed years (Budd et al. 2005). To overcome this issue, we rely on previous versions of Amadeus (i.e., yearly tapes from the early 2000s) to match accounting data with exact information on the ownership structure. This selection process allows us to track any potential change in the ownership structure of a firm and accurately classify its owner over the sample period. In case a firm's ownership data were not included in earlier versions of Amadeus, we rely on the most recent information for the entire sample period. We classify subsidiaries as being part of a multinational group if they are owned by a foreign parent company. To be precise, the global ultimate owner must be an independent company that owns more than 90% of the capital. This requirement ensures that the interests of the parent company and its foreign affiliates are fully aligned and there are no agency problems (for a similar approach, see Becker and Riedel 2012; Beer and Loeprick 2015).

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<sup>16</sup> The countries in the top (bottom) quartile are Belgium, the Czech Republic, Denmark, Germany, Ireland, Luxembourg, Malta, and the Netherlands (Austria, Italy, and Spain). All the other countries are equally distributed in the second and third quartiles. Note also that in neither of the Tax Administration Guides (2006, 2013b) do we observe tax enforcement data for Croatia, which, in our sample, corresponds to about 1,296 firm-year observations.

Next, in line with Merz and Overesch (2016), we exclude financial institutions, since these firms employ different profit-shifting strategies to relocate income to low-tax jurisdictions. Following Maffini and Mokkas (2011), we focus on all firms located and incorporated in Europe.<sup>17</sup> To ensure that the accounting period is uniform in our sample, we remove observations with fiscal years other than 12 months and further require tangible fixed assets, total assets, and wages expense to be positive for each affiliate. The observational unit in our analyses is the multinational subsidiary per year. Our final data comprise 101,985 (131,729) firm–year observations for 17,538 (19,248) unique affiliates and 7,341 (7,954) unique parent companies from 26 EU countries,<sup>18</sup> depending on the dependent variable used in the regression analyses.

The numbers of firm–year observations and affiliate firms resemble those of previous studies (e.g., Dischinger et al. 2014a). However, we note that some EU countries are not included (e.g., Greece, Latvia) in our sample because of insufficient firm–year observations. Thus, we additionally cross-check our sample countries with those of De Simone et al. (2017), since our sample period mostly overlaps with theirs. We note that our sample countries mirror theirs, further reassuring us that our selection criteria are in line with prior literature and that our sample includes all potential firm–year observations from Amadeus.

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<sup>17</sup> Since the objective of this study is to investigate income shifting perpetrated by European multinational companies, we focus on European multinationals whose parent companies and their affiliates reside in Europe.

<sup>18</sup> Some countries, such as Italy, are overrepresented in Amadeus because of different reporting requirements. We perform several additional tests in Tables 4 and A.4 of the Online Appendix and show that our results are robust to excluding firm–year observations from those countries. Another caveat of Amadeus is that it does not provide data on non-European tax haven affiliates. This could bias, for example, our trend analysis if multinational firms were to systematically shift less income within Europe and more to non-European countries over the sample period. While we cannot fully rule out this alternative, we are also aware that prior literature (Dharmapala 2014) does not find any substantial differences in signs, magnitude, or significance in profit shifting between studies using Amadeus and studies using other data sources that incorporate non-European tax haven countries (Weichenrieder 2009). This evidence reassures us that we can still obtain meaningful results using Amadeus.

### 3.3 Empirical Strategy

To analyze the effect of corporate tax reforms on profit shifting, we estimate the following panel regression model:

$$\begin{aligned} \ln(EBIT_{i,j,k,t}) = & \beta_0 + \beta_1 Tax\ Difference_{j,k,t} + \beta_2 Tax\ Difference_{j,k,t} \\ & \times Tax\ Base\ Host_{j,t} + \beta_3 Tax\ Base\ Host_{j,t} + \gamma X_{i,j,k,t} + \gamma \Pi_{j,t} \\ & + \gamma \Pi_{k,t} + \delta_{i,j,k} + \omega_{l,t} + \epsilon_{i,j,k,t} \end{aligned} \quad (1)$$

where  $\ln(EBIT)$  is the dependent variable of affiliate  $i$  located in host country  $j$  with the parent company in country  $k$  in year  $t$ . We define  $\ln(EBIT)$  as the natural logarithm of the affiliate's earnings before interest and taxes (EBIT; see Maffini and Mokkas 2011).<sup>19</sup> We capture the profit-shifting incentive between the parent company and its affiliates by computing the tax difference ( $Tax\ Difference_{j,k,t}$ ) in the statutory corporate tax rates between the host and the parent country (for a similar approach, see Dischinger 2008; Weichenrieder 2009; Dischinger et al. 2014a; Beuselinck et al. 2015). The coefficient of interest is  $\beta_1$ , for which we expect a negative sign ( $\beta_1 < 0$ ). That is, the tax difference reflects the extent to which the multinational company shifts profits into (or out of) its affiliate  $i$ , following a decrease (increase) in the tax rate of the host country or an increase (decrease) in the tax rate of the parent country.<sup>20</sup>

In addition to controlling for the profit-shifting incentive stemming from the tax rate difference, we control for changes in the tax base by including  $Tax\ Base\ Host_{j,t}$  with the tax base elements of the host country and its interaction with the tax difference.<sup>21</sup> As argued earlier,

<sup>19</sup> In a series of robustness tests, we alternatively employ the natural logarithm of the affiliate's return on assets plus one ( $ROA + 1$ ) as the dependent variable, which allows us to further include loss-making firms in our analyses (De Simone et al. 2017). We find that the results are robust to the use of either dependent variable.

<sup>20</sup> We focus on the bilateral flow of income between the parent company and its affiliates, since several studies in corporate finance (e.g., Jensen 1986; Rajan et al. 2000) and taxation (Dischinger et al. 2014b) show that profits and valuable resources within a multinational group are ultimately managed by the parent company. Nevertheless, in untabulated analyses, we also estimate equation (1) while proxying for the tax incentive, as Huizinga and Laeven (2008). Throughout all the tests, the results are robust and in line with our hypotheses.

<sup>21</sup> As argued in Section 3.1, the tax base index controls for transfer pricing documentation requirements, thin capitalization rules (i.e., debt-to-equity or earnings stripping rules), accelerated tax depreciation allowances, loss carryback and loss carryforward rules, and provisions on tax consolidation regimes.

we combine all the tax base elements into an overall index because they all *concurrently* target profit shifting. This index indicates how broad the tax base is according to the host country's tax code in a given year, with higher values suggesting that more income is subject to corporate taxation. The coefficient of interest is  $\beta_3$ , for which we expect a negative sign ( $\beta_3 < 0$ ). Consistent with H1, in which multinational companies engage in *less* profit shifting into (or out of) countries with broader tax bases, we expect the interaction term to be negatively related to profit shifting ( $\beta_2 > 0$ ). In other words, a positive sign for the coefficient of interest  $\beta_2$  denotes that the host country is effective at constraining the income flowing between the multinational affiliate and its parent company.

Throughout all specifications, we ensure that the identification of all the coefficients stems from changes in the tax rate or in the tax base over time by including firm fixed effects ( $\partial_{i,j,k}$ ). That is, firm fixed effects allow us to exploit *within*-affiliate variation in both the tax rate and the tax base over time. Such *within*-affiliate variation is due to changes either in the tax difference between the host and the parent country or in the tax base index of the host country. The changes in the tax difference are generated by tax reforms either in the host or in the parent country, whereas the changes in the tax base index are due to tax reforms in the host country.<sup>22</sup> As in previous profit-shifting studies (Dischinger 2014b), firm fixed effects also absorb any firm- or country-level time-invariant characteristics that could be correlated with a multinational company's profit-shifting strategy.

We follow Hines and Rice (1994) and De Simone (2016) and include a vector  $X_{i,j,k,t}$  with several affiliate-level controls. More specifically, our proxies for capital and labor are the natural logarithm of fixed assets (*Fixed Assets*) and the natural logarithm of the cost of employees (*Cost of Employees*), respectively. Moreover, we include the natural logarithm of

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<sup>22</sup> As Dharmapala (2014, p. 426) notes, these corporate tax reforms are plausibly exogenous from an affiliate standpoint and "they are unlikely to be attributable directly to the affiliate's own behavior or choices."

intangible assets (*Intangibles*) and the natural logarithm of research and development expenses (*R&D*), since these assets are potential drivers of profit shifting (Beer and Loeprick 2015).

In line with prior studies (Dischinger 2008; Disdier and Head 2008; Erel et al. 2012; Beer and Loeprick 2015), we further control for the non-tax country-level characteristics of the host country ( $\Pi_{j,t}$ ) and parent country ( $\Pi_{k,t}$ ) to ensure that economic and institutional conditions do not spuriously drive the results. More specifically, we add the gross domestic product (GDP) growth (*GDP Growth*), the GDP per capita (*GDP per capita*), a proxy for the geographic proximity of the host to the parent country (*Distance*), the inflation rate (*Inflation*), and the unemployment rate (*Unemployment*). Finally, we account for the institutional quality of both countries by including the yearly estimate of a country's control of corruption (*Control of Corruption*) from the World Governance Indicators. We do not make any ex ante predictions on the signs of the country-level variables, since there could be reasons to expect both negative and positive coefficients. Taking the variable for the control of corruption as an example, we could expect firms to shift their profits to highly regulated environments and protect themselves from potential expropriation (Dharmapala and Hines 2009) or to weaker institutional environments and better conceal income (Johannesen et al. 2016).

In addition to including firm fixed effects, we include year or industry-year fixed effects defined at the one-digit Standard Industrial Classification (SIC) code level ( $\omega_{l,t}$ ).<sup>23</sup> The inclusion of industry-year fixed effects ensures that we compare multinational affiliates within the same industry while absorbing transitory industry shocks that could also affect a multinational's profit-shifting behavior. We correct for standard error clustering at the firm level.

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<sup>23</sup> In the Online Appendix, we repeat all the analyses including industry-year fixed effects defined at the two-digit SIC code level. We document that the results are not sensitive to the definition of the industry.

### 3.4 Summary Statistics

Table 2 presents the summary statistics for the firm-level controls (Panel A) and the country-level variables (Panel B). In panel A, we find that, on average, a multinational subsidiary has EBIT (*EBIT*) of 26.4 million euros<sup>24</sup> and fixed assets (*Fixed Assets*) and employee costs (*Cost of Employees*) of 108 million euros and 7.36 million euros, respectively. Moreover, the average multinational subsidiary accounts for intangibles (*Intangibles*) of about 4.2 million euros and has a return on assets (*ROA*) of 8.42 percentage points. The average distance (*Distance*) between the host and the parent countries is about 905 kilometers.

In panel B of Table 2, we present the univariate analysis of the country-level controls by differentiating between the host and parent countries. We find that all the country variables are statistically different from each other between the two groups. In particular, the average corporate tax rate (tax base) value of the host country is significantly lower (higher) than that of the parent country by about two percentage points (half a unit). Further, we find that the average GDP growth (GDP per capita) value is significantly higher (lower) in the host country, as well as the value of inflation and unemployment. Finally, multinational subsidiaries tend to reside in more corrupt environments than their parent firms do.

## 4. Empirical Results

### 4.1 Joint Effect of the Tax Rate and the Tax Base on Profit Shifting: Baseline Results

Table 3 presents the results from estimating equation (1) and using the natural logarithm of *EBIT* as the dependent variable. In columns (1) to (2), we test our baseline regression without time-varying firm- and country-level variables. In columns (3) and (4), we add firm- and country-level control variables, which appear to have minimal impact on both the coefficient

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<sup>24</sup> The average *EBIT* is slightly higher than its 75th percentile value. However, this feature also appears in De Simone et al. (2017), whose sample mostly overlaps with ours. Furthermore, to curtail outliers, we log-transform the continuous variables throughout all specifications. In Figure A.3 of the Online Appendix, we show that the log distribution of *EBIT* approximates a bell-shaped distribution similar to a normal distribution.

estimates and statistical significance. Finally, in columns (5) and (6), we document the robustness of our findings to additionally control for the interaction between the variables *Tax Difference* and *Tax Base* for the parent country.

Throughout all specifications, we find that the tax difference coefficient is consistently negative and statistically different from zero at the 1% and 5% levels. In line with previous studies (e.g., Dischinger et al. 2014a, 2014b; Beuselinck et al. 2015), the negative sign of the tax difference indicates that the larger (smaller) the tax difference between the host and parent countries, the lower (higher) the reported income at the multinational affiliate level.<sup>25</sup> In economic terms, using as a reference point our regression output in column (4) of Table 3 (which controls for firm and industry–year fixed effects along with all firm- and country-level variables), we find that an increase (decrease) of 10 percentage points in the tax difference corresponds to a decrease (increase) in reported profits of 4.92% ( $= 1 - e^{-0.6775}$ ). In euro terms, the effect translates into a reduction (increase) in the affiliate’s EBIT of about 1.3 million euros.

As predicted in our first hypothesis, we find that the interaction between the tax difference and the tax base of the host country is always positive and statistically significant at least at the 5% level. This result holds even after controlling for the interaction term with the tax base of the parent country (columns (5) and (6) of Table 3). Further, we find the interaction term with the coefficient of the tax difference to be jointly significant across all specifications.

To interpret the economic magnitude of our results, we again use as a reference point the regression output in column (4) of Table 3. The positive interaction term indicates that a one-unit increase in the tax base of the host country decreases the profit-shifting incentive (i.e., the tax difference) by 0.1678, or by 25% of the average tax difference of 0.6775 ( $= 0.1678/0.6775$ ). Thus, the corresponding income trapped at the affiliate level due to a broader tax base is about

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<sup>25</sup> In untabulated analyses, we also test for nonlinearity in the tax difference (for a similar approach, see Dowd et al. 2017). Namely, we run the main specification while controlling for the quadratic term of *Tax Difference*. Although the main coefficient is still significant and close to our baseline estimate, we find that the quadratic term is not significant, suggesting that the tax rate effect is linear in our sample.



0.92% ( $= [1 - e^{-0.6775}] - [1 - e^{-0.5097}]$ ). In euro terms, the average amount of 1.3 million euros in shifted profits decreases by about 0.24 million euros for the average multinational affiliate in the sample.

The coefficient of the tax base index is negative but insignificant across all specifications. Furthermore, the coefficients of the remaining control variables (not tabulated here for brevity)<sup>26</sup> are in line with prior profit-shifting studies (e.g., Dharmapala and Riedel 2013; De Simone et al. 2017). In particular, we find that all firm-level controls enter positively in our regressions, and most are statistically different from zero. As for the country-level controls, we find that the GDP growth of both the host and parent countries is positively associated with the profitability of the multinational subsidiary. Relatedly, the inflation rate and the control of corruption in the host country are positively correlated with the multinational affiliate's EBIT and resemble the findings reported in previous work (e.g., Dischinger 2008). By contrast, the unemployment rate is negative and statistically significant at the 1% level across all specifications. Taken together, these results suggest that a broader tax base set by the host country can constrain income flowing between a multinational affiliate and its parent company.

#### *4.2 Joint Effect of the Tax Rate and the Tax Base on Profit Shifting: Robustness Tests*

To confirm the robustness of our results to sample selection criteria, we undertake a number of additional analyses. In particular, in Table 4 we estimate equation (1) while excluding firm-year observations for affiliate and parent countries that are overrepresented in Amadeus (i.e., France and Italy, in columns (1) and (2), respectively) or firm-year observations

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<sup>26</sup> In Table A.4 of the Online Appendix, we report the extended version of our regression output with all the control variables. Moreover, in Table A.5, we document that the results are robust to excluding one tax base item at a time from the tax base index to make sure that no specific rule is driving our results. Relatedly, in untabulated analyses, we estimate equation (1) while controlling for all the tax base items separately. We find results similar to those reported in Table 3 when using the natural logarithm of *EBIT* as the dependent variable. However, the results become weaker when using the natural logarithm of pre-tax income as the dependent variable, which is consistent with the work of Heckemeyer and Overesch (2017), suggesting that transfer pricing is a more prominent profit-shifting channel than debt shifting is.

where the parent firm is located either in Germany (column (3))<sup>27</sup> or in the Netherlands (column (4)), which is also a well-known European tax haven used by multinational companies for treaty shopping (Weyzig 2013).<sup>28</sup> Imposing these additional sample restrictions reduces our sample by up to 22,796 firm–year observations. Nevertheless, estimating our tests on these subsamples yields similar signs, magnitudes, and levels of significance as those reported in Table 3.

Next, we test the sensitivity of our findings to using an alternative dependent variable. More specifically, in Table 5, we present the results from estimating equation (1) using the natural logarithm of the sum of an affiliate’s return on assets plus one ( $ROA + 1$ ) as the dependent variable (Claessens and Laeven 2004; De Simone et al. 2017). The advantage of such a dependent variable is that it enables us to include in our sample loss-making firms, which could employ a shift-to-loss strategy to save on taxes. Throughout all specifications, we continue to find the signs and significance levels of all the variables to be consistent with those in Table 3. To interpret the economic magnitude, we use as a reference point our regression output of the tax difference in column (2), net of the tax base effect (i.e., the sum of the tax difference and its interaction with the tax base). We find that an increase (decrease) of 10 percentage points in the tax difference corresponds to a decrease (increase) in the affiliate’s return on assets of 0.45% ( $= 1 - e^{-0.0464}$ ).

#### 4.3 Joint Effect of the Tax Rate and the Tax Base on Inward versus Outward Profit Shifting

To further shed light on our first hypothesis, which predicts that multinational companies shift less profits *into* and *out* of countries with broader tax bases, we dig deeper into the

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<sup>27</sup> To further investigate whether a specific country is driving the main results, we run equation (1) but exclude one parent country at a time. That is, we do not allow a specific country to influence the overall tax rate and tax base effect. Figure A.4 of the Online Appendix plots the coefficient estimates of the tax difference and its interaction with the tax base index following this exercise. All results remain significant, and their effects on profit shifting are of approximately equal magnitude.

<sup>28</sup> In untabulated analyses, we repeat the analysis in column (4) of Table 4 while excluding other well-known European tax havens (i.e., Estonia, Ireland, Luxembourg, and Malta) and find our inferences to be the same. The results are available upon request.

*direction* of profit shifting by separately investigating inward profit shifting (income shifted into a foreign affiliate) and outward profit shifting (income shifted out of a foreign affiliate).

To this end, we estimate the augmented version of equation (1) as follows:

$$\begin{aligned} \ln(EBIT_{i,j,k,t}) = & \beta_0 + \beta_1 \text{Inward Incentive}_{j,k,t} + \beta_2 \text{Inward Incentive}_{j,k,t} \\ & \times \text{Tax Base Host}_{j,t} + \beta_3 \text{Tax Base Host}_{j,t} + \gamma X_{i,j,k,t} + \gamma \Pi_{j,t} \\ & + \gamma \Pi_{k,t} + \delta_{i,j,k} + \omega_{l,t} + \epsilon_{i,j,k,t} \end{aligned} \quad (2)$$

where  $\ln(EBIT)$  is the dependent variable of affiliate  $i$  located in host country  $j$  with the parent company in country  $k$  in year  $t$ . In this test, we capture the profit-shifting incentive between the parent company and its affiliates by creating an indicator variable that takes the value of one if the tax difference is negative, and zero otherwise. The coefficient of interest is  $\beta_1$ , for which we expect a positive sign ( $\beta_1 > 0$ ). That is, the smaller (i.e., the more negative) the tax difference between the host and parent countries, the higher the reported income at the multinational affiliate level.

With respect to the tax base of the host country and its interaction with the inward incentive, we expect both coefficients to be negative ( $\beta_2 < 0$  and  $\beta_3 < 0$ ). A negative sign of  $\beta_3$  suggests that a broader tax base of the host country, on average, reduces the multinational affiliate's profitability, since more income is subject to corporate taxation. Relatedly, the negative sign of the interaction term ( $\beta_2$ ) indicates that a broader tax base of the host country reduces the incentives for the multinational company to shift profits into its foreign affiliates. We include firm controls, country controls, and the same fixed effects as in equation (1).

Columns (1) and (2) of Table 6 report the results. We find that a negative tax difference increases profit shifting into foreign affiliates, as suggested by the positive and statistically significant inward incentive coefficient. However, this effect is significantly lower when the tax base of the host country is broader, since the interaction between *Inward Incentive* and *Tax Base Host* is negative and statistically significant. In line with this result, we also find the joint

coefficient of *Inward Incentive* and *Inward Incentive*  $\times$  *Tax Base Host* to be statistically significant at the 1% or 5% level, with economic magnitudes resembling those of Table 3 (about 3.6–4.8%).<sup>29</sup>

Next, following the same approach, we focus on outward profit shifting and estimate equation (2) while proxying for the profit-shifting incentive between the parent company and its affiliates with an indicator variable that takes the value of one if the tax difference is positive, and zero otherwise. The coefficient of interest (*Outward Incentive*) is  $\beta_1$ , for which we expect a negative sign ( $\beta_1 < 0$ ). That is, the larger (i.e., the more positive) the tax difference between the host and parent countries, the lower the reported income at the multinational affiliate level. We expect the interaction term of the tax base host with the outward incentive to be positive ( $\beta_2 > 0$ ), since a broader tax base prevents the multinational company from shifting income out of its foreign affiliates. In line with the inward analyses, we predict a negative sign of the tax base of the host country ( $\beta_3 < 0$ ).

Columns (3) and (4) of Table 6 present the results. We find that a positive tax difference increases the outflow of income from foreign affiliates toward the parent company, since the outward incentive coefficient is negative and statistically significant at the 1% level. Tax base–broadening rules, though, reduce such outflow of income, as suggested by the positive and statistically significant interaction term. To corroborate this result, we also test for the joint significance between the coefficient of *Outward Incentive* and that of *Outward Incentive*  $\times$  *Tax Base Host* and find it to be statistically significant at the 5% or 10% level, with economic magnitudes resembling those of the previous analyses (about 4.8–5.5%). Taken together, these

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<sup>29</sup> As opposed to our baseline analyses, we proxy for the inward incentive with an indicator variable that simplifies the interpretation of the main effect, the interaction term, and the joint coefficient as percentage changes in the multinational affiliate’s income. Note that the economic magnitude of column (4) of Table 3, net of the tax base effect (i.e., the sum of the tax difference and its interaction with the tax base), is also about 4%. Hence, the current empirical exercise yields similar signs, magnitudes, and levels of significance as those reported in Table 3. In Table A.6 of the Online Appendix, we also document the robustness of our findings to additionally interacting the inward (outward) incentive with tax enforcement.

findings outline that tax base–broadening rules reduce the incentives to engage in both inward and outward profit shifting.

#### *4.4 Joint Effect of the Tax Rate and the Tax Base on Inward versus Outward Profit Shifting:*

##### *The Role of Each Tax Base Item*

The first set of analyses documents that tax base–broadening reforms constrain multinationals’ income shifting into and out of countries. Our second hypothesis further points to a differential role of each tax base item in profit shifting. While anti-avoidance rules aim to curb profit shifting out of countries (H2b), other tax base–broadening rules, such as restrictions on the deductibility of tax losses or on group tax relief, should reduce to incentives to shift profits into foreign affiliates (H2a).

To examine the distinctive role of tax base items on income shifting and provide evidence in support of H2a and H2b, we estimate equation (2) and additionally decompose the tax base index of the host country into two components. Specifically, we create two sub-indices: the first index proxies for anti-avoidance rules (*TP & Thin Cap*) and theoretically ranges from zero (no transfer pricing documentation requirements and no thin capitalization rules) to two (transfer pricing documentation requirements and thin capitalization rules in place). The other index captures the changes in the other tax base–broadening rules (*Other Tax Rules*) and theoretically ranges from zero (very narrow tax base) to four (very broad tax base, with no tax consolidation, no accelerated depreciation allowances, no loss carryback rule, and loss carryforward up to a maximum of five years).

Consistent with H2a, according to which the other tax base–broadening rules reduce the incentives to shift profits into foreign affiliates, we expect the interaction of *Other Tax Rules* with *Inward Incentive* to be negative, since restrictions on the usage of tax allowances, or tax losses, and on group tax relief reduce multinationals’ inward income shifting. We do not make any ex ante prediction on the sign of the anti-avoidance rules index, since there could be reasons

to expect a negative/zero and positive coefficient.<sup>30</sup> For our argument, however, the interaction between *Inward Incentive* and *Other Tax Rules* is most important. All other variables are defined as in equation (2).

Columns (1) and (2) of Table 7 present the results. In both specifications, we find that the inward incentive coefficient is positive and statistically significant at the 5% level, which is in line with our previous analyses. As predicted in H2a, we find that the interaction term is negative and statistically significant at the 1% level, suggesting that 1) other tax base–broadening rules, beyond transfer pricing and thin capitalization rules, are equally relevant for profit shifting, and that 2) these rules reduce or even neutralize, as indicated by the insignificant joint coefficient, the incentives to shift profits into foreign affiliates.

To test for H2b, we focus on outward profit shifting and re-estimate equation (2). Consistent with our hypothesis, we expect anti-avoidance rules to prevent multinational companies from shifting profits out of foreign affiliates. Hence, the coefficient of interest is the interaction between *TP & Thin Cap* and *Outward Incentive*, for which we predict a positive sign. Similar to the previous analyses, we have no ex ante expectation of the sign of the other tax base–broadening rules because, for our hypothesis to be corroborated, anti-avoidance rules should mainly be at work.

Columns (3) and (4) of Table 7 report the results. We find that a positive tax difference increases profit shifting out of foreign affiliates, as indicated by the negative and statistically significant outward incentive coefficient. Nevertheless, the outflow of income from foreign affiliates is significantly lower when countries enact anti-avoidance rules, since the interaction between *Outward Incentive* and *TP & Thin Cap* is positive and statistically significant.

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<sup>30</sup> As Beer and Loeprick (2015, p. 434) argue, the effect of anti-avoidance rules on inward profit shifting is less clear because, “on the one hand, if reported profits are already inflated, then firm behavior might be unaffected by the [anti-avoidance rules]. On the other hand, perceived risk of penalization linked to [anti-avoidance rules] may further increase the incentives to shift profits into the country.”

Consistent with this result, the joint coefficient of *Outward Incentive* and *Outward Incentive*  $\times$  *TP & Thin Cap* is also statistically significant at least at the 10% level.

Overall, the results provide novel evidence that tax base–broadening reforms mitigate the incentives for profit shifting.<sup>31</sup> While anti-avoidance rules mainly act as a constraint on the outflow of income from foreign affiliates toward the parent company, other tax base–broadening rules seem to discourage multinational companies from shifting profits into their foreign affiliates.

#### 4.5 Profit Shifting Trend across EU Countries

The previous analyses show that countries can successfully curb profit shifting by broadening the definition of income subject to tax. Motivated by this evidence, in the third set of analyses, we test whether these corporate tax reforms have also led to a downward trend in profit shifting in Europe over the past decade (H3). More specifically, we rerun equation (1), which allows us to control for changes in the tax base while estimating the tax difference coefficient for three different subperiods. In particular, the first subperiod groups all firm–year observations from 2003 to 2006, the second subperiod groups all firm–year observations from 2007 to 2010, and the last subperiod groups all firm–year observations from 2011 to 2013.<sup>32</sup>

Table 8 presents the results. In columns (1) and (2), we estimate equation (1) using the natural logarithm of *EBIT* as the dependent variable. We find that the tax difference is negative and statistically different from zero at conventional levels across all subperiods. We note that the economic magnitude of the tax difference coefficients exhibits a clear downward trend, with earlier (later) years having the highest (lowest) coefficient estimates. Using the coefficient estimates in column (2) as a reference point, we find that the difference in the tax difference

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<sup>31</sup> In Table A.7 of the Online Appendix, we find unchanged inferences when we further control for the interaction between the inward (outward) incentive and tax enforcement.

<sup>32</sup> Ideally, one would like to estimate the tax difference coefficient yearly to evaluate the trend in profit shifting over time. However, due to different sample sizes over the years, this could lead to inconsistent coefficient estimates.

coefficients between the first subperiod, from 2003 to 2006, and the second subperiod, from 2007 to 2010 (last subperiod, from 2011 to 2013), is statistically different from zero at the 5% (10%) level. In economic terms, this translates to a reduction in the profit-shifting incentive (i.e., the tax difference coefficient) of about 40% ( $= 0.2850/0.7094$ ) relative to the second subperiod, or 42% ( $= 0.2948/0.7094$ ) relative to the last subperiod. Closely related to this, it is also worth pointing out that, between the first subperiod, from 2003 to 2006, and the second and last subperiods, from 2007 to 2010 and from 2011 to 2013, the average tax base index has substantially increased by almost one unit.

Similarly, in columns (5) to (6) of Table 8, we estimate equation (1) using the natural logarithm of  $ROA + 1$  as the dependent variable. We continue to find inferences similar to those reported in columns (1) and (2). Economically, the results in column (6) imply that the profit-shifting incentive has decreased over time by about 35% ( $= 0.0281/0.0803$ ) relative to the second subperiod, or by 51% ( $= 0.0408/0.0803$ ) relative to the last subperiod.

Furthermore, to alleviate the remaining concern that the business cycle is driving our results, we re-estimate equation (1) while excluding recession years. More specifically, we exclude firm–year observations in which either the host or the parent country experienced more than two consecutive quarters of negative GDP growth, which is consistent with the conventional definition of recession (Blanchard and Johnson 2013).<sup>33</sup> Columns (3) and (4) (columns (7) and (8)) of Table 8 report the results using the natural logarithm of  $EBIT$  ( $ROA + 1$ ) as the dependent variable. Throughout all four specifications, we find that the tax difference is negative and statistically different from zero at conventional levels across all subperiods. Interestingly, we note that the economic magnitude, although still exhibiting a clear downward path, is larger outside of recession periods.

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<sup>33</sup> In Figure A.5 of the Online Appendix, we plot the GDP growth trends and recession years for each sample country over 2003–2013.



#### 4.6 Profit Shifting Trend across EU Countries: The Role of Tax Enforcement

In the fourth set of analyses, we analyze whether the strength of a country's tax enforcement has also played a role in the downward trend in profit shifting observed in the previous analyses. According to our theoretical framework, tax base–broadening measures and tax enforcement complement each other, since tax enforcement strengthens the effectiveness of tax rules. Thus, we expect the decline in profit shifting to be more pronounced when tax enforcement is stricter (H4).

To provide evidence consistent with this prediction, we repeat the trend analysis and further interact the tax difference coefficient for the three subperiods with the standardized version of *Tax Enforcement*, which eases the interpretation. Similar to the previous analysis, we expect the main tax difference coefficients to be negative and declining over time. Moreover, to support our hypothesis that tax enforcement also plays a role in constraining multinationals' profit shifting, we expect the interaction terms to be positive and increasing in magnitude over time. That is, the positive sign indicates that, as tax enforcement becomes stricter, less income flows between a multinational affiliate and its parent firm.

Table 9 presents the results. In columns (1) and (2) (columns (3) and (4)), we use the natural logarithm of *EBIT* ( $ROA + 1$ ) as the dependent variable. As expected, we continue to find the tax difference to be negative and statistically different from zero at conventional levels across all subperiods, with the economic magnitude decreasing over time. Furthermore, we find compelling evidence that tax enforcement has played a role in the observed profit-shifting trend in Europe over the past decade. More specifically, the results show that the tax enforcement coefficients are mostly positive and statistically significant, with the economic magnitude sharply increasing in the second and last subperiods. These findings are consistent with countries developing additional enforcement capabilities to tackle tax avoidance and profit shifting in the last years of the sample period (OECD 2013a, 2015). In economic terms, the

results across all four specifications imply that, when accounting for tax enforcement, the profit-shifting incentive has further decreased over time by about 56% relative to the second subperiod, or 93% relative to the last subperiod.<sup>34</sup> Collectively, the findings suggest that profit shifting has significantly declined in Europe over time because of broader tax bases and stricter tax enforcement.<sup>35</sup>

#### 4.7 Macroeconomic Determinants of Corporate Tax Reforms

In the last set of analyses, we examine the macroeconomic conditions around the adoption of corporate tax policy changes; that is, we investigate whether country-level variables are systematically correlated with tax rate changes, since politico-economic considerations can make countries more likely to enact corporate tax reforms (Altshuler and Goodspeed 2015). Thus, we estimate a panel data model that includes all the economic predictors used in the regression analyses, along with country and year fixed effects. All country-level variables are measured in the two years before the tax rate change comes into effect.

Table 10 reports the results. Of a large set of political and economic determinants, none are correlated with corporate tax rates suggesting that, in our sample, the business cycle is not driving the tax rate changes. However, we find that corporate tax rates and corporate tax bases are negatively correlated with each other (i.e., a one-unit increase in the tax base index corresponds to a decrease of about 0.3 percentage points in the corporate tax rate). This finding lends further support for our interpretation that governments trade off lower tax rates with broader tax bases to curb profit shifting (Haufler and Schjelderup 2000; OECD 2010).

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<sup>34</sup> To compute the average decrease in profit shifting (i.e., the combined effect of *Tax Difference* and *Tax Enforcement*) across all four specifications, we first calculate the decrease in profit shifting for each specification relative to the second (last) subperiod and then average them out. For example, the profit-shifting incentive (column (1)) has decreased by about 55% ( $= 0.4007 / (0.8003 - 0.0692)$ ) relative to the second subperiod. Similarly, in column (2), the decrease in profit shifting relative to the second subperiod is equal to 59% ( $= 0.4163 / (0.7818 - 0.0768)$ ), and so on. The average decrease across all four specifications is equal to 56%.

<sup>35</sup> In Table A.8 of the Online Appendix, we repeat the trend analysis (with and without *Tax Enforcement*) while defining industry fixed effects at the two-digit SIC code level. We continue to find similar signs, magnitudes, and levels of significance for all the variables as in Tables 8 and 9.

## 5. Conclusion

This paper investigates the effect of corporate tax reforms on tax-motivated profit shifting. We use a large sample of multinationals and their subsidiaries in Europe and exploit 68 corporate tax reforms over 2003–2013. We focus on the income flowing between multinational subsidiaries and their parent companies. With a panel regression model, we assess whether the corporate tax reforms enacted over the past decade have constrained this particular tax strategy. Although, on average, multinational affiliates are still sensitive to tax rate changes, we document that profit shifting is significantly lower when accounting for policy changes that broaden the tax base (Haufler and Schjelderup 2000; OECD 2010).

With respect to the *direction* of profit shifting, we find that tax base–broadening reforms reduce profit shifting into and out of foreign affiliates. In particular, anti-avoidance rules appear to constrain the outflow of profits from foreign affiliates, whereas other tax base–broadening rules, such as restrictions on the deductibility of tax losses or on group tax relief, seem to reduce the incentives for the inflow of income into foreign affiliates.

Finally, we analyze whether the corporate tax reforms have also changed the profit shifting trend across EU countries over the sample period. We find a downward trend in the profit-shifting incentive in relation to the tax rate. In economic terms, our results imply a decrease in multinationals’ profit shifting of about 40% in the second half of the sample period (2007–2013) and of up to 93% when additionally accounting for tax enforcement. These results starkly contrast with empirical evidence showing that the tax avoidance (Dyreng et al. 2017) and income shifting (Grubert 2012; Klassen and Laplante 2012) of U.S. multinationals have grown over time. Instead, our results suggest that income shifting—the key cross-border tax avoidance tool—has decreased in Europe during 2003–2013. Overall, our findings are consistent with broader tax bases and stricter tax enforcement having successfully curbed profit shifting across European countries over the past decade (OECD 2013a, 2015; Dharmapala 2014).

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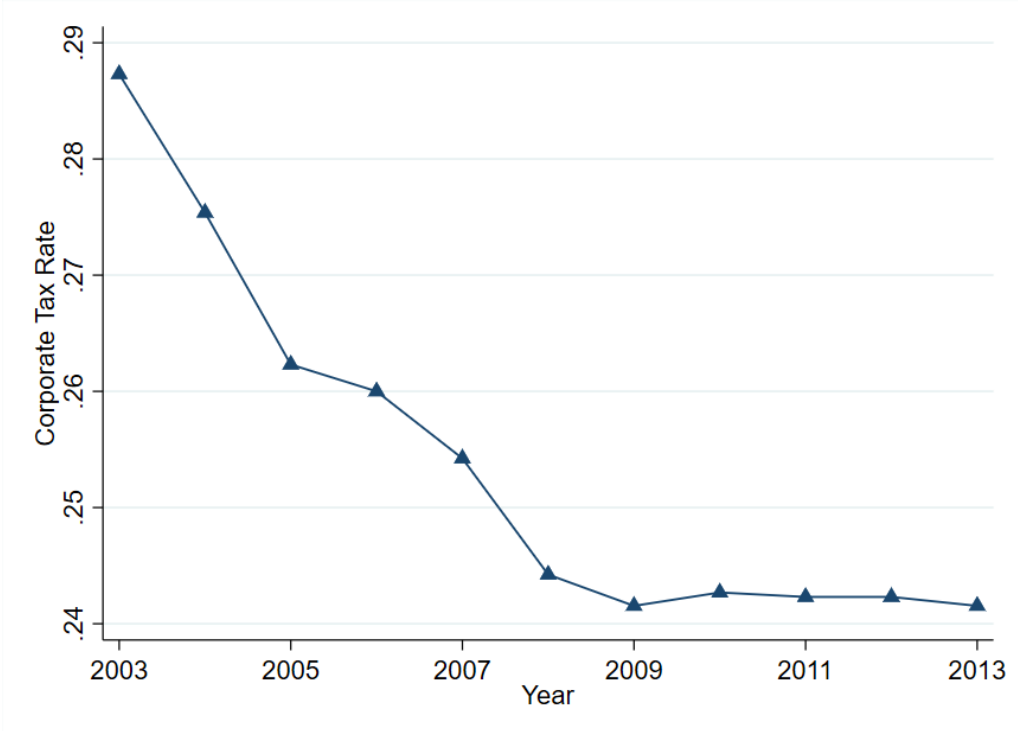
## Appendix: Variable Definitions

<b>Firm-level controls</b> (Source: Amadeus)	
<i>ln(EBIT)</i>	<i>ln(EBIT)</i> is the natural logarithm of the firm's EBIT ( <i>EBIT</i> ).
<i>ln(ROA + 1)</i>	<i>ln(ROA + 1)</i> is the natural logarithm of the firm's return on assets ( <i>EBIT/TOAS</i> ) plus one (De Simone et al. 2017).
<i>ln(Fixed Assets)</i>	<i>ln(Fixed Assets)</i> is the natural logarithm of the firm's fixed asset stock ( <i>FIAS</i> ).
<i>ln(Cost of Employees)</i>	<i>ln(Cost of Employees)</i> is the natural logarithm of the firm's cost of employees ( <i>STAF</i> ).
<i>ln(Intangibles)</i>	<i>ln(Intangibles)</i> is the natural logarithm of the firm's intangible assets ( <i>IFAS</i> ). We replace missing and zero values with one (Weichenrieder 2009).
<i>ln(R&amp;D)</i>	<i>ln(R&amp;D)</i> is the natural logarithm of the firm's research and development expenses ( <i>RD</i> ). We replace missing and zero values with one (Weichenrieder 2009).
<b>Tax controls</b> (Sources: Taxation Trends in Europe 2014, Eurostat; E&Y Corporate Tax Guides; OECD)	
<i>Tax Difference</i>	<i>Tax Difference</i> is the difference in the statutory corporate tax rates of the subsidiary considered and its parent firm.
<i>Inward Incentive</i>	<i>Inward Incentive</i> is an indicator variable taking the value of one if the tax difference is negative, and zero otherwise.
<i>Outward Incentive</i>	<i>Outward Incentive</i> is an indicator variable taking the value of one if the tax difference is positive, and zero otherwise.
<i>Tax Base Index</i>	<i>Tax Base Index</i> is an index ranging from 0 (very narrow tax base) to 6 (very broad tax base with transfer pricing documentation requirements, restrictions on interest payments deductibility, no tax consolidation, no accelerated depreciation allowances, no loss carryback rule, and loss carryforward up to a maximum of 5 years). This index indicates how broad the tax base is according to the country's tax code.
<i>TP &amp; Thin Cap</i>	<i>TP &amp; Thin Cap</i> is an index ranging from 0 (no transfer pricing documentation requirements and no restrictions on interest payments deductibility) to 2 (transfer pricing documentation requirements and restrictions on interest payments deductibility). This index is based on the <i>Tax Base Index</i> and captures the extent to which the country's tax code has transfer pricing and thin capitalization rules in place that limit profit shifting.
<i>Other Tax Rules</i>	<i>Other Tax Rules</i> is an index ranging from 0 (narrow tax base) to 4 (broad tax base with no tax consolidation, no accelerated depreciation allowances, no loss carryback rule, and loss carryforward up to a maximum of 5 years). This index is based on the <i>Tax Base Index</i> and indicates how broad the tax base is according to the country's tax code, beyond transfer pricing and thin capitalization rules.
<i>Tax Enforcement</i>	<i>Tax Enforcement</i> is the ratio of citizens to tax staff at the central government tax agency converted into tax staff per 1,000 inhabitants.
<b>Country-level controls</b> (Source: World Bank)	
<i>Control of Corruption</i>	<i>Control of Corruption</i> is the yearly estimate of a country's quality relating to the control of corruption.

<i>Distance</i>	<i>Distance</i> is the natural logarithm of the great circle distance between the capitals of the parent and host countries. The latitudes and longitudes of the capital cities of each country are obtained from the Maps of the World website (mapsofworld.com). The standard formula is then applied to calculate the distance (Erel et al. 2012).
<i>GDP Growth</i>	<i>GDP Growth</i> is the annual percentage growth rate of the GDP in constant 2005 U.S. dollars.
<i>GDP per capita</i>	<i>GDP per capita</i> is the natural logarithm of the GDP per capita in constant 2005 U.S. dollars.
<i>Inflation</i>	<i>Inflation</i> is the rate of price change in a country as a whole as measured by the annual growth rate of the GDP implicit deflator.
<i>Unemployment</i>	<i>Unemployment</i> is the number of unemployed people as a percentage of the total labor force. Unemployed people are those without work who have taken active steps to find work.

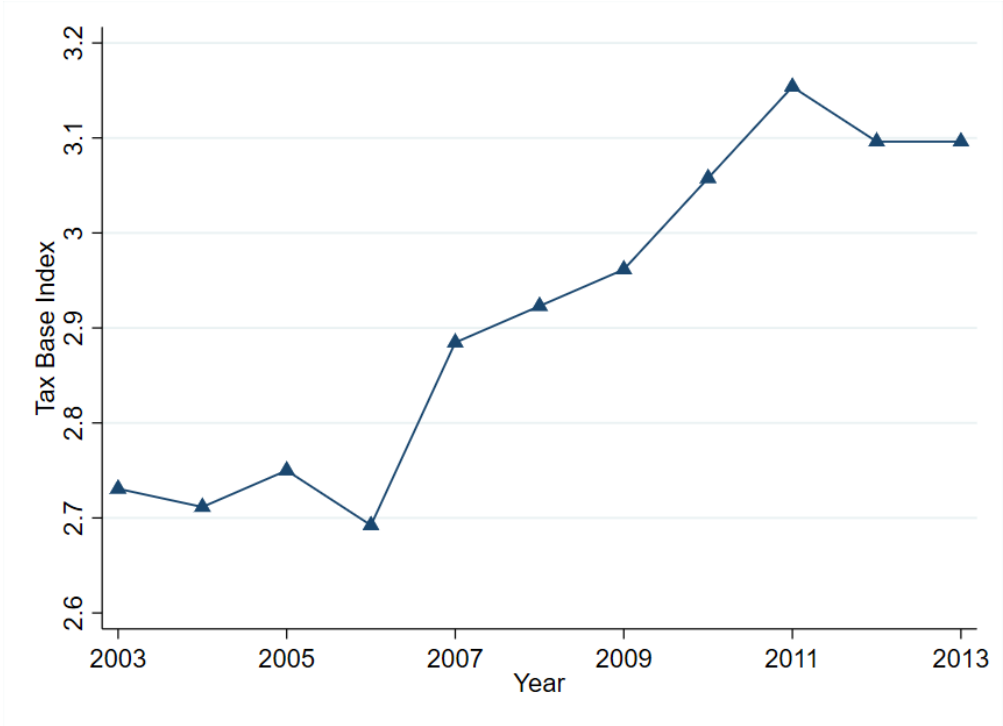
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**Figure 1: Corporate Tax Rate in Europe, 2003–2013**



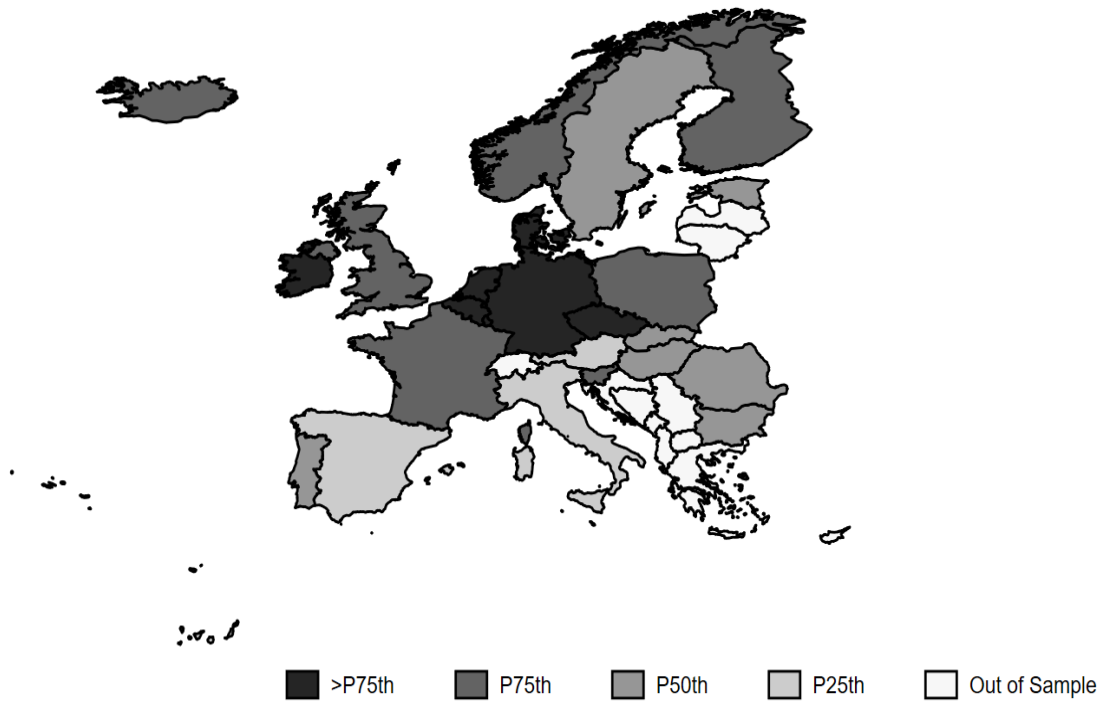
This figure plots the yearly mean of the corporate tax rate across 26 European countries over 2003–2013.

**Figure 2: Tax Base in Europe, 2003–2013**



This figure plots the yearly mean of the tax base index across 26 European countries over 2003–2013.

**Figure 3: Tax Enforcement in Europe, 2003–2013**



This figure displays the variation in tax enforcement across 26 European countries over 2003–2013. Tax enforcement is the average ratio of citizens to tax staff converted into tax staff per 1,000 inhabitants and divided into quartiles over the sample period. Darker shading corresponds to stronger tax enforcement.

**Table 1: Tax Base Index in Europe, 2003–2013**

ISO Code	Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AT	Austria	2	2	2	2	2	2	2	2	2	2	2
BE	Belgium	3	3	3	3	3	3	3	3	3	3	3
BG	Bulgaria	4	5	4	4	4	4	4	4	4	4	4
HR	Croatia	3	3	3	3	3	3	3	3	3	3	3
CZ	Czech Republic	3.5	4	4	4	4	4	4	4	4	4	4
DK	Denmark	4	4	4	4	4	3	3	3	3	3	3
EE	Estonia	4	4	4	4	5	5	5	5	5	5	5
FI	Finland	2.5	2.5	2.5	2.5	3.5	3.5	2.5	2.5	2.5	2.5	2.5
FR	France	2	1	1	1	0	0	0	1	1	1	1
DE	Germany	2	2	2	2	2	3	2	2	3	3	3
HU	Hungary	5	4	4	4	4	4	4	5	5	5	5
IS	Iceland	2.5	2.5	2.5	2.5	2.5	2.5	2.5	1.5	1.5	1.5	1.5
IE	Ireland	1	1	1	1	1	1	1	1	2	2	2
IT	Italy	3	2	3	3	3	3	4	5	5	4	4
LU	Luxembourg	2	2	2	2	2	2	2	2	2	2	2
MT	Malta	2	2	2	2	2	2	2	2	2	2	2
NL	Netherlands	2	3	3	3	3	3	3.5	3.5	3.5	3.5	3.5
NO	Norway	1.5	1.5	1.5	1	1	1	1	2	2	2	2
PL	Poland	4	4	4	4	5	5	5	5	5	5	5
PT	Portugal	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4
RO	Romania	4	4	4	4	5	5	4.5	4.5	4.5	4.5	4.5
SK	Slovak Republic	4	3	3	3	3	3	4	3.5	3.5	3.5	3.5
SI	Slovenia	2	3	4	4	5	5	5	5	5	5	5
ES	Spain	2.5	2.5	2.5	2.5	2.5	2.5	3.5	3.5	3.5	3	3
SE	Sweden	1	1	1	1	2	2	2	2	2	2	2
GB	United Kingdom	1	1	1	0	0	1	1	1	1	1	1

*Notes:* This table summarizes the data for our tax base index during 2003–2013. Each country–year observation is from the E&Y Corporate Tax Guides.

**Table 2:** Descriptive statistics

Panel A:	Firm-level controls (millions of euros)				
	Mean	P25	Median	P75	Std.
<i>EBIT</i>	26.400	0.178	6.510	26.210	129.00
<i>Fixed Assets</i>	108.000	1.470	103.200	679.000	649.00
<i>Cost of Employees</i>	7.360	0.593	1.830	6.222	3.890
<i>Intangibles</i>	4.237	0	0.502	13.700	25.300
<i>R&amp;D</i>	0	0	0	0	0
<i>ROA (%)</i>	8.42%	0.74%	6.14%	14.33%	13.77%
<i>Distance (km)</i>	905.960	434.240	879.850	1274.940	522.840

Panel B:	Country-level controls		
	Mean Host	Mean Parent	$\Delta$ Mean
<i>Corporate Tax Rate</i>	0.272	0.293	-0.021*** (-81.125)
<i>Tax Base</i>	2.776	2.269	0.507*** (86.190)
<i>Control of Corruption</i>	1.046	1.663	-0.617*** (-230.000)
<i>GDP Growth</i>	0.013	0.011	0.002*** (35.362)
<i>GDP Per Capita</i>	10.119	10.573	-0.454*** (-220.000)
<i>Inflation</i>	0.023	0.018	0.005*** (73.341)
<i>Unemployment</i>	0.087	0.073	0.014*** (101.360)

*Notes:* This table presents descriptive statistics for our main variables during 2003–2013. In Panel A, firm-level variables are in millions of euros and the variable *ROA (Distance)* is in percentage points (kilometers). In Panel B, country-level controls are presented at their mean value for the host (column (1)) and parent countries (column (2)). Column (3) of Panel B reports the significance test results between the host and parent countries. The *t*-statistics with heteroskedastic-robust standard errors are clustered at the firm level and shown in parentheses. The superscripts \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively. All the variables are defined in the Appendix.

**Table 3:** Corporate tax reforms, tax base broadening, and profit shifting

Dependent Variable:	ln ( <i>EBIT</i> )					
Explanatory Variables:	(1)	(2)	(3)	(4)	(5)	(6)
<i>Tax Difference</i>	-0.8665*** (0.2588)	-0.6960*** (0.2590)	-0.8078*** (0.2539)	-0.6775*** (0.2543)	-0.7410** (0.3141)	-0.6734** (0.3135)
<i>Tax Difference</i> × <i>Tax Base Host</i>	0.2433*** (0.0870)	0.2035** (0.0869)	0.1982** (0.0833)	0.1678** (0.0832)	0.1962** (0.0836)	0.1677** (0.0835)
<i>Tax Base Host</i>	-0.0072 (0.0092)	-0.0058 (0.0093)	-0.0090 (0.0090)	-0.0083 (0.0090)	-0.0088 (0.0090)	-0.0083 (0.0090)
<i>Tax Base Parent</i>	0.0319*** (0.0089)	0.0303*** (0.0088)	0.0315*** (0.0087)	0.0300*** (0.0087)	0.0309*** (0.0088)	0.0299*** (0.0088)
Joint Significance [( <i>Tax Difference</i> × <i>Tax Base Host</i> ) + ( <i>Tax Difference</i> )]	-0.6233*** (0.1977)	-0.4925** (0.1979)	-0.6096*** (0.1959)	-0.5097*** (0.1963)	-0.5448** (0.2646)	-0.5057* (0.2641)
Controls	-	-	✓	✓	✓	✓
Control for <i>Tax Difference</i> × <i>Tax Base Parent</i>	-	-	-	-	✓	✓
Firm fixed effects	✓	✓	✓	✓	✓	✓
Industry–Year fixed effects	-	✓	-	✓	-	✓
Year fixed effects	✓	-	✓	-	✓	-
#Observations	101,985	101,985	101,985	101,985	101,985	101,985
#Affiliates	17,538	17,538	17,538	17,538	17,538	17,538
Adj. R-Squared	0.863	0.864	0.870	0.871	0.870	0.871

*Notes:* Observational units are profit-making *multinational subsidiaries* per year. All specifications include a full set of affiliate dummies and a full set of year dummies. Industry–year dummies (at the one-digit SIC code level) are included where indicated. The dependent variable is the natural logarithm of *EBIT*. The variable *Tax Base Host (Parent)* is an index ranging from zero (very narrow tax base) to six (very broad tax base with transfer pricing documentation requirements, restrictions on interest payments deductibility, no tax consolidation, no accelerated depreciation allowances, no loss carryback rule, and loss carryforward up to a maximum of five years). It indicates how broad the tax base is according to the tax code in that country and year. The variable *Tax Difference* equals the subsidiary tax rate minus the parent tax rate. The variable *Joint Significance* tests for the effect of *Tax Difference* × *Tax Base Host* + *Tax Difference*. All the variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the firm level and shown in parentheses. The superscripts \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table 4:** Corporate tax reforms, tax base broadening, and profit shifting—Robustness tests I

Dependent Variable:	ln ( <i>EBIT</i> )			
Excluded Observations from:	Sub. Country France	Sub. Country Italy	Parent Country Germany	Parent Country Netherlands
Explanatory Variables:	(1)	(2)	(3)	(4)
<i>Tax Difference</i>	-0.8965** (0.3689)	-0.7944** (0.3293)	-0.8209** (0.3837)	-0.7387** (0.3239)
<i>Tax Difference</i> × <i>Tax Base Host</i>	0.2778*** (0.0981)	0.1883** (0.0880)	0.2438** (0.1116)	0.1770** (0.0871)
<i>Tax Base Host</i>	-0.0078 (0.0105)	0.0033 (0.0108)	-0.0083 (0.0103)	-0.0065 (0.0096)
<i>Tax Base Parent</i>	0.0231** (0.0097)	0.0292*** (0.0093)	0.0305*** (0.0098)	0.0302*** (0.0096)
Joint Significance [( <i>Tax Difference</i> × <i>Tax Base Host</i> ) + ( <i>Tax Difference</i> )]	-0.6187** (0.3033)	-0.6060** (0.2795)	-0.5771* (0.3157)	-0.5617** (0.2720)
Controls	✓	✓	✓	✓
Control for <i>Tax Diff.</i> × <i>Tax Base Parent</i>	✓	✓	✓	✓
Firm fixed effects	✓	✓	✓	✓
Industry–Year fixed effects	✓	✓	✓	✓
#Observations	85,879	92,454	79,189	90,877
#Affiliates	14,829	15,973	13,794	15,612
Adj. R-Squared	0.871	0.868	0.868	0.870

*Notes:* Observational units are profit-making *multinational subsidiaries* per year. All specifications include a full set of affiliate dummies and a full set of industry–year dummies (at the one-digit SIC code level). Columns (1) and (2) exclude multinational subsidiaries from France or Italy, whereas columns (3) and (4) exclude multinational subsidiaries whose parent firm is located either in Germany or in the Netherlands. The dependent variable is the natural logarithm of *EBIT*. The variable *Tax Base Host (Parent)* is an index ranging from zero (very narrow tax base) to six (very broad tax base with transfer pricing documentation requirements, restrictions on interest payments deductibility, no tax consolidation, no accelerated depreciation allowances, no loss carryback rule, and loss carryforward up to a maximum of five years). It indicates how broad the tax base is according to the tax code in the country and year. The variable *Tax Difference* equals the subsidiary tax rate minus the parent tax rate. The variable *Joint Significance* tests for the effect of  $Tax\ Difference \times Tax\ Base\ Host + Tax\ Difference$ . All the variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the firm level and shown in parentheses. The superscripts \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.



**Table 5:** Corporate tax reforms, tax base broadening, and profit shifting—Robustness tests

## II

Dependent Variable:	ln ( <i>ROA</i> + 1)			
Explanatory Variables:	(1)	(2)	(3)	(4)
<i>Tax Difference</i>	-0.0724*** (0.0246)	-0.0624** (0.0248)	-0.0668** (0.0315)	-0.0631** (0.0316)
<i>Tax Difference</i> × <i>Tax Base Host</i>	0.0187** (0.0082)	0.0160* (0.0082)	0.0185** (0.0083)	0.0160* (0.0083)
<i>Tax Base Host</i>	-0.0006 (0.0008)	-0.0005 (0.0009)	-0.0006 (0.0008)	-0.0005 (0.0009)
<i>Tax Base Parent</i>	0.0016** (0.0008)	0.0015* (0.0008)	0.0016** (0.0008)	0.0015* (0.0008)
Joint Significance [( <i>Tax Difference</i> × <i>Tax Base Host</i> ) + ( <i>Tax Difference</i> )]	-0.0538*** (0.0190)	-0.0464** (0.0191)	-0.0483* (0.0265)	-0.0470* (0.0266)
Controls	✓	✓	✓	✓
Control for <i>Tax Diff</i> × <i>Tax Base Parent</i>	-	-	✓	✓
Firm fixed effects	✓	✓	✓	✓
Industry–Year fixed effects	-	✓	-	✓
Year fixed effects	✓	-	✓	-
#Observations	131,729	131,729	131,729	131,729
#Affiliates	19,248	19,248	19,248	19,248
Adj. R-Squared	0.523	0.524	0.523	0.524

*Notes:* Observational units are profit-making and loss-making *multinational subsidiaries* per year. All specifications include a full set of affiliate dummies and a full set of year dummies. Industry–year dummies (at the one-digit SIC code level) are included where indicated. The dependent variable is the natural logarithm of *ROA* + 1. The variable *Tax Base Host (Parent)* is an index ranging from zero (very narrow tax base) to six (very broad tax base with transfer pricing documentation requirements, restrictions on interest payments deductibility, no tax consolidation, no accelerated depreciation allowances, no loss carryback rule, and loss carryforward up to a maximum of five years). It indicates how broad the tax base is according to the tax code in the country and year. The variable *Tax Difference* equals the subsidiary tax rate minus the parent tax rate. The variable *Joint Significance* tests for the effect of *Tax Difference* × *Tax Base Host* + *Tax Difference*. All the variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the firm level and shown in parentheses. The superscripts \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table 6:** Corporate tax reforms, tax base broadening, and inward versus outward profit shifting

Dependent Variable:	ln ( <i>EBIT</i> )			
Profit Shifting:	Inward		Outward	
Explanatory Variables:	(1)	(2)	(3)	(4)
<i>Inward Incentive</i>	0.0777*** (0.0288)	0.0628** (0.0288)		
<i>Inward Incentive</i> × <i>Tax Base Host</i>	-0.0301*** (0.0103)	-0.0271*** (0.0102)		
<i>Outward Incentive</i>			-0.0763*** (0.0248)	-0.0659*** (0.0249)
<i>Outward Incentive</i> × <i>Tax Base Host</i>			0.0212** (0.0102)	0.0177* (0.0102)
<i>Tax Base Host</i>	0.0025 (0.0098)	0.0024 (0.0098)	-0.0178* (0.0100)	-0.0157 (0.0100)
<i>Tax Base Parent</i>	0.0307*** (0.0087)	0.0289*** (0.0087)	0.0308*** (0.0086)	0.0295*** (0.0086)
<b>Joint Significance</b>				
[( <i>Inward Incentive</i> × <i>Tax Base Host</i> ) + ( <i>Inward Incentive</i> )]	0.0476** (0.0208)	0.0357* (0.0209)		
[( <i>Outward Incentive</i> × <i>Tax Base Host</i> ) + ( <i>Outward Incentive</i> )]			-0.0551*** (0.0178)	-0.0482*** (0.0178)
Controls	✓	✓	✓	✓
Firm fixed effects	✓	✓	✓	✓
Industry–Year fixed effects	-	✓	-	✓
Year fixed effects	✓	-	✓	-
#Observations	101,985	101,985	101,985	101,985
#Affiliates	17,538	17,538	17,538	17,538
Adj. R-Squared	0.870	0.871	0.870	0.871

*Notes:* Observational units are profit-making *multinational subsidiaries* per year. All specifications include a full set of affiliate dummies and a full set of industry–year dummies (at the one-digit SIC code level). Columns (1) and (2) show the results on inward profit shifting, whereas columns (3) and (4) show the results on outward profit shifting. The dependent variable is the natural logarithm of *EBIT*. The variable *Tax Base Host (Parent)* is an index ranging from zero (very narrow tax base) to six (very broad tax base with transfer pricing documentation requirements, restrictions on interest payments deductibility, no tax consolidation, no accelerated depreciation allowances, no loss carryback rule, and loss carryforward up to a maximum of five years). It indicates how broad the tax base is according to the tax code in the country and year. The variable *Inward (Outward) Incentive* is an indicator variable taking the value of one if the difference between the subsidiary tax rate minus the parent tax rate is negative (positive). The variable *Joint Significance* tests for the effect of *Inward (Outward) Incentive* × *Tax Base Host* + *Inward (Outward) Incentive*. All the variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the firm level and shown in parentheses. The superscripts \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table 7:** Corporate tax reforms, tax base broadening, and inward versus outbound profit shifting—The role of each tax base item

Dependent Variable:	ln ( <i>EBIT</i> )			
Profit Shifting:	Inward		Outward	
Explanatory Variables:	(1)	(2)	(3)	(4)
<i>Inward Incentive</i>	0.0732** (0.0294)	0.0590** (0.0294)		
<i>Inward Incentive</i> × <i>TP &amp; Thin Cap</i>	-0.0124 (0.0189)	-0.0115 (0.0190)		
<i>Inward Incentive</i> × <i>Other Tax Rules</i>	-0.0392*** (0.0129)	-0.0352*** (0.0129)		
<i>Outward Incentive</i>			-0.0840*** (0.0256)	-0.0730*** (0.0257)
<i>Outward Incentive</i> × <i>TP &amp; Thin Cap</i>			0.0374** (0.0184)	0.0326* (0.0185)
<i>Outward Incentive</i> × <i>Other Tax Rules</i>			0.0099 (0.0134)	0.0073 (0.0134)
<i>TP &amp; Thin Cap</i>	0.0116 (0.0139)	0.0114 (0.0139)	-0.0092 (0.0147)	-0.0071 (0.0147)
<i>Other Tax Rules</i>	-0.0109 (0.0143)	-0.0105 (0.0143)	-0.0341** (0.0142)	-0.0316** (0.0142)
<i>Tax Base Parent</i>	0.0301*** (0.0087)	0.0283*** (0.0087)	0.0312*** (0.0087)	0.0298*** (0.0087)
<b>Joint Significance</b>				
[( <i>Inward Incentive</i> × <i>TP &amp; Thin Cap</i> ) + ( <i>Inward Incentive</i> )]	0.0608*** (0.0232)	0.0475** (0.0232)		
[( <i>Inward Incentive</i> × <i>Other Tax Rules</i> ) + ( <i>Inward Incentive</i> )]	0.0340 (0.0250)	0.0239 (0.0250)		
[( <i>Outward Incentive</i> × <i>TP &amp; Thin Cap</i> ) + ( <i>Outward Incentive</i> )]			-0.0466** (0.0199)	-0.0404** (0.0199)
[( <i>Outward Incentive</i> × <i>Other Tax Rules</i> ) + ( <i>Outward Incentive</i> )]			-0.0740*** (0.0232)	-0.0657*** (0.0232)
Controls & Firm fixed effects	✓	✓	✓	✓
Industry–Year fixed effects	-	✓	-	✓
Year fixed effects	✓	-	✓	-
#Observations	101,985	101,985	101,985	101,985
#Affiliates	17,538	17,538	17,538	17,538
Adj. R-Squared	0.870	0.871	0.870	0.871

*Notes:* Observational units are profit-making *multinational subsidiaries* per year. All specifications include a full set of affiliate dummies and a full set of industry–year dummies (at the one-digit SIC code level). Columns (1) and (2) show the results on inward profit shifting, whereas columns (3) and (4) show the results on outward profit shifting. The dependent variable is the natural logarithm of *EBIT*. The variable *TP & Thin Cap* is an index ranging from 0 (no transfer pricing documentation requirements and no restrictions on interest payments deductibility) to 2 (transfer pricing documentation requirements and restrictions on interest payments deductibility). The variable *Other Tax Rules* is an index ranging from 0 (narrow tax base) to 4 (broad tax base with no tax consolidation, no accelerated depreciation allowances, no loss carryback rule, and loss carryforward up to a maximum of 5 years). The variable *Inward (Outward) Incentive* is an indicator variable taking the value of one if the difference between the subsidiary tax rate minus the parent tax rate is negative (positive). The variable *Joint Significance* tests for the effect of *Inward (Outward) Incentive* × *TP & Thin Cap* + *Inward (Outward) Incentive* (*Inward (Outward) Incentive* × *Other Tax Rules* + *Inward (Outward) Incentive*). All the variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the firm level and shown in parentheses. The superscripts \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table 8:** Profit shifting and development over time

Dependent Variable:	ln ( <i>EBIT</i> )				ln ( <i>ROA</i> + 1)			
Sample:	Baseline		No recession years		Baseline		No recession years	
Explanatory Variables:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Tax Difference</i> × 2003-2006	-0.7260*** (0.2242)	-0.7094*** (0.2238)	-1.2245*** (0.3099)	-1.2347*** (0.3098)	-0.0819*** (0.0227)	-0.0803*** (0.0228)	-0.1110*** (0.0302)	-0.1088*** (0.0304)
<i>Tax Difference</i> × 2007-2010	-0.4669** (0.2055)	-0.4244** (0.2055)	-0.8001*** (0.2930)	-0.7973*** (0.2930)	-0.0540*** (0.0203)	-0.0523** (0.0203)	-0.0680** (0.0281)	-0.0665** (0.0281)
<i>Tax Difference</i> × 2011-2013	-0.4872** (0.1980)	-0.4146** (0.1983)	-0.8221*** (0.2763)	-0.7517*** (0.2771)	-0.0440** (0.0191)	-0.0395** (0.0191)	-0.0549** (0.0264)	-0.0496* (0.0264)
Joint Significance								
[( <i>Tax Difference</i> × 2003-2006) – ( <i>Tax Difference</i> × 2007-2010)]	-0.2591** (0.1267)	-0.2850** (0.1268)	-0.4244*** (0.1322)	-0.4374*** (0.1322)	-0.0279** (0.0126)	-0.0281** (0.0126)	-0.0429*** (0.0132)	-0.0424*** (0.0132)
Joint Significance								
[( <i>Tax Difference</i> × 2003-2006) – ( <i>Tax Difference</i> × 2011-2013)]	-0.2388 (0.1622)	-0.2948* (0.1624)	-0.4025** (0.1875)	-0.4830** (0.1877)	-0.0379** (0.0159)	-0.0408** (0.0159)	-0.0560*** (0.0178)	-0.0592*** (0.0179)
Controls & Firm fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Industry–Year fixed effects	-	✓	-	✓	-	✓	-	✓
Year fixed effects	✓	-	✓	-	✓	-	✓	-
#Observations	101,985	101,985	65,646	65,646	131,729	131,729	84,253	84,253
#Affiliates	17,538	17,538	15,793	15,793	19,248	19,248	18,100	18,100
R-Squared	0.870	0.871	0.891	0.891	0.523	0.524	0.535	0.536

*Notes:* Observational units are profit-making and loss-making *multinational subsidiaries* per year. All specifications include a full set of affiliate dummies and a full set of year dummies. Industry–year dummies (at the one-digit SIC code level) are included where indicated. Specifications (1) to (4) use the natural logarithm of *EBIT* as the dependent variable and specifications (5) to (8) use the natural logarithm of *ROA* + 1 as the dependent variable. Columns (3) and (4) (columns (7) and (8)) exclude multinational subsidiaries whose parent or host countries experienced a recession that year. The variable *Tax Difference* equals the subsidiary tax rate minus the parent tax rate. The variable *Joint Significance* checks the equality of the two coefficients *Tax Difference* × 2003-2006 and *Tax Difference* × 2007-2010 (*Tax Difference* × 2003-2006 and *Tax Difference* × 2011-2013). All the variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the firm level and shown in parentheses. The superscripts \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table 9:** Profit shifting and development over time—The role of tax enforcement

Dependent Variable:	ln ( <i>EBIT</i> )		ln ( <i>ROA</i> + 1)	
Explanatory Variables:	(1)	(2)	(3)	(4)
$[\beta_1]$ <i>Tax Difference</i> × 2003-2006	-0.8003*** (0.2251)	-0.7818*** (0.2248)	-0.0823*** (0.0231)	-0.0810*** (0.0232)
$[\beta_2]$ <i>Tax Diff.</i> × 2003-2006 × <i>Tax Enforc.</i>	0.0692 (0.1471)	0.0768 (0.1471)	0.0063 (0.0180)	0.0069 (0.0180)
$[\beta_3]$ <i>Tax Difference</i> × 2007-2010	-0.5654*** (0.2084)	-0.5218** (0.2084)	-0.0585*** (0.0205)	-0.0565*** (0.0206)
$[\beta_4]$ <i>Tax Diff.</i> × 2007-2010 × <i>Tax Enforc.</i>	0.2351** (0.1124)	0.2332** (0.1124)	0.0232** (0.0100)	0.0221** (0.0100)
$[\beta_5]$ <i>Tax Difference</i> × 2011-2013	-0.4010* (0.2048)	-0.3218 (0.2052)	-0.0351* (0.0197)	-0.0304 (0.0197)
$[\beta_6]$ <i>Tax Diff.</i> × 2011-2013 × <i>Tax Enforc.</i>	0.3474** (0.1772)	0.3749** (0.1773)	0.0238 (0.0154)	0.0255* (0.0153)
<i>Tax Enforcement</i>	0.0175* (0.0101)	0.0184* (0.0101)	0.0010 (0.0009)	0.0010 (0.0009)
Joint Significance [[ $\beta_1 + \beta_2$ ] - [ $\beta_3 + \beta_4$ ]]	-0.4007** (0.1647)	-0.4163** (0.1646)	-0.0407** (0.0170)	-0.0397** (0.0170)
Joint Significance [[ $\beta_1 + \beta_2$ ] - [ $\beta_5 + \beta_6$ ]]	-0.6774** (0.2722)	-0.7580*** (0.2723)	-0.0647** (0.0268)	-0.0691** (0.0268)
Controls	✓	✓	✓	✓
Firm fixed effects	✓	✓	✓	✓
Industry–Year fixed effects	-	✓	-	✓
Year fixed effects	✓	-	✓	-
#Observations	100,689	100,689	129,920	129,920
#Affiliates	17,325	17,325	19,005	19,005
Adj. R-Squared	0.870	0.871	0.524	0.525

*Notes:* Observational units are profit-making and loss-making *multinational subsidiaries* per year. All specifications include a full set of affiliate dummies and a full set of year dummies. Industry–year dummies (at the one-digit SIC code level) are included where indicated. Specifications (1) and (2) use the natural logarithm of *EBIT* as the dependent variable, whereas specifications (3) and (4) use the natural logarithm of *ROA* + 1 as the dependent variable. The variable *Tax Difference* equals the subsidiary tax rate minus the parent tax rate. The variable *Tax Enforcement* is the number of full-time employees at the central government tax agency per 1,000 inhabitants in the host country. The variable *Joint Significance* checks the equality of the following coefficients [(*Tax Difference* × 2003-2006) + (*Tax Difference* × 2003-2006 × *Tax Enforcement*)] – [(*Tax Difference* × 2007-2010) + (*Tax Difference* × 2007-2010 × *Tax Enforcement*)] and [(*Tax Difference* × 2003-2006) + (*Tax Difference* × 2003-2006 × *Tax Enforcement*)] – [(*Tax Difference* × 2011-2013) + (*Tax Difference* × 2011-2013 × *Tax Enforcement*)]. All the variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the firm level and shown in parentheses. The superscripts \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table 10:** Macroeconomic determinants of the corporate tax rate and base changes

Dependent Variable:	<i>Corporate Tax Rate</i>			
	Level	First Differences	Level	First Differences
Estimation in:	Level	First Differences	Level	First Differences
Explanatory Variables:	(1)	(2)	(3)	(4)
<i>Corporate Tax Rate</i> <sub>t-1</sub>	0.7190*** (0.0412)	0.0008 (0.0426)	0.7200*** (0.0429)	0.0014 (0.0432)
<i>Corporate Tax Rate</i> <sub>t-2</sub>	-0.0455 (0.0529)	0.0672 (0.0567)	-0.0371 (0.0585)	0.0636 (0.0603)
<i>Tax Base Index</i> <sub>t-1</sub>	-0.0031 (0.0019)	-0.0027* (0.0015)	-0.0032* (0.0018)	-0.0028* (0.0014)
<i>Tax Base Index</i> <sub>t-2</sub>	-0.0018 (0.0023)	0.0014 (0.0025)	-0.0017 (0.0023)	0.0016 (0.0027)
<i>Inflation</i> <sub>t-1</sub>	0.0224 (0.0521)	0.0410 (0.0534)	0.0251 (0.0467)	0.0329 (0.0474)
<i>Inflation</i> <sub>t-2</sub>	0.0118 (0.0238)	0.0102 (0.0215)	0.0200 (0.0253)	0.0082 (0.0223)
<i>Unemployment</i> <sub>t-1</sub>	-0.0007 (0.0831)	0.0281 (0.0807)	0.0439 (0.0785)	0.0630 (0.0806)
<i>Unemployment</i> <sub>t-2</sub>	0.0289 (0.0812)	0.0610 (0.112)	0.0238 (0.0748)	0.0385 (0.106)
<i>Control of Corruption</i> <sub>t-1</sub>	-0.0093 (0.0117)	-0.0148 (0.0124)	-0.0097 (0.0114)	-0.0153 (0.0127)
<i>Control of Corruption</i> <sub>t-2</sub>	0.0173 (0.0116)	0.0118 (0.00733)	0.0161 (0.0109)	0.0119 (0.00748)
<i>GDP Growth</i> <sub>t-1</sub>	-0.0673 (0.0427)	-0.0435 (0.0341)		
<i>GDP Growth</i> <sub>t-2</sub>	-0.0025 (0.0354)	-0.0450 (0.0477)		
<i>GDP per capita</i> <sub>t-1</sub>			-0.0182 (0.0454)	-0.0269 (0.0404)
<i>GDP per capita</i> <sub>t-2</sub>			0.0399 (0.0402)	0.0142 (0.0265)
Country fixed effects	✓	-	✓	-
Year fixed effects	✓	✓	✓	✓
#Observations	285	259	285	259
#Countries	26	26	26	26
Adj. R-Squared	0.959	0.072	0.959	0.068

*Notes:* Observational units are *countries* per year. All specifications include a full set of country dummies and year dummies. The corporate tax rate is the dependent variable. The variable *Tax Base Index* is an index ranging from zero (very narrow tax base) to six (very broad tax base with transfer pricing documentation requirements, restrictions on interest payments deductibility, no tax consolidation, no accelerated depreciation allowances, no loss carryback rule, and loss carryforward up to a maximum of five years). It indicates how broad the tax base is according to the tax code in that country and year. The specifications in columns (2) and (4) are in first differences. All the variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the country level and shown in parentheses. The superscripts \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

# **Corporate Tax Reforms and Tax-motivated Profit Shifting: Evidence from the EU**

Anna Alexander, Antonio De Vito, Martin Jacob

## **Online Appendix**

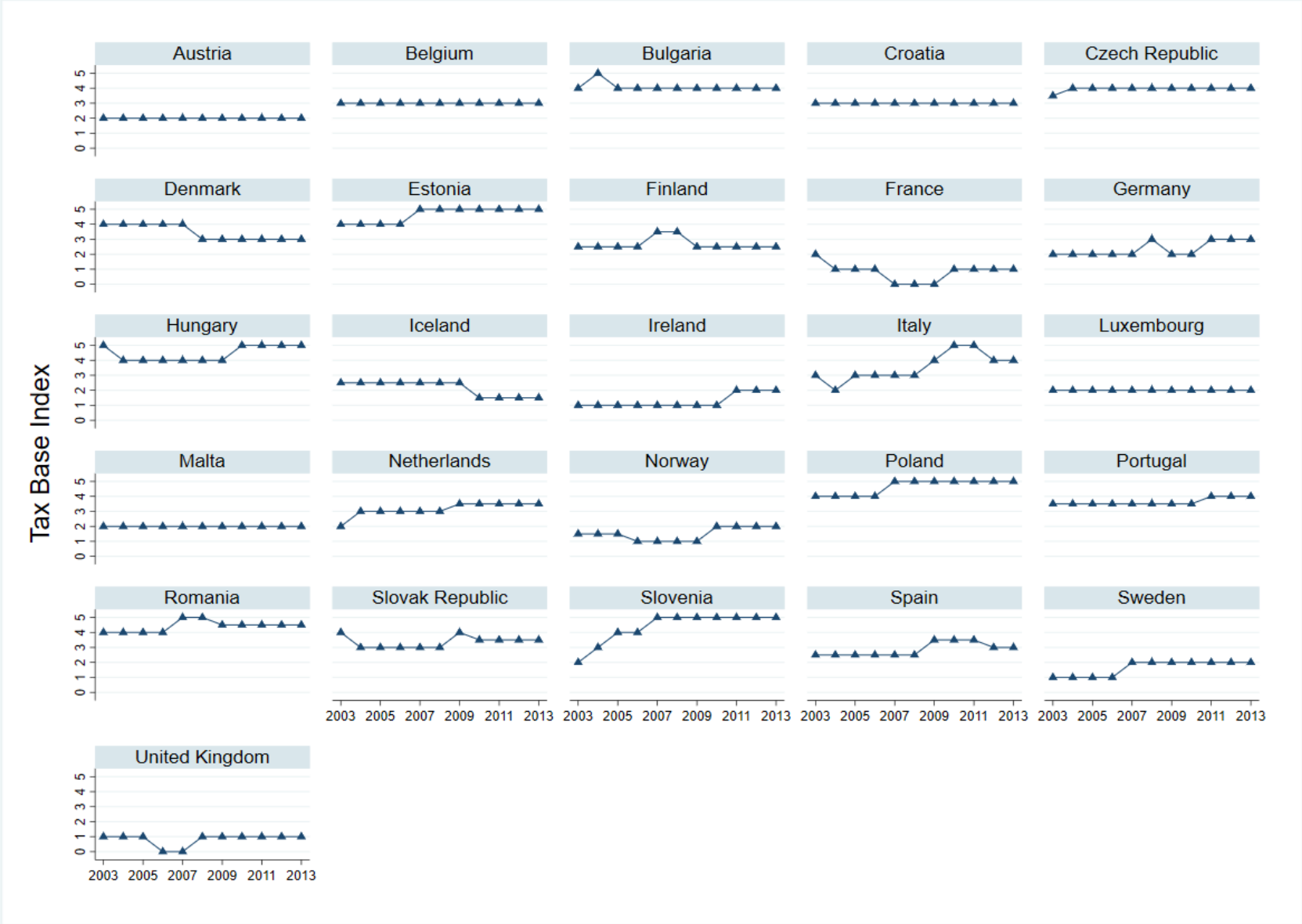
**Figure A.1:** Evolution of Top statutory tax rates on corporate income by country, 2003–2013



Notes: This figures displays the evolution of corporate tax rates (in percentage points) by country during 2003–2013. Each country–year observation is from *Taxation Trends in Europe 2014*, Eurostat.

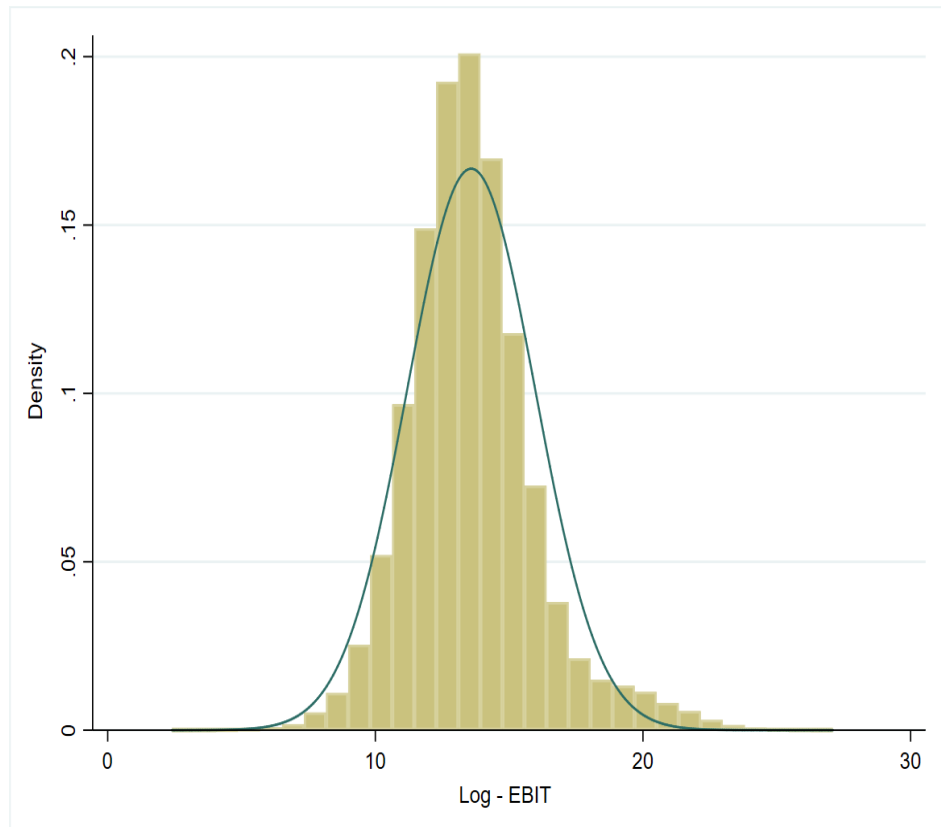


**Figure A.2:** Evolution of Tax base index by country, 2003–2013



Notes: This figures displays the evolution of tax base index by country during 2003–2013. Each country–year observation is from the E&Y Corporate Tax Guides.

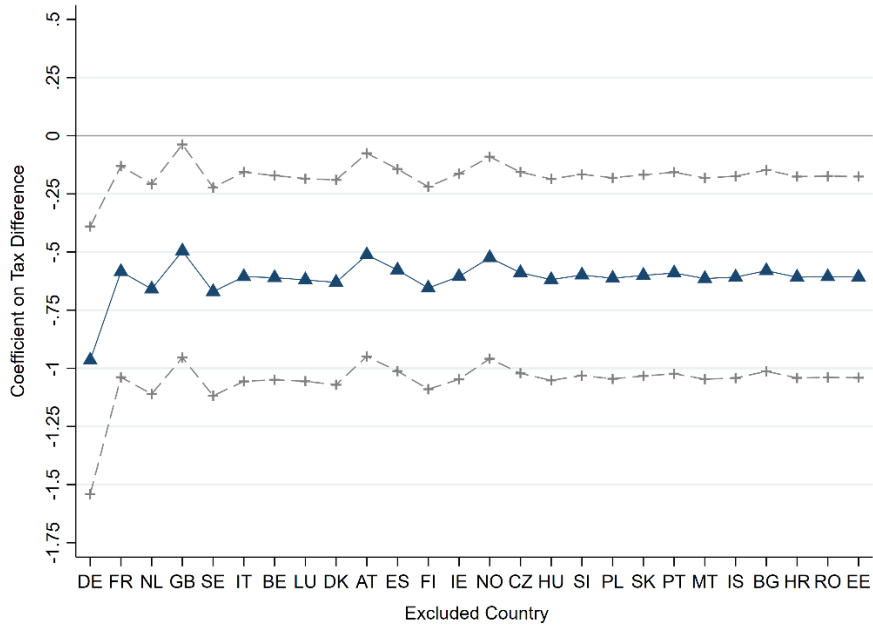
**Figure A.3:** Distribution of the natural logarithm of the firm's EBIT



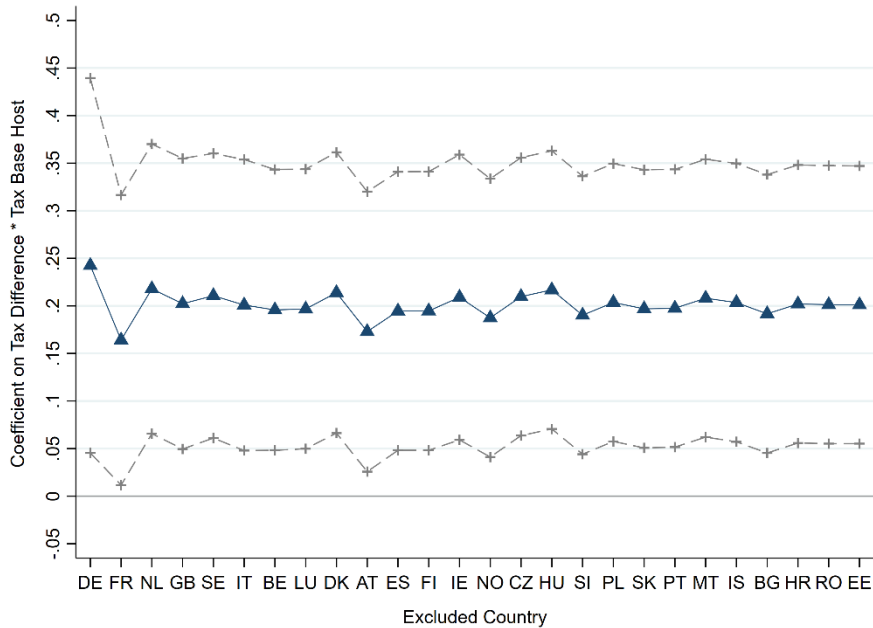
*Notes:* This figure plots the distribution of the natural logarithm of the firm's *EBIT* in our sample. The bell-shaped black line indicates the normal-density distribution.

**Figure A.4:** Corporate tax reforms, tax base broadening, and profit shifting – Excluding one Country at a Time

*Panel A: Coefficient on Tax Difference*

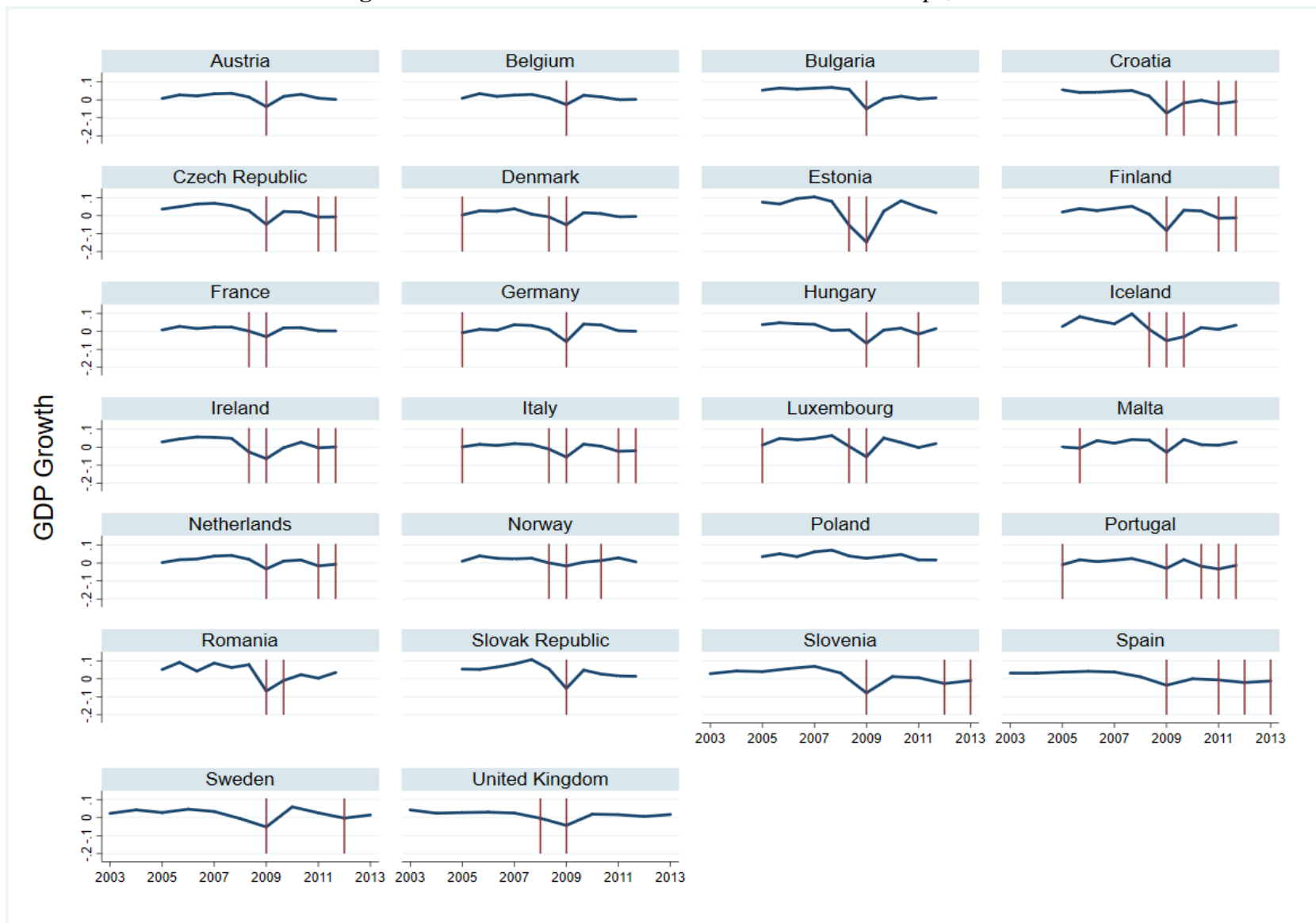


*Panel B: Coefficient on Tax Difference × Tax Base Host*



*Notes:* This figure shows the coefficients on *tax difference* (*tax difference* × *tax base host*) from the regression in equation (1), excluding one parent country at a time. All specifications exclude time-varying firm- and country-controls, but include a full set of affiliate dummies and a full set of industry–year dummies (SIC1, one-digit level). The gray line represents the 90% confidence interval.

**Figure A.5: GDP Growth Trends and Recessions in Europe, 2003-2013**



*Notes:* This figure plots the GDP growth trends and recession years across 26 European countries over 2003–2013. The vertical black lines indicate recession years.

**Table A.1:** Top statutory tax rates on corporate income, 2003–2013

ISO Code	Country	Affiliate Country	Parent Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AT	Austria	1,935	3,468	34.0	34.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
BE	Belgium	7,984	5,481	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0
BG	Bulgaria	864	138	23.5	19.5	15.0	15.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
HR	Croatia	1,296	131	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
CZ	Czech Republic	6,381	974	31.0	28.0	26.0	24.0	24.0	21.0	20.0	19.0	19.0	19.0	19.0
DK	Denmark	807	4,109	30.0	30.0	28.0	28.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
EE	Estonia	1,377	36	26.0	26.0	24.0	23.0	22.0	21.0	21.0	21.0	21.0	21.0	21.0
FI	Finland	2,907	2,260	29.0	29.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	24.5	24.5
FR	France	16,105	11,433	35.4	35.4	35.0	34.4	34.4	34.4	34.4	34.4	34.4	36.1	36.1
DE	Germany	4,410	22,790	39.6	38.3	38.7	38.7	38.7	30.2	30.2	30.2	30.2	30.2	30.2
HU	Hungary	2,065	710	19.6	17.6	17.5	17.5	21.3	21.3	21.3	20.6	20.6	20.6	20.6
IS	Iceland	11	164	18.0	18.0	18.0	18.0	18.0	15.0	15.0	18.0	20.0	20.0	20.0
IE	Ireland	908	1,928	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
IT	Italy	9,531	6,780	38.3	37.3	37.3	37.3	37.3	31.4	31.4	31.4	31.4	31.4	31.4
LU	Luxembourg	369	4,593	30.4	30.4	30.4	29.6	29.6	29.6	28.6	28.6	28.8	28.8	29.2
MT	Malta	8	206	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
NL	Netherlands	673	11,096	34.5	34.5	31.5	29.6	25.5	25.5	25.5	25.5	25.0	25.0	25.0
NO	Norway	4,261	1,570	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
PL	Poland	8,794	411	27.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
PT	Portugal	1,788	249	33.0	27.5	27.5	27.5	26.5	26.5	26.5	29.0	29.0	31.5	31.5
RO	Romania	5,996	39	25.0	25.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
SK	Slovak Republic	3,273	326	25.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	23.0
SI	Slovenia	893	491	25.0	25.0	25.0	25.0	23.0	22.0	21.0	20.0	20.0	18.0	17.0
ES	Spain	7,319	2,314	35.0	35.0	35.0	35.0	32.5	30.0	30.0	30.0	30.0	30.0	30.0
SE	Sweden	2,972	9,623	28.0	28.0	28.0	28.0	28.0	28.0	26.3	26.3	26.3	26.3	22.0
GB	United Kingdom	9,058	10,665	30.0	30.0	30.0	30.0	30.0	30.0	28.0	28.0	26.0	24.0	23.0

Notes: This table summarizes the data for corporate tax rates (in percentage points) during 2003–2013 along with the number of observations for each affiliate (parent) country. Each country–year corporate tax rate is from *Taxation Trends in Europe 2014*, Eurostat.

**Table A.2:** Evolution of tax policy regulation on tax base items, 2003–2013

Country	Transfer Pricing Documentation	Debt-to-Equity Rule	Earnings Stripping Rule	Tax Consolidation	Accelerated Depreciation	Loss Carry-back	Loss Carryforward
Austria				From 2003 on			Unlimited years
Belgium		From 2003 on			From 2003 on		Unlimited years
Bulgaria		From 2003 on			2003; from 2005 on		5 years
Croatia		From 2005 on			From 2003 on		5 years
Czech Republic		From 2003 on			From 2003 on		7 years in 2003, 5 years from 2004 on
Denmark	From 2003 on	From 2003 on		From 2003 on	From 2008 on		Unlimited years
Estonia	From 2007 on						
Finland	From 2007 on			From 2003 on	From 2009 on		10 years
France	From 2010 on	2003 to 2006		From 2003 on	From 2003 on	From 2003 on	5 years in 2003, unlimited years from 2004 on
Germany	From 2003 on	2003 to 2007	From 2008 on	From 2003 on	2003 to 2007; 2009 to 2010	From 2003 on	Unlimited years
Great Britain	From 2008 on	2003 to 2005		From 2003 on	From 2003 on	From 2003 on	Unlimited years
Hungary	From 2010 on	From 2003 on					5 years in 2003, unlimited years from 2004 on
Iceland				From 2003 on	From 2010 on		8 years in 2003, 10 years from 2004 on
Ireland	From 2011 on			From 2003 on		From 2003 on	Unlimited years

Italy	From 2010 on	2005 to 2007	From 2008 on	From 2004 on	2003 to 2008		5 years from 2003 to 2011, unlimited years from 2012 on
Luxembourg		From 2003 on		From 2003 on	From 2003 on		Unlimited years
Malta				From 2003 on	From 2003 on		Unlimited years
Netherlands	From 2003 on	2004 to 2012		From 2003 on	2009 to 2010	From 2003 on	Unlimited years from 2003 to 2006, 9 years from 2007 on
Norway	From 2008 on			From 2003 on	From 2003 on	2008 to 2009	10 years from 2003 to 2005, unlimited years from 2006 on
Poland	From 2003 on	From 2003 on		From 2003 on	2003 to 2006		5 years
Portugal	From 2003 on	2003 to 2012		From 2003 on	From 2003 on		6 years from 2003 to 2010, 4 years from 2011 to 2012, 5 years in 2013
Romania	From 2007 on	From 2003 on			From 2003 on		5 years from 2003 to 2008, 7 years from 2009 on
Slovenia	From 2005 on	From 2005 on		2003 to 2006	2003 to 2006		5 years from 2003 to 2006, unlimited years from 2007 on
Slovakia	From 2009 on	2003			From 2003 on		5 years from 2003 to 2009, 7 years from 2010 on
Spain	From 2009 on	2003 to 2011	From 2012 on	From 2003 on	From 2003 on		15 years from 2003 to 2011, 18 years from 2012 on
Sweden	From 2007 on			From 2003 on	From 2003 on		Unlimited years

*Notes:* This table summarizes the data for our main tax base variables during 2003–2013. Each country–year observation is from the E&Y Corporate Tax Guides.

**Table A.3:** Tax Enforcement in Europe, 2003 and 2011

<b>ISO Code</b>	<b>Country</b>	<b>Tax Enforcement<sub>2003</sub></b>	<b>Tax Enforcement<sub>2011</sub></b>
AT	Austria	0.652	0.913
BE	Belgium	1.894	0.962
BG	Bulgaria	1.094	1.094
HR	Croatia	-	-
CZ	Czech Republic	1.477	1.328
DK	Denmark	1.818	1.235
EE	Estonia	1.745	0.584
FI	Finland	1.212	0.971
FR	France	1.266	1.062
DE	Germany	1.431	1.351
HU	Hungary	0.930	1.698
IS	Iceland	1.845	0.806
IE	Ireland	1.600	1.330
IT	Italy	0.603	0.541
LU	Luxembourg	2.770	1.742
MT	Malta	0.500	1.880
NL	Netherlands	1.595	1.385
NO	Norway	1.318	1.200
PL	Poland	1.312	1.264
PT	Portugal	1.100	0.954
RO	Romania	1.100	1.100
SK	Slovak Republic	1.133	0.952
SI	Slovenia	1.346	1.181
ES	Spain	0.642	0.511
SE	Sweden	1.206	0.868
GB	United Kingdom	1.235	1.076

*Notes:* This table summarizes the data for tax enforcement in 2003 and 2011. The tax enforcement is the ratio of citizens to tax staff at the central government tax agency converted into tax staff per 1,000 inhabitants. Higher scores indicate stronger tax enforcement. Each country-year observation is from the OECD Tax Administration guides (2006, 2013b).



**Table A.4:** Corporate tax reforms, tax base broadening, and profit shifting – Robustness tests III

Dependent Variable:	ln ( <i>EBIT</i> )				
Sample:	All Subsidiaries	No Sub. from France	No Sub. from Italy	No Parents from Germany	No Parents from Netherlands
Explanatory Variables:	(1)	(2)	(3)	(4)	(5)
<i>Tax Difference</i>	-0.7260** (0.3132)	-0.9892*** (0.3685)	-0.8787*** (0.3296)	-0.9218** (0.3828)	-0.7969** (0.3238)
<i>Tax Difference</i> × <i>Tax Base Host</i>	0.1647** (0.0838)	0.2876*** (0.0986)	0.1798** (0.0882)	0.2635** (0.1123)	0.1689* (0.0874)
<i>Tax Difference</i> × <i>Tax Base Parent</i>	0.0617 (0.0860)	-0.0218 (0.0935)	0.0563 (0.0907)	-0.0109 (0.0982)	0.0758 (0.0934)
<i>Tax Base Host</i>	-0.0090 (0.0091)	-0.0088 (0.0106)	0.0017 (0.0109)	-0.0096 (0.0103)	-0.0068 (0.0096)
<i>Tax Base Parent</i>	0.0280*** (0.0088)	0.0215** (0.0098)	0.0278*** (0.0094)	0.0272*** (0.0098)	0.0275*** (0.0097)
Joint Significance [( <i>Tax Difference</i> × <i>Tax Base Host</i> ) + ( <i>Tax Difference</i> )]	-0.5613** (0.2640)	-0.7016** (0.3030)	-0.6989** (0.2797)	-0.6583** (0.3151)	-0.6279** (0.2721)
<i>Log Fixed Assets</i>	0.0738*** (0.0065)	0.0774*** (0.0071)	0.0754*** (0.0068)	0.0763*** (0.0073)	0.0706*** (0.0070)
<i>Log Cost of Employees</i>	0.4233*** (0.0164)	0.4214*** (0.0178)	0.4238*** (0.0178)	0.4127*** (0.0176)	0.4343*** (0.0175)
<i>Log Intangibles</i>	0.0016 (0.0013)	0.0028* (0.0014)	0.0017 (0.0014)	0.0023 (0.0015)	0.0014 (0.0014)
<i>Log R&amp;D</i>	0.0144*** (0.0050)	0.0136*** (0.0050)	0.0133*** (0.0050)	0.0131** (0.0056)	0.0144*** (0.0054)
<i>Distance</i>	-0.0855 (0.1542)	0.1094 (0.1254)	-0.0880 (0.1567)	-0.0360 (0.1972)	-0.0386 (0.1824)

<i>Control of Corruption Host</i>	0.0893** (0.0379)	0.1107*** (0.0402)	0.0645 (0.0408)	0.1135** (0.0442)	0.0937** (0.0405)
<i>Control of Corruption Parent</i>	-0.0379 (0.0427)	-0.0046 (0.0475)	-0.0301 (0.0452)	-0.0408 (0.0452)	-0.0446 (0.0442)
<i>GDP Growth Host</i>	1.8037*** (0.2160)	1.7877*** (0.2206)	1.8809*** (0.2181)	1.7652*** (0.2501)	1.7822*** (0.2255)
<i>GDP Growth Parent</i>	0.7171** (0.3175)	0.7258** (0.3441)	0.8621*** (0.3335)	0.8386** (0.3487)	0.5028 (0.3447)
<i>GDP per capita Host</i>	-0.1850 (0.1453)	-0.1647 (0.1494)	-0.2378 (0.1552)	-0.1271 (0.1699)	-0.1264 (0.1526)
<i>GDP per capita Parent</i>	0.0516 (0.2192)	0.0603 (0.2362)	0.0609 (0.2260)	-0.0098 (0.2365)	0.0030 (0.2470)
<i>Inflation Host</i>	0.5762** (0.2259)	0.6260*** (0.2273)	0.5471** (0.2297)	0.4097 (0.2492)	0.4948** (0.2328)
<i>Inflation Parent</i>	-0.3047 (0.3348)	-0.2361 (0.3701)	-0.1591 (0.3492)	-0.3159 (0.3497)	-0.3892 (0.3441)
<i>Unemployment Host</i>	-1.4636*** (0.2414)	-1.3271*** (0.2442)	-1.5362*** (0.2477)	-1.3586*** (0.2775)	-1.5259*** (0.2558)
<i>Unemployment Parent</i>	-0.1162 (0.3672)	0.1367 (0.4082)	-0.1608 (0.3924)	0.1791 (0.4189)	-0.2102 (0.3866)
Firm fixed effects	✓	✓	✓	✓	✓
SIC2 Industry–Year fixed effects	✓	✓	✓	✓	✓
#Observations	101,985	85,865	92,449	79,175	90,868
#Affiliates	17,538	14,828	15,972	13,792	15,611
Adj. R-Squared	0.871	0.871	0.869	0.869	0.871

*Notes:* Observational units are profit-making *multinational subsidiaries* per year. All specifications include a full set of affiliate dummies and a full set of industry–year dummies (SIC2, two-digit level). Columns (2) and (3) exclude multinational subsidiaries from France or Italy, whereas Columns (4) and (5) exclude multinational subsidiaries whose parent firm is located either in Germany or in the Netherlands. The dependent variable is the natural logarithm of *EBIT*. The variable *Tax Base Host (Parent)* is an index ranging from zero (very narrow tax base) to six (very broad tax base with transfer pricing documentation requirements, restrictions on interest payments deductibility, no tax consolidation, no accelerated depreciation allowances, no loss carryback rule, and loss carryforward up to a maximum of five years). It indicates how broad the tax base is according to the tax code in the country and year. The variable *Tax Difference* equals the subsidiary tax rate minus the parent tax rate. The variable *Joint Significance* tests for the effect of  $Tax\ Difference \times Tax\ Base\ Host + Tax\ Difference$ . All the variables are defined in the Appendix. Heteroskedasticity-robust standard errors clustered at the firm level in parentheses. The superscripts \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table A.5:** Corporate tax reforms, tax base broadening, and profit shifting – Robustness tests IV

Dependent Variable:	ln ( <i>EBIT</i> )				
Excluded Tax Base Item:	Transfer Pricing	Thin Cap. Rules	Accelerated Depreciation	Tax Consolidation	Tax Loss Rules
Explanatory Variables:	(1)	(2)	(3)	(4)	(5)
<i>Tax Difference</i>	-0.6665** (0.2953)	-0.7686** (0.3080)	-0.8217** (0.3239)	-0.7575** (0.3118)	-0.5642** (0.2800)
<i>Tax Difference</i> × <i>Tax Base Host</i>	0.1493* (0.0892)	0.1944** (0.0974)	0.1871** (0.0938)	0.1975** (0.0912)	0.1708* (0.1029)
<i>Tax Diff.</i> × <i>Tax Base Parent</i>	0.0566 (0.0861)	0.0617 (0.0862)	0.0618 (0.0859)	0.0601 (0.0860)	0.0505 (0.0857)
<i>Tax Base Host</i>	-0.0234** (0.0116)	-0.0057 (0.0101)	0.0064 (0.0111)	-0.0084 (0.0091)	-0.0098 (0.0094)
<i>Tax Base Parent</i>	0.0269*** (0.0088)	0.0291*** (0.0088)	0.0286*** (0.0088)	0.0282*** (0.0088)	0.0285*** (0.0088)
Joint Significance [( <i>Tax Difference</i> × <i>Tax Base Host</i> ) + ( <i>Tax Difference</i> )]	-0.5172** (0.2501)	-0.5742** (0.2582)	-0.6345** (0.2672)	-0.5600** (0.2595)	-0.3934* (0.2375)
Controls	✓	✓	✓	✓	✓
Firm fixed effects	✓	✓	✓	✓	✓
SIC2 Industry–Year fixed effects	✓	✓	✓	✓	✓
#Observations	101,985	101,985	101,985	101,985	101,985
#Affiliates	17,538	17,538	17,538	17,538	17,538
Adj. R-Squared	0.871	0.871	0.871	0.871	0.871

*Notes:* Observational units are profit-making *multinational subsidiaries* per year. All specifications include a full set of affiliate dummies and a full set of industry–year dummies (SIC2, two-digit level). The dependent variable is the natural logarithm of *EBIT*. The variable *Tax Base Host (Parent)* is an index ranging from zero (very narrow tax base) to six (very broad tax base with transfer pricing documentation requirements, restrictions on interest payments deductibility, no tax consolidation, no accelerated depreciation allowances, no loss carryback rule, and loss carryforward up to a maximum of five years). It indicates how broad the tax base is according to the tax code in the country and year. The variable *Tax Difference* equals the subsidiary tax rate minus the parent tax rate. Each column excludes one tax base item at a time from the tax base index. The variable *Joint Significance* tests for the effect of *Tax Difference* × *Tax Base Host* + *Tax Difference*. All the variables are defined in the Appendix. Heteroskedasticity-robust standard errors clustered at the firm level in parentheses. The superscripts \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table A.6:** Corporate tax reforms, tax base broadening, and inward versus outward profit shifting – Robustness tests

Dependent Variable:	ln ( <i>EBIT</i> )			
Profit Shifting:	Inward		Outward	
Explanatory Variables:	(1)	(2)	(3)	(4)
$[\beta_1]$ <i>Inward Incentive</i>	0.1285*** (0.0334)	0.1128*** (0.0335)		
$[\beta_2]$ <i>Inward Incentive</i> × <i>Tax Base Host</i>	-0.0345*** (0.0106)	-0.0315*** (0.0106)		
$[\beta_3]$ <i>Inward Incentive</i> × <i>High Enforc.</i>	-0.0743*** (0.0222)	-0.0724*** (0.0223)		
$[\beta_1]$ <i>Outward Incentive</i>			-0.1159*** (0.0303)	-0.1054*** (0.0304)
$[\beta_2]$ <i>Outward Incentive</i> × <i>Tax Base Host</i>			0.0267** (0.0108)	0.0231** (0.0108)
$[\beta_3]$ <i>Outward Incentive</i> × <i>High Enforc.</i>			0.0509** (0.0212)	0.0503** (0.0213)
<i>High Enforcement</i>	-0.0268 (0.0172)	-0.0306* (0.0173)	-0.0790*** (0.0186)	-0.0820*** (0.0187)
<i>Tax Base Host</i>	0.0074 (0.0099)	0.0075 (0.0099)	-0.0165 (0.0100)	-0.0142 (0.0100)
<i>Tax Base Parent</i>	0.0301*** (0.0087)	0.0285*** (0.0087)	0.0322*** (0.0086)	0.0309*** (0.0086)
Joint Significance [[ $\beta_1$ ] + ( $\beta_2$ )]	0.0940*** (0.02540)	0.0812*** (0.0255)	-0.0892*** (0.0228)	-0.0823*** (0.0228)
Joint Significance [[ $\beta_1$ ] + ( $\beta_3$ )]	0.0542* (0.0292)	0.0404 (0.0292)	-0.0650** (0.0251)	-0.0551** (0.0252)
Controls & Firm fixed effects	✓	✓	✓	✓
Industry–Year fixed effects	-	✓	-	✓
Year fixed effects	✓	-	✓	-
#Observations	100,689	100,689	100,689	100,689
#Affiliates	17,325	17,325	17,325	17,325
Adj. R-Squared	0.870	0.871	0.870	0.871

*Notes:* Observational units are profit-making *multinational subsidiaries* per year. All specifications include a full set of affiliate dummies and a full set of industry–year dummies (at the one-digit SIC code level). Columns (1) and (2) show the results on inward profit shifting, whereas columns (3) and (4) show the results on outward profit shifting. The dependent variable is the natural logarithm of *EBIT*. The variable *Tax Base Host (Parent)* is an index ranging from zero (very narrow tax base) to six (very broad tax base with transfer pricing documentation requirements, restrictions on interest payments deductibility, no tax consolidation, no accelerated depreciation allowances, no loss carryback rule, and loss carryforward up to a maximum of five years). It indicates how broad the tax base is according to the tax code in the country and year. The variable *Inward (Outward) Incentive* is an indicator variable taking the value of 1 if the difference between the subsidiary tax rate minus the parent tax rate is negative (positive). The variable *High Enforcement* is an indicator variable taking the value of one if the tax enforcement is above the sample median and zero otherwise. The variable *Joint Significance* tests for the effect of *Inward (Outward) Incentive* × *Tax Base Host* + *Inward (Outward) Incentive*, and *Inward (Outward) Incentive* × *High Enforcement* + *Inward (Outward) Incentive*. All the variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the firm level and shown in parentheses. The superscripts \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table A.7:** Corporate tax reforms, tax base broadening, and inward versus outward profit shifting—The role of each tax base item – Robustness tests

Dependent Variable:	ln ( <i>EBIT</i> )			
Profit Shifting:	Inward		Outward	
Explanatory Variables:	(1)	(2)	(3)	(4)
<b>[<math>\beta_1</math>] Inward Incentive</b>	0.1266*** (0.0341)	0.1114*** (0.0342)		
<b>[<math>\beta_2</math>] Inward Incent <math>\times</math> TP &amp; Thin Cap</b>	-0.0245 (0.0192)	-0.0231 (0.0192)		
<b>[<math>\beta_3</math>] Inward Incent <math>\times</math> Other Tax Rules</b>	-0.0399*** (0.0130)	-0.0361*** (0.0131)		
<b>[<math>\beta_4</math>] Inward Incent. <math>\times</math> High Enforc.</b>	-0.0743*** (0.0222)	-0.0724*** (0.0223)		
<b>[<math>\beta_1</math>] Outward Incentive</b>			-0.1247*** (0.0310)	-0.1133*** (0.0311)
<b>[<math>\beta_2</math>] Outward Incent <math>\times</math> TP &amp; Thin Cap</b>			0.0417** (0.0187)	0.0366* (0.0188)
<b>[<math>\beta_3</math>] Outward Incent <math>\times</math> Other Tax Rules</b>			0.0169 (0.0138)	0.0144 (0.0139)
<b>[<math>\beta_4</math>] Outward Incent. <math>\times</math> High Enforc.</b>			0.0534** (0.0212)	0.0526** (0.0213)
<i>TP &amp; Thin Cap</i>	0.0161 (0.0141)	0.0158 (0.0141)	-0.0105 (0.0147)	-0.0082 (0.0147)
<i>Other Tax Rules</i>	-0.0044 (0.0144)	-0.0034 (0.0144)	-0.0292** (0.0143)	-0.0262* (0.0143)
<i>High Enforcement</i>	-0.0230 (0.0174)	-0.0270 (0.0175)	-0.0748*** (0.0187)	-0.0781*** (0.0188)
<i>Tax Base Parent</i>	0.0297*** (0.0087)	0.0281*** (0.0087)	0.0326*** (0.0087)	0.0312*** (0.0087)
Joint Significance [[ $\beta_1$ ] + ( $\beta_2$ )]	0.1021*** (0.0271)	0.0881*** (0.0272)	-0.0830*** (0.0244)	-0.0767*** (0.0245)
Joint Significance [[ $\beta_1$ ] + ( $\beta_3$ )]	0.0866*** (0.0292)	0.0752** (0.0293)	-0.1077*** (0.0273)	-0.0989*** (0.0274)
Joint Significance [[ $\beta_1$ ] + ( $\beta_4$ )]	0.0523* (0.0298)	0.0389 (0.0298)	-0.0713*** (0.0259)	-0.0607** (0.0260)
Controls & Firm fixed effects	✓	✓	✓	✓
Industry–Year fixed effects	-	✓	-	✓
Year fixed effects	✓	-	✓	-
#Observations	100,689	100,689	100,689	100,689
#Affiliates	17,325	17,325	17,325	17,325
Adj. R-Squared	0.870	0.871	0.870	0.871

*Notes:* Observational units are profit-making *multinational subsidiaries* per year. All specifications include a full set of affiliate dummies and a full set of industry–year dummies (at the one-digit SIC code level). Columns (1) and (2) show the results on inward profit shifting, whereas columns (3) and (4) show the results on outward profit shifting. The dependent variable is the natural logarithm of *EBIT*. The variable *TP & Thin Cap* is an index ranging from 0 (no transfer pricing documentation requirements and no restrictions on interest payments deductibility) to 2 (transfer pricing documentation requirements and restrictions on interest payments deductibility). The variable *Other Tax Rules* is an index ranging from 0 (narrow tax base) to 4 (broad tax base with no tax consolidation, no accelerated depreciation allowances, no loss carryback rule, and loss carryforward up to a maximum of 5 years). The variable *High Enforcement* is an indicator variable taking the value of one if the tax enforcement is above the sample median and zero otherwise. The variable *Inward (Outward) Incentive* is an indicator variable taking the value of one if the difference between the subsidiary tax rate minus the parent tax rate is negative (positive). The variable *Joint Significance* tests for the effect of *Inward (Outward) Incentive*  $\times$  *TP & Thin Cap* + *Inward (Outward) Incentive*  $\times$  *Other Tax Rules* + *Inward (Outward) Incentive*  $\times$  *High Enforcement* + *Inward (Outward) Incentive*. All the variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the firm level and shown in parentheses. The superscripts \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table A.8:** Profit shifting and development over time – Robustness tests

Dependent Variable:	ln (EBIT)		ln (ROA + 1)	
Explanatory Variables:	(1)	(2)	(3)	(4)
$[\beta_1]$ Tax Difference $\times$ 2003-2006	-0.6645*** (0.2239)	-0.7385*** (0.2250)	-0.0779*** (0.0223)	-0.0782*** (0.0227)
$[\beta_2]$ Tax Difference $\times$ 2003-2006 $\times$ Tax Enforcement		0.0668 (0.1469)		0.0043 (0.0182)
$[\beta_3]$ Tax Difference $\times$ 2007-2010	-0.3220 (0.2069)	-0.4222** (0.2101)	-0.0471** (0.0203)	-0.0518** (0.0205)
$[\beta_4]$ Tax Difference $\times$ 2007-2010 $\times$ Tax Enforcement		0.2220* (0.1133)		0.0224** (0.0102)
$[\beta_5]$ Tax Difference $\times$ 2011-2013	-0.2758 (0.1991)	-0.1761 (0.2060)	-0.0343* (0.0191)	-0.0243 (0.0197)
$[\beta_6]$ Tax Difference $\times$ 2011-2013 $\times$ Tax Enforcement		0.4087** (0.1772)		0.0270* (0.0154)
Tax Enforcement		0.0210** (0.0101)		0.0013 (0.0009)
Joint Significance [[ $\beta_1$ ] – [ $\beta_3$ ]]	-0.3425*** (0.1267)		-0.0308** (0.0124)	
Joint Significance [[ $\beta_1$ ] – [ $\beta_5$ ]]	-0.3886** (0.1624)		-0.0436*** (0.0157)	
Joint Significance [[ $\beta_1 + \beta_2$ ] – [ $\beta_3 + \beta_4$ ]]		-0.4715*** (0.1656)		-0.0444*** (0.0170)
Joint Significance [[ $\beta_1 + \beta_2$ ] – [ $\beta_5 + \beta_6$ ]]		-0.9043*** (0.2720)		-0.0766*** (0.0267)
Controls	✓	✓	✓	✓
Firm fixed effects	✓	✓	✓	✓
SIC2 Industry–Year fixed effects	✓	✓	✓	✓
#Observations	101,985	100,689	131,729	129,920
#Affiliates	17,538	17,325	19,248	19,005
Adj. R-Squared	0.871	0.871	0.527	0.528

Notes: Observational units are profit-making and loss-making multinational subsidiaries per year. All specifications include a full set of affiliate dummies and a full set of industry–year dummies (SIC2, two-digit level). Specifications (1) and (2) use the natural logarithm of EBIT as the dependent variable, whereas specifications (3) and (4) use the natural logarithm of (ROA+1) as the dependent variable. The variable Tax Difference equals the subsidiary tax rate minus the parent tax rate. The variable Tax Enforcement is the number of full-time employees at the central government tax agency per 1,000 inhabitants. The variable Joint Significance checks the equality of the following coefficients [(Tax Difference  $\times$  2003-2006) – (Tax Difference  $\times$  2007-2010)], [(Tax Difference  $\times$  2003-2006) – (Tax Difference  $\times$  2011-2013)], [(Tax Difference  $\times$  2003-2006) + (Tax Difference  $\times$  2003-2006  $\times$  Tax Enforcement)] – [(Tax Difference  $\times$  2007-2010) + (Tax Difference  $\times$  2007-2010  $\times$  Tax Enforcement)], and [(Tax Difference  $\times$  2003-2006) + (Tax Difference  $\times$  2003-2006  $\times$  Tax Enforcement)] – [(Tax Difference  $\times$  2011-2013) + (Tax Difference  $\times$  2011-2013  $\times$  Tax Enforcement)]. All the variables are defined in the Appendix. Heteroskedasticity-robust standard errors clustered at the firm level in parentheses. The superscripts \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.