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Tax avoidance over time: A comparison of European and U.S. firms

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ABSTRACT

In recent years, the international tax policy debate has focused on the tax avoidance strategies applied by multinational firms. We investigate whether differences can be observed over time between the tax avoidance behaviors of U.S. firms and those of firms from 12 European countries. Our results show that the mean effective tax rate (ETR) of U.S. firms and that of firms in large European countries, such as France and Germany, are similar. Additionally, we investigate whether changes in statutory tax rates (STRs) explain the declining ETRs of European firms. In contrast to observations for the U.S., we find that the gap between the STR and the ETR significantly decreases over time for EU firms. This finding suggests that tax avoidance in EU firms may have, on average, decreased over time.

1. Introduction

While tax planning strategies that use complex group structures to minimize a company's tax burden without violating tax laws may be morally reprehensible or highly questionable, they are not illegal (Lisowsky, 2010; Wilson, 2009). Newspapers report anecdotal evidence of extensive tax avoidance activities by multinational corporations (MNCs) almost daily (e.g., Hakim, 2014; Garside, 2016b). For example, although the U.S. corporate income tax rate is approximately 40 percent, the U.S. technology company with the third largest market capitalization has a tax rate of 2.4 percent (Drucker, 2010).

Based on these findings, two largely media-driven commonly held beliefs have emerged. First, the tax avoidance behavior of (multinational) firms has increased over the last decade (e.g., Duhigg & Kocieniewski, 2012). Second, because the popular press mainly focuses on the tax avoidance activities of U.S. firms (e.g., Google, Starbucks, and Amazon), European opponents have argued that in contrast to U.S. firms, European firms are unable to reduce their tax rates to minimal levels (e.g., Boffey, 2017; Garside, 2016a). We attempt to contribute to this debate by answering the following research question: Do U.S. firms indeed avoid taxes more than European firms? To address this research question, this paper offers empirical underpinnings to help determine whether the tax avoidance behaviors of firms (1) have indeed become more prevalent over time and whether they (2) differ between U.S. and European firms. Our study is closely related to the work of Markle and Shackelford (2012), who compare effective tax rates (ETRs), defined as the ratio of total income tax expense to pretax income, across different countries over time. However, their study does not consider potential changes in statutory tax rates (STRs) over time. Thus, to the best of our knowledge, our study is the first to examine changes over time in ETRs and differences between U.S. and EU firms after considering the STRs.

The prior literature has presented substantial evidence regarding the scale of tax avoidance using real tax, financial, and survey data. The recent literature has begun to focus more directly on the reasons why some firms are more aggressive in their tax planning than others. Such studies have provided insights into organizational incentives (McGuire, Wang, & Wilson, 2014; Gallemore & Labro, 2015; Higgins, Omer, & Phillips, 2015; Kubick, Lynch, Mayberry, & Omer, 2015; McGuire, Omer, & Wilde, 2014; Phillips, 2003;

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Robinson, Sikes, & Weaver, 2010) and into organizations' external relationships, such as corporate social responsibilities (Keung, Qiang, & Hao, 2013), political connections and activities (Brown, Drake, & Wellman, 2015), and reputations (Gallemore, Maydew, & Thornock, 2014). Additionally, several studies have examined executives' incentives (Armstrong, Blouin, & Larcker, 2012; Chyz, 2013; Dyreng, Hanlon, & Maydew, 2010; Dyreng, Mayew, & Williams, 2012; Francis, Hasan, Qiang, & Meng, 2014); shareholders' influences (Khurana & Moser, 2013; Badertscher, Katz, & Rego, 2013; Cheng, Huang, Yinghua, & Stanfield, 2012; Rego & Wilson, 2012); and the involvement of other external parties, such as auditors (McGuire, Omer, & Wang, 2012) and labor unions (Chyz, Leung, Li, & Rui, 2013). The literature also describes how MNCs use tax havens to reduce their overall tax burden (e.g., Dyreng, Lindsey, & Thornock, 2013; Markle & Shackelford, 2012; Dyreng & Lindsey, 2009; Seida & Wempe, 2004), and finds that the presence of subsidiaries in tax havens considerably reduces overall tax burdens.

However, most prior studies of tax avoidance, particularly those on ETRs, have been cross-sectional. Some studies have also investigated inter-temporal changes but not as their main focus (e.g., Dyreng, Hanlon, & Maydew, 2008; Hoopes, Mescall, & Pittman, 2012; Blouin, 2012). More closely related to our study are the findings of Markle and Shackelford (2012) and Dyreng, Hanlon, Maydew, and Thornock, (2017). Markle and Shackelford (2012) examine ETRs around the world and find evidence of their decline over time in many countries. They examine firms in 82 countries over the period of 2005–2009 and find evidence that the average ETR of U.S. firms is high relative to that of firms in other countries, but that it declined over the sample period.

By dividing their U.S. sample into multinational and domestic firms, Dyreng et al. (2017) investigate the development of cash ETRs over the past 25 years. They report that cash ETRs decreased significantly over the sample period, including a cumulative decline of approximately 5 percentage points from 32 percent (in 1988) to approximately 27 percent (in 2012) and an average decline in the cash ETR of 0.4 percent per year over the sample period. This major economic trend resulted in a $109 billion decrease in taxes paid in 2012 relative to the amount that would have been paid had no decrease in ETRs occurred.[1]

Based on the long-standing debate among academics and policymakers regarding the tax planning activities of MNCs, we analyze differences between the tax avoidance behaviors of U.S. firms and those of European firms over time. The U.S. and EU member states maintain different tax bases and corporate income tax rates. For example, while the U.S. adopts a worldwide tax system, all European countries examined in our sample employ territorial tax systems (Atwood, Drake, Myers, & Myers, 2012). National tax laws differ with regard to research and development (R&D) credits, thin capitalization rules, provisions for controlled foreign corporations, and rules regarding the determination of legal forms for tax purposes, among other factors. Notably, differences exist not only between the U.S. and the EU but also between European countries because corporate income taxes are not harmonized within the EU.[2] Specifically, European countries' STRs differ considerably. Poland and other Eastern European countries have rather low tax rates, whereas countries such as Belgium and France have high tax rates. Thus, whether European or U.S. firms engage in increased tax avoidance over time is an empirical question.

Therefore, we compare the tax avoidance behaviors of U.S. and European firms over a 12-year sample period (i.e., 2005–2016), and begin by analyzing whether these firms differ with regard to their tax avoidance behaviors. Specifically, if ETRs decline more rapidly for U.S. firms than for European firms, then U.S. firms may increasingly have cost advantages over European firms by virtue of having lower ETRs. However, we find that the average U.S. firm has a higher mean ETR than the average EU firm and that the declines in ETRs occurred at annual rates of approximately 0.26 percent in Europe and 0.17 percent in the U.S. over the sample period. However, STRs have remained relatively constant in the U.S., whereas significant declines have occurred in Europe. Therefore, the larger declines in the ETRs of European firms likely resulted from declines in STRs.

In stark contrast to conventional wisdom, we find that the difference between the STR and the ETR of EU firms has declined, indicating that, on average, tax avoidance in EU firms may have decreased over time. Since 2009, the gap has declined to such an extent that the ETRs of European firms do not differ substantially from the STRs applied where a parent company is domiciled, even if the firm operates in many tax jurisdictions. Firms have lower average ETRs than their STRs in only a limited number of European countries. Only in Belgium and Spain is the average difference between the STR and the mean ETR more than two percentage points. In contrast, the mean U.S. ETR is more than 11 percentage points lower than the U.S. STR. Similarly to U.S. firms, European firms are able to engage in activities (e.g., non-deductible expenses or tax-exempt income) that cause their ETRs to differ substantially from their STRs. Therefore, it is surprising that European firms report ETRs that are remarkably similar to the STRs of their parent company countries. More precisely, the common perception that European firms have ETRs that are substantially below their STRs is not necessarily accurate.

Based on these findings, we conduct an in-depth analysis of European firms to assess whether the nearly synchronous trend observed in ETRs and STRs – especially in the years since 2009 – is robust. First, it may be that temporal trends in ETRs differ between purely domestic and MNCs, as MNCs employ tax avoidance strategies that are not available to purely domestic firms (e.g., transfer pricing strategies or shifting income and intangibles). However, we show that both domestic and multinational corporate groups appear to mimic parent companies' STRs. Specifically, European multinationals show a slightly higher average ETR than purely domestic firms. We attempt to explain why MNCs do not seem to avoid more taxes than domestic firms, and we find that European MNCs with at least one subsidiary domiciled in the U.S. have higher ETRs than multinationals without a U.S. subsidiary. This finding suggests that much of the income taxed in the U.S. raises the mean ETR of European multinationals. By contrast, we do not find that

[1] Consistent with most recent research, Klassen and Laplante (2012) examine the long-term cross-border income shifting of U.S. MNCs. Considering two full decades of data, they investigate how income-shifting behavior has changed over time and report that income shifting has increased significantly – primarily because of declining regulatory costs.

[2] In addition, Swiss firms are included in our sample, even though Switzerland is not an EU member state.

European multinationals with (without) subsidiaries in tax havens have a lower (higher) mean ETR.

Second, to understand the synchronous trends of tax avoidance and STR observed within the EU at their full extent, we extend our analysis by also investigating the development of cash and current ETRs. We find that the mean EU cash ETR (25.04 percent) and the mean EU current ETR (25.60 percent) are lower than the mean EU ETR (26.67 percent) and consequently lower than the STR. It is important to note that cash ETR and current ETR measure temporary tax planning while ETR, due to its inclusion of deferred taxes, measures permanent differences. Therefore, our finding suggests that the average European firm seems more focused on temporary tax planning than on permanent (i.e., very aggressive) tax planning. Among other potential reasons (e.g., the role of tax enforcement or tax compliance), one explanation for this result could be the cost-benefit tradeoff. Tax planning can be viewed as a tradeoff in which firms weigh the marginal benefits (e.g., higher after-tax earnings) of tax planning against the marginal costs (e.g., tax expert compensation, penalties assessed by tax courts, or reputational damage) of tax planning. Compared to those of the U.S., the STRs of EU countries are lower. This cost-benefit tradeoff could make aggressive (i.e., permanent) tax planning less beneficial to European firms relative to the potential costs.

The contributions of our study are twofold. First, our paper extends the initial findings of Dyreng et al. (2017), which elucidates and explains the variations in cash ETRs over a 25-year period (1988–2012) in U.S. firms. However, they do not examine trends in tax avoidance within European firms. Therefore, we attempt to incrementally contribute to the overall understanding of international taxes by comparing the tax avoidance trends of U.S. and European corporate groups. Second, our paper makes an incremental contribution over Markle and Shackelford (2012), who find that ETRs have been falling over their sample period and that there are only minor differences in the rates of purely domestic and MNCs. However, their study does not consider potential changes in STRs over time. Hence, we contribute to the prior literature by examining changes in ETRs occurring over time and the differences between U.S. and EU firms after considering STRs. Therefore, taken together with the findings of Dyreng et al. (2017) and Markle and Shackelford (2012), our most surprising finding is that the deviation observed between the STRs and the ETRs of European firms has become smaller over time. In contrast to predominant perceptions, this finding suggests that tax avoidance in EU firms may have decreased over time. European firms appear to have average ETRs that are remarkably close to the STRs – at least for the last years of our sample period. A strong assumption exists that European firms engage in tax activities that cause their ETRs to fall substantially below the STR. In this regard, we contribute to the prior literature by providing potential explanations for the synchronous trend observed between ETRs and STRs (e.g., the role of U.S. subsidiaries, temporary vs. permanent tax planning).

Our findings should be interpreted with caution in the context of the ongoing debate over base erosion and profit shifting (BEPS). The Organization for Economic Cooperation and Development (OECD) has published an action plan with 15 specific action items designed to facilitate multilateral cooperation between governments to prevent BEPS by MNCs (Dharmapala, 2014). However, we are careful about drawing political implications for the ongoing OECD BEPS project. The purpose of our study is to investigate indicators of and trends in tax avoidance in general and not to measure income-shifting patterns. Income shifting is a specific technique that companies may employ to avoid taxes, but our proxies are not valid measures of income shifting.[3] 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. Thus, an association between our results and the BEPS project could create a misleading impression regarding the scale of the BEPS problem.

This paper proceeds as follows. In the next section, we describe our sample selection process and our methodological approach. In the third and fourth sections, we present the results, robustness tests and political implications before concluding the paper.

2. Sample selection and research design

We obtain our European data from Compustat Global; U.S. data are provided by Compustat North America. Table 1 reports our sample selection process. We investigate all firm-years from 2005 to 2016 and exclude years before 2005 because of the limited availability of data (at least for some countries) for earlier years in the Compustat Global database. We use the same data requirements for the U.S. and European samples (e.g., non-missing values of the total income tax expense and pretax income variables).

Our investigation begins with 75,577 European and 100,854 U.S. firm-years. We exclude all financial firms, reducing our sample to 62,598 EU and 72,872 U.S. firm-years.[4] We also exclude all firm-years with either a negative pretax income or negative income taxes because negative ETRs are difficult to interpret; this further reduces our sample to 40,169 EU and 37,249 U.S. firm-years.[5] Additionally, we exclude both firm-years with missing data on control variables (7,798 EU and 2,308 U.S. firm-years are excluded) and firm-years with a calculated ETR greater than one (746 EU and 732 U.S. firm-years are excluded).[6] Regarding the EU sample, we

[3] A large stream of literature has investigated income shifting within MNCs (e.g., Desai, Foley, & Hines, 2004; Huizinga, Laeven, & Nicodeme, 2008; Karkinsky & Riedel, 2012; Buettner & Wamser, 2013). The first authors to investigate income shifting by MNCs include Grubert and Mutti (1991); Harris (1993), and Klassen, Lang, and Wolfson, (1993), who investigate whether tax rate differences between a parent company and its subsidiaries are associated with income-shifting incentives. Hines and Rice (1994) find that a 10-percentage point decrease in a country's tax rate (e.g., from 35 to 25 percent) is associated with an increase in reported income of 22.5 percent, while Huizinga and Laeven (2008) use an European dataset and find that a 10-percentage point decrease in a country's tax rate is associated with a 13 percent increase in reported income.

[4] Financial institutions are excluded from the sample because they are subject to different financial reporting and disclosure requirements (e.g., Gupta & Newberry, 1997).

[5] The exclusion of firms with negative pretax book incomes is a common method in the ETR literature to ensure a reasonable interpretation (e.g., Spooner, 1986; Wilkie & Limberg, 1993; Dyreng et al., 2017).

[6] In additional tests, winsorizing at the 1 and 99 percent level yields similar results. Moreover, we also find similar results after setting the *ETR*

Table 1
Sample selection criteria.

Criteria	EU data	U.S. data
Full sample: All firm-years between 2005 and 2016	75,577	100,854
Excluding all financial firm-years	*(-12,979)* = 62,598	*(-27,982)* = 72,872
With pretax income of less than zero	*(-18,200)* = 44,398	*(-23,391)* = 49,481
With taxation (i.e., income taxes) of less than zero	*(-3,677)* = 40,721	*(-3,027)* = 46,454
With no missing values for pretax income or taxation	*(-552)* = 40,169	*(-9,205)* = 37,249
With no missing values for control variables	*(-7,798)* = 32,371	*(-2,308)* = 34,941
With no effective tax rate greater than one	*(-746)* = 31,625	*(-732)* = **34,209**
With more than 500 observations per country and data for each year of the 12-year sample period.	*(-5,908)* = **25,717**	

Notes: All financial statement data are acquired from the annual fundamentals database produced by Compustat Global (EU firms) and Compustat North America (U.S. firms).

also exclude all countries with fewer than 500 observations and all countries for which data are not available over the entire 12-year sample period (2005–2016).[7] Thus, our final sample includes 25,717 EU and 34,209 U.S. firm-year observations.

Prior research does not rely on a single measure of tax avoidance because every measure has its own limitations. Following prior research (e.g., Hanlon & Heitzman, 2010; Lisowsky, Robinson, & Schmidt, 2013), we begin our analysis by using two main proxies for tax avoidance: *ETR*, the basic ETR variable, and $DIFF_{(STR\text{-}ETR)}$, the difference between the STR and the ETR. Our main argument for using *ETR* is that it includes deferred taxes and thus information about future taxes. More precisely, due to the inclusion of deferred taxes, *ETR* measures permanent differences. In general, permanent book-tax differences arise when firms engage in very aggressive tax planning strategies (such as the use of tax havens or income shifting). However, as the purpose and intent of our study is to investigate indicators and trends of tax avoidance at its full extent, we extend our analysis by two additional measures of tax avoidance (i.e., *CASHETR* and *CURRENTETR*) in Section 4.2.

ETR is defined as the ratio of total (i.e., current and deferred) income tax expenses **(TXT)** to pretax book income **(PI)**. Higher *ETRs* reflect less tax avoidance. The *ETR* for a given firm i in year t can be written as follows:

$$ETR_{i,t} = \frac{TXT_{i,t}}{PI_{i,t}} \tag{1}$$

Compustat data item mnemonics are reported in parentheses and are written in all caps and bold font (**COMPUSTAT**). Computed variables are written in italics.

Our second measure of tax avoidance is the difference between the *STR* (i.e., *STR* = STR of country c in year t) and a firm's *ETR*. Higher values of $DIFF_{(STR\text{-}ETR)}$ indicate greater levels of tax avoidance. We take the STR of the parent company's state of residence (i.e., the headquarter country) as the firm's *STR*. This measure captures (1) the different levels and (2) the time-varying STRs within the EU and the U.S. and is calculated as follows:

$$DIFF_{(STR-ETR)i,t} = STR_{c,t} - ETR_{i,t} \tag{2}$$

The strengths and weaknesses of these two tax avoidance proxies should be considered when interpreting our results. One advantage of *ETRs* is that they can be computed for each jurisdiction. However, the rules underlying both the numerator and denominator can vary to some extent across countries and across time, especially when comparing the U.S. to the EU. Additionally, if governments reduce tax rates and firms pay lower taxes, the *ETR* measure alone provides a limited view of tax avoidance. In this case, our second measure ($DIFF_{(STR\text{-}ETR)}$), i.e., the gap between the *STR* and the *ETR*, has a greater claim on this terminology. Regarding our proxy, $DIFF_{(STR\text{-}ETR)}$, tax rules may differ between U.S. and EU firms and therefore provide different incentives for different types of activities. For example, the relatively high U.S. STR appears to be coupled with certain deductions (e.g., dividend received deduction or domestic production activities deduction). Additionally, our proxies for tax avoidance fail to reflect tax strategies that only defer income (e.g., accelerated depreciations) while reflecting items that are not income-shifting strategies. The goal of our study is to investigate indicators of and trends in tax avoidance in general and not to measure income shifting, as our proxies are not valid measures of income shifting. Therefore, we are not able to draw strong conclusions regarding income-shifting trends or to make policy recommendations regarding the BEPS project based on the findings of our study.

Table 2, Panel A shows the descriptive statistics (decomposed into EU and U.S. firms) for our firm characteristics. The mean U.S. *ETR* (28.9 percent) is approximately two percentage points above the mean EU *ETR* (26.7 percent). Notably, the mean difference between the *STR* and the firm's *ETR* ($DIFF_{(STR\text{-}ETR)}$) is positive for the U.S. sample but is nearly zero for the EU sample. This finding suggests that, on average, the *ETR* of European firms is nearly as high as the corresponding *STR*, whereas U.S. firms have an *ETR* that is lower than the *STR*. However, univariate results should be interpreted with caution, as they do not offer within-firm comparisons or

(*footnote continued*)
variable equal to zero in the case of tax refunds and equal to one when the *ETR* is greater than one instead of excluding firms with extreme *ETRs* (i.e., 0 and 1).

[7] We exclude all firm-years of Italian firms because they have an extraordinarily high mean *ETR* (i.e., more than 40 percent). In an untabulated robustness test, the results are statistically unchanged when all Italian firm-years are not excluded.

Table 2
Descriptive statistics.

Panel A: Firm characteristics

Name	Data	N	Mean	STD	p25	p50	p75	Diff.
ETR		59,926	0.279	0.147	0.196	0.287	0.362	
	U.S. data	34,209	0.289	0.150	0.205	0.318	0.375	*0.022***
	EU data	25,717	0.267	0.142	0.192	0.261	0.322	*(18.15)*
DIFF$_{(STR-ETR)}$		59,926	0.066	0.155	−0.006	0.047	0.140	
	U.S. data	34,209	0.111	0.150	0.025	0.082	0.195	*0.105***
	EU data	25,717	0.006	0.140	−0.038	0.004	0.070	*(87.30)*
ROA		59,926	0.069	0.060	0.029	0.054	0.091	
	U.S. data	34,209	0.072	0.063	0.029	0.055	0.094	*0.006***
	EU data	25,717	0.066	0.056	0.029	0.052	0.086	*(10.76)*
SIZE		59,926	6.266	2.174	4.616	6.174	7.789	
	U.S. data	34,209	6.715	2.094	5.227	6.722	8.165	*1.046***
	EU data	25,717	5.669	2.134	4.063	5.363	7.078	*(60.04)*
LEV		59,926	0.214	0.188	0.047	0.190	0.324	
	U.S. data	34,209	0.233	0.207	0.042	0.210	0.353	*0.044***
	EU data	25,717	0.189	0.155	0.052	0.169	0.289	*(28.61)*
PPE		59,926	0.276	0.243	0.077	0.201	0.418	
	U.S. data	34,209	0.307	0.261	0.090	0.217	0.491	*0.072***
	EU data	25,717	0.235	0.210	0.062	0.182	0.345	*(36.18)*
INTAN		59,926	0.182	0.197	0.016	0.108	0.296	
	U.S. data	34,209	0.179	0.201	0.010	0.100	0.293	*−0.007****
	EU data	25,717	0.186	0.192	0.025	0.119	0.300	*(-4.67)*
R&D		59,926	0.019	0.039	0.000	0.000	0.017	
	U.S. data	34,209	0.021	0.042	0.000	0.000	0.021	*0.006****
	EU data	25,717	0.015	0.035	0.000	0.000	0.012	*(17.40)*
CAPEX		59,926	0.280	0.320	0.121	0.201	0.337	
	U.S. data	34,209	0.246	0.181	0.118	0.196	0.321	*−0.079****
	EU data	25,717	0.325	0.438	0.126	0.207	0.361	*(-30.46)*

Panel B: Country characteristics

Name	Data	N	Mean	STD	p25	p50	p75	Diff.
COMPLEXITY		59,926	0.384	0.486	0.000	0.000	1.000	
	U.S. data	34,209	0.260	0.439	0.000	0.000	1.000	*−0.289****
	EU data	25,717	0.549	0.498	0.000	1.000	1.000	*(-75.39)*
CFC		59,926	0.892	0.311	1.000	1.000	1.000	
	U.S. data	34,209	1.000	0.000	1.000	1.000	1.000	*0.252****
	EU data	25,717	0.748	0.434	0.000	1.000	1.000	*(110.19)*
STRENGTH_AUDIT		59,926	0.424	0.494	0.000	0.000	1.000	
	U.S. data	34,209	0.251	0.434	0.000	0.000	1.000	*−0.404****
	EU data	25,717	0.655	0.475	0.000	1.000	1.000	*(-108.27)*

Notes: In Table 2, we report descriptive statistics for the firm characteristics (Panel A) and country characteristics (Panel B) used in this study. The last column (Diff.) reports the mean difference between U.S. and EU firms for each variable. The t-statistics are reported in parentheses below the coefficient estimates. *** denotes the significant differences at the 1 percent level (two-tailed). All variables defined in Appendix A.

control for firm characteristics, which would mitigate endogeneity concerns.

Regarding *ROA* (return on assets, calculated as net income **(NI)** divided by total assets **(TA)**) and *INTAN* (level of intangible assets **(INTAN)** scaled by total assets **(TA)**), no major differences between the EU and U.S. samples are observed. The average U.S. firm in our sample seems to be larger than the average EU firm (*SIZE,* calculated as the natural logarithm of total assets **(TA)**). To ensure that our results are not driven by currency changes within a given country (Atwood et al., 2012), we convert all data to Euro (using the year-end currency translation rates) before computing *SIZE*. The mean leverage (*LEV*, calculated as the ratio of long-term debt plus the debt included in current liabilities **(DLC + DLTT)** to total assets **(TA)**) is higher in the U.S. sample (23.3 percent) than in the European sample (18.9 percent). By contrast, the mean intensity of tangible assets (*PPE*, which is ratio of the current year's net property, plant and equipment **(PPENT)** to total assets (**TA**)) is lower for European firms (23.5 percent) than for U.S. firms (30.7 percent). A similar finding is observed for mean R&D expenses. *R&D* is defined as the ratio of R&D expenses (**XRD**) in a given year scaled by total assets (**TA**). However, this difference could be caused by the relatively poor data availability for *R&D* in the European sample (while 68 percent of the firm-year observations are coded as zero in the European sample, only 47 percent are coded as zero in the U.S. sample). The average EU (U.S.) firm-year has capital expenditures (*CAPEX*, the amount spent on capital assets **(CAPX)** scaled

by net property, plant and equipment **(PPENT)**) of 32.5 percent (24.6 percent).

In Table 2, Panel B, descriptive statistics for the country characteristics are presented. Tax regulations seem to be less complex in the U.S. than in the EU (*COMPLEXITY*). Additionally, for 74.8 percent of the European firm-years, controlled foreign company rules (*CFC*) exist, whereas CFC rules exist in the U.S. across the whole sample period (i.e., 2005–2016).[8] Moreover, the strength of auditing and reporting standards (*STRENGTH_AUDIT*) is greater for the EU subsample than for the U.S. subsample.

Table 3 provides the Pearson (below the diagonal) and Spearman (above the diagonal) correlations among the main variables. All reported correlations are statistically significant at the 5 percent level or better, with the exception of the correlations shown in bold. For example, *PPE* is highly correlated (Pearson Rho = 0.43) with our control variable for intangible assets (*INTAN*). Following both Gleason and Lee (2003) and Atwood et al. (2012), we conduct a test of collinearity (untabulated) by regressing the dependent variables on all of the independent variables and calculating the variance inflation factors (VIFs) for each variable. The average VIF is 1.30 and the highest VIF across the regressions is 1.73, which is well below the generally accepted threshold of 10. This suggests that multicollinearity is not a problem in our model.

Table 3
Correlations matrix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) *ETR*		−0.76	−0.16	−0.22	0.06	0.02	**−0.01**	0.08	−0.10	0.02	−0.02	0.18	−0.04
(2) $DIFF_{(STR\text{-}ETR)}$	−0.87		−0.39	0.20	0.11	0.03	0.06	−0.08	0.11	−0.04	−0.12	0.18	−0.17
(3) *EU*	−0.07	−0.34		−0.03	−0.25	−0.07	−0.13	0.07	−0.04	0.05	0.29	−0.40	0.40
(4) *ROA*	−0.23	0.22	−0.04		−0.11	−0.32	−0.11	−0.07	0.14	0.20	−0.05	0.01	0.03
(5) *SIZE*	0.06	0.06	−0.24	−0.14		0.37	0.25	0.18	0.02	−0.19	−0.11	0.14	−0.09
(6) *LEV*	**0.01**	0.05	−0.12	−0.25	0.31		0.32	0.13	−0.21	−0.26	−0.03	0.03	−0.04
(7) *PPE*	−0.05	0.09	−0.15	−0.12	0.21	0.30		−0.42	−0.27	−0.48	−0.04	−0.05	−0.09
(8) *INTAN*	0.08	−0.08	0.02	−0.13	0.15	0.14	−0.43		0.15	0.16	−0.02	0.08	0.06
(9) *R&D*	−0.08	0.11	−0.07	0.13	−0.08	−0.23	−0.28	0.02		0.15	−0.01	0.06	0.02
(10) *CAPEX*	−0.01	−0.02	0.12	0.11	−0.22	−0.16	−0.31	0.10	0.12		0.03	0.04	0.07
(11) *COMPLEXITY*	**−0.00**	−0.10	0.29	−0.05	−0.10	−0.04	−0.05	−0.04	−0.02	0.07		−0.14	0.07
(12) *CFC*	0.13	0.15	−0.40	0.02	0.14	0.05	−0.02	0.10	0.06	**0.01**	−0.14		−0.01
(13) *STRENGTH_AUDIT*	−0.02	−0.14	0.40	0.02	−0.08	−0.05	−0.09	0.05	**−0.00**	0.06	0.07	−0.01	

Notes: In Table 3, all reported correlations are statistically significant at the 5 percent level or better with the exception of the correlations in bold. Pearson correlations are reported below the diagonal and Spearman correlations are reported above the diagonal. All variables defined in Appendix A.

3. Comparing the tax avoidance behaviors of EU and U.S. firms over time

3.1. Development of the ETRs of EU and U.S. firms: Descriptive results

We compare the tax avoidance behaviors of U.S. and European corporate groups. We begin our analysis with a brief investigation of mean *ETRs* over the 12-year sample period (Fig. 1). Corporate groups domiciled in Poland have the lowest mean *ETR* over the sample period (21 percent). The mean *ETR* varies between 21 and 31 percent (France). As previously shown in Table 2, the mean U.S. *ETR* is 29 percent. Firms from ten of our 12 European countries have a lower mean *ETR* than the U.S. Furthermore, it is striking that the mean U.S. *ETR* is comparable to those of larger European states (France, Germany, Spain, and the U.K.).[9]

We next analyze the development of mean *ETRs* for each year from 2005 to 2016. With regard to the time trend (Fig. 2), the average *ETR* of U.S. firms was approximately 30 percent in 2005. However, a downward trend is observed over time. In 2016, the average U.S. *ETR* was approximately 28.3 percent. Comparing this U.S. finding to the development of the mean EU *ETR*, we also find a clear downward trend of EU *ETRs* over the 12 years studied. The average *ETR* was approximately 28.2 percent in 2005 but decreased to approximately 25 percent by 2016. The mean *ETR* of U.S. firms was higher than the mean EU *ETR* in all years of the investigation period.

[8] Five countries (Austria, Belgium, the Netherlands, Poland, and Switzerland) within our sample have not established CFC rules (see Johansson et al., 2016).

[9] According to the International Monetary Fund, Germany, the U.K. and France are the European countries with the highest nominal GDPs: http://www.imf.org.

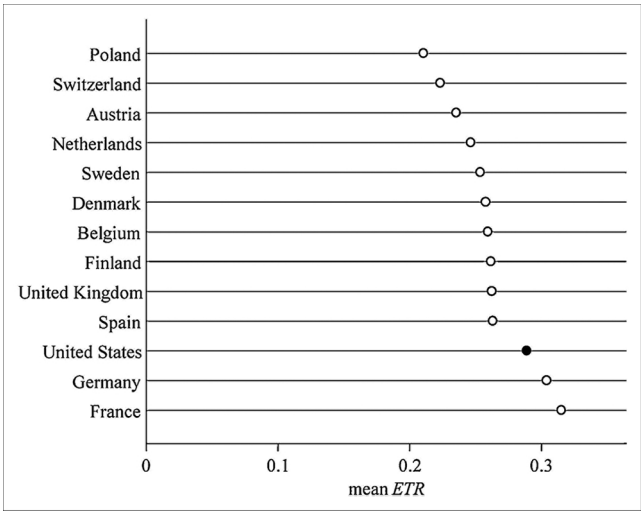

Fig. 1. Average effective tax rate (*ETR*) for each country from 2005 to 2016.

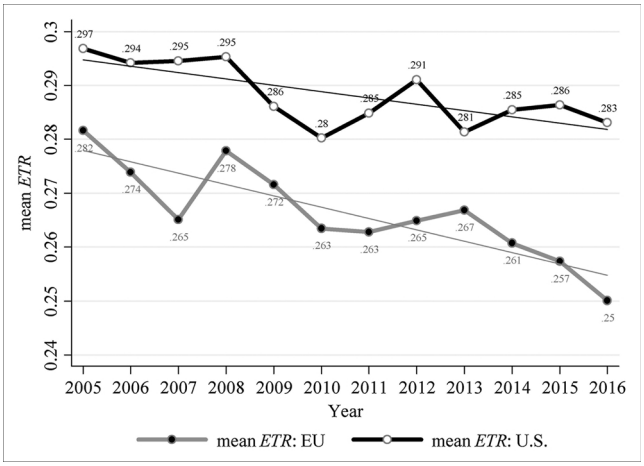

Fig. 2. Average annual effective tax rates (*ETRs*) for EU and U.S. firms from 2005 to 2016.

Fig. 2 displays two fitted trend lines computed by regressing the annual mean value of *ETR* on a linear time trend.[10] The (untabulated) coefficients for the linear time trends in Fig. 2 are -0.0021 (t-statistic = −5.38) for the mean EU *ETR* and -0.0012 (t-statistic = -3.34) for the mean U.S. *ETR*. These statistically significant downward trends indicate an average annual decrease in the EU *ETR* of 0.21 percent (in the U.S., 0.12 percent) over the 12 year sample period.

Next we compare the *ETR* distributions of EU and U.S. firms (Fig. 3). In Panel A, which shows the 1-year *ETRs*, the histogram indicates that the largest group of U.S. firms (42 percent) in our sample has an *ETR* between 30 and 40 percent, whereas the largest group of European firms (40 percent) has an *ETR* between 20 and 30 percent. Therefore, most U.S. firms have a higher *ETR* than European firms. The analysis of the *ETR* distribution also indicates that approximately 10 percent of the European observations and 14 percent of the U.S. firms have an *ETR* below 10 percent. This indicates that more U.S. firms appear to have the opportunity to lower their tax burden to a minimal rate.

Panel B of Fig. 3 shows the distribution of the long-run *ETR* (i.e., over a 10-year time horizon) for both European and U.S. firms. The long-run distribution clearly shows fewer observations at the upper and lower limits of the distribution, indicating that more than 82 percent of the European corporate groups experience an *ETR* between 20 and 40 percent (more than 86 percent of U.S. corporate groups). Approximately 1 percent of the European observations (4 percent of the U.S. observations) show a long-run *ETR* below the 10 percent threshold, indicating that few European and U.S. corporate groups are able to consistently hold their *ETR* at an extremely low level. Our results seem to be consistent with the finding of Dyreng et al. (2008) that some U.S. firms have low long-run cash ETRs.[11]

[10] The time trend is calculated as the fiscal year for a given firm-year observation minus the value for 2005, which is the first year in the dataset.

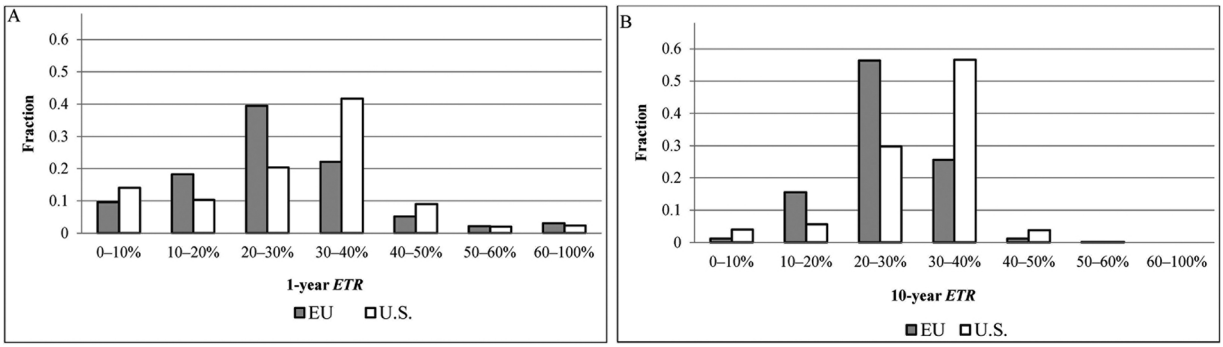

Fig. 3. Panel A: Distribution of 1-year ETRs for EU and U.S. firms.
Panel B: Distribution of 10-year ETRs for EU and U.S. firms.
Notes: The figure in Panel A plots the fraction of firms for seven different groups of 1-year *ETRs* from 2005 to 2016. The figure in Panel B plots the fraction of firms for seven different groups of long-run *ETRs* (10 years) over the sample period. Firms are only considered if ten years of data are available.

The comparison of the *ETRs* of European and U.S. firms shows that the difference, especially between the U.S. and large European countries, is not striking. Compared with European firms, the downward trend of U.S. firms is slower over the 12 years studied.

A comparison of the development of the mean corporate *ETR* in each country with their *STR* (Fig. 4) reveals that nearly all European countries studied exhibit no (or little) divergence between the two tax rates over time. We find a significant decline in the mean *ETR* in Europe, as depicted in Fig. 2. In nearly all countries, this decline appears to be completely in line with the trend in the *STR*. Thus, the decline in *ETRs* appears to be attributable to the decline in *STRs* in Europe.

This differs from findings for the U.S. In both the U.S. and Europe, a decline in the mean *ETR* is observed; however, the *STR* in the U.S. is nearly constant over the last 12 years (approximately 40 percent), whereas a notable decline in *STRs* occurs in Europe. Hence, the observed mean U.S. *ETR* of 29.7 percent in 2005 indicates a difference of approximately 10 percentage points between this mean *ETR* and the *STR*. Due to the decreasing mean U.S. *ETR* and the constant *STR*, this discrepancy increases further over time. For the EU firms, the mean difference varies around the zero line, which indicates that, on average, no large differences are observed. The finding that European firms have *ETRs* that are remarkably close to the corresponding *STR* is surprising because they are able to engage in activities (e.g., non-deductible expenses or tax-exempt income) that cause their *ETR* to differ substantially from the *STR*.

3.2. Development of tax avoidance behaviors in EU and U.S. firms: Regression results

To more formally test the abovementioned insights presented in Figs. 1 to 4, we estimate the following OLS regression Eq. (3):

$$TaxAv_{i,t} = \beta_{industry} + \beta_1 TIME_t + \beta_2 EU_i + \beta_3 EU_i * TIME_t + \beta_4 ROA_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 LEV_{i,t} + \beta_7 PPE_{i,t} + \beta_8 INTAN_{i,t} + \beta_9 R\&D_{i,t} + \beta_{10} CAPEX_{i,t} + \sum \beta_k CONTROL_k + \varepsilon_{i,t} \quad (3)$$

For the measure of tax avoidance (*TaxAv*), we start our analysis with two proxies: *ETR* or $DIFF_{(STR\text{-}ETR)}$.[12] *TIME* is defined as the fiscal year for a given firm-year observation minus the number 2005, which is the first year included in the dataset. Thus, *TIME* takes values of 0–11, which correspond to the sample years 2005–2016. *EU* is a dummy variable that equals one for firms domiciled in the EU and zero for firms domiciled in the U.S.). The interaction of *TIME* with *EU* (*EU*TIME*) tests differences in the time trend between U.S. and EU firms.

We draw on prior research to identify a wide range of control variables that may influence the level of tax avoidance (e.g., Gupta & Newberry, 1997; Mills, 1998; Manzon & Plesko, 2002; Rego, 2003; Dyreng et al., 2008; Frank, Lynch, & Rego, 2009; Chen, Chen, Cheng, & Shevlin, 2010). We use a set of control variables that are computable for both the EU and the U.S. sample.[13] Prior research suggests that more profitable firms (*ROA*) display higher levels of tax avoidance. Furthermore, we incorporate *SIZE* because tax avoidance may vary depending on firm size. Additionally, firms with higher debt tax shields (*LEV*) generally present lower levels of tax avoidance. We also control for differences in financial and tax accounting treatments (*PPE*, *INTAN*, *R&D*), which also influence our measures of tax avoidance. Capital expenditures (*CAPEX*) is included to capture new investments in capital assets that could also

[11] We also test whether the average *ETRs* of European corporate groups differ across industrial sectors (measured by NAICS codes). The average *ETRs* vary between 22.5 percent (transportation and warehousing) and 30.5 percent (educational services). Therefore, the *ETRs* per industry code do not indicate that the tax avoidance mechanisms of European corporate groups suggest a larger problem. Similarly, Dyreng et al. (2008) do not find industry effects on the level of U.S. ETRs.

[12] In Section 4.2, we rerun the regressions using two additional measures of tax avoidance, namely, *CASHETR* and *CURRENTETR*. Furthermore, in untabulated robustness tests, we are able to show that our main results are statistically and economically equal when we use the scaled difference between the *STR* and the *ETR* (i.e., the difference is scaled by the *STR*, $rel\_DIFF_{(STR\text{-}ETR)}$) or permanent book-tax differences (*PermBTD*).

[13] For example, net operating losses (*NOL*) are not available for the EU dataset; therefore, they are not included as a control variable in the EU sample or in the U.S. sample.

Fig. 4. The effective tax rate (*ETR*) versus the statutory tax rate (*STR*) of each country.

result in different treatments for book and tax purposes.[14]

A comparison of U.S. tax avoidance with a diverse group of EU countries should take the (tax-related) country-level effects (*CONTROL*) of different countries into account. Therefore, we control for the characteristics of a country's tax system by including two indicator variables: the complexity of tax regulations (*COMPLEXITY*) and controlled foreign company rules (*CFC*). We expect to find that firms located in countries with relatively complex tax regulations (i.e., *COMPLEXITY* = 1) have higher *ETRs*. Similarly, we expect to find that the association between *CFC* and *ETR* is positive. Additionally, we control for the strength of auditing and reporting standards (*STRENGTH_AUDIT*), as this cross-country institutional factor may impact tax decisions. We expect to find that firms in countries with relatively strong financial auditing and reporting standards (i.e., *STRENGTH_AUDIT* = 1) are associated with less tax avoidance.

All other variables are defined as above and are detailed in Appendix A. For all of our estimations, we include industry fixed effects (based on two-digit NAICS codes); however, for the sake of brevity, we do not report their coefficients. In all tests, standard errors are clustered by firm and year.

Table 4 reports the results of this regression analysis. In Panel A of Table 4, we show that the time trends of the *ETRs* are

Table 4
Regressions of *ETR* and $DIFF_{(STR\text{-}ETR)}$ on *TIME* with firm and country characteristics.

Panel A: *ETR* on *TIME* with firm and country characteristics

	(1) All Firms	(2) EU Firms	(3) U.S. Firms
TIME	−0.0020***	−0.0026***	−0.0017***
	(-4.37)	(-8.43)	(-5.54)
EU	−0.0179***		
	(-4.40)		
*EU*TIME*	−0.0004		
	(-0.63)		
ROA	−0.5894***	−0.7079***	−0.5093***
	(-16.38)	(-14.88)	(-14.14)
SIZE	0.0020***	0.0023***	0.0011
	(2.97)	(2.99)	(1.05)
LEV	−0.0463***	−0.0038	−0.0715***
	(-6.07)	(-0.39)	(-7.65)
PPE	−0.0379***	−0.0507***	−0.0282**
	(-4.20)	(-4.74)	(-2.36)
INTAN	0.0067	−0.0310***	0.0387***
	(0.63)	(-2.81)	(3.16)
R&D	−0.3226***	−0.0548	−0.4587***
	(-9.40)	(-1.34)	(-11.27)
CAPEX	−0.0007	−0.0001	0.0005
	(-0.27)	(-0.04)	(0.07)
COMPLEXITY	0.0067***	0.0134***	−0.0017
	(3.55)	(3.45)	(-1.04)
CFC	0.0523***	0.0522***	
	(12.44)	(12.66)	
STRENGTH_AUDIT	−0.0008	−0.0038	0.0047***
	(-0.21)	(-0.88)	(2.60)
Industry FE	YES	YES	YES
N	59,926	25,717	34,209
Adj. R^2	10.6%	12.0%	11.1%

(*continued on next page*)

[14] Because a low *ETR* could be due to either low tax expense or upward earnings management, we control for earnings management using the Jones model in additional tests. In untabulated results, we observe that all results remain economically and statistically similar. However, the number of observations, especially for the European sample, is dramatically reduced (from 25,717 to 13,832).

Table 4 (*continued*)

Panel B: $DIFF_{(STR-ETR)}$ on *TIME* with firm and country characteristics

	(1) All Firms	(2) EU Firms	(3) U.S. Firms
TIME	0.0015*** (3.99)	−0.0041*** (-8.16)	0.0017*** (5.54)
EU	−0.0603*** (-10.90)		
*EU*TIME*	−0.0055*** (-7.74)		
ROA	0.5562*** (15.53)	0.6314*** (12.44)	0.5093*** (14.14)
SIZE	−0.0001 (-0.21)	0.0019*** (2.77)	−0.0011 (-1.05)
LEV	0.0521*** (6.90)	0.0187** (1.98)	0.0715*** (7.65)
PPE	0.0274*** (3.10)	0.0224** (2.18)	0.0282** (2.36)
INTAN	−0.0183* (-1.76)	0.0082 (0.75)	−0.0387*** (-3.16)
R&D	0.3295*** (10.00)	0.0818* (1.94)	0.4587*** (11.27)
CAPEX	0.0066** (2.38)	0.0067** (1.98)	−0.0005 (-0.07)
COMPLEXITY	0.0028 (1.00)	0.0033 (0.60)	0.0017 (1.04)
CFC	0.0124*** (2.94)	0.0126*** (2.90)	
STRENGTH_AUDIT	−0.0081** (-2.39)	−0.0109 (-1.59)	−0.0047*** (-2.60)
Industry FE	YES	YES	YES
N	59,926	25,717	34,209
Adj. R^2	19.2%	8.3%	11.1%

Notes: In Table 4, we report the results of regression (3), which is an OLS regression of *ETR* (Panel A) and $DIFF_{(STR-ETR)}$ (Panel B) on a linear time trend (*TIME*) with firm and country characteristics. All variables are defined in Appendix A. In all three models, standard errors are clustered by firm and year. T-statistics are reported in parentheses below the coefficient estimates. *, **, *** indicate significance at 10 percent, 5 percent, and 1 percent, respectively. Industry fixed effects are included in the estimations, but they are not reported.

significantly negative for each Model (-0.26 percent per year for the EU and -0.17 percent per year for the U.S.).[15] Additionally, we can interpret the significant negative indicator variable *EU* as follows: EU firms show significantly lower *ETRs* than U.S. firms during our sample period. The coefficient on *EU*TIME* is insignificant, suggesting that the declines in *ETRs* over time are similar for EU and U.S. firms. All of these findings are in line with Fig. 2.

However, in Panel B of Table 4, we use $DIFF_{(STR-ETR)}$ as a measure of tax avoidance. The *EU* indicator variable included in Model 1 is significantly negative, indicating that the gap between *STRs* and *ETRs* is lower for EU firms than for U.S. firms. Additionally, the negative coefficient on *EU*TIME* suggests that the time trends of EU and U.S. firms are significantly different. More precisely, the negative coefficient on *TIME* (-0.0041) shown in Model 2 of Panel B implies that the gap between the *STR* and the *ETR* significantly decreases for EU firms over time. By contrast, U.S. firms show a significant average increase of 0.17 percent per year (*TIME* in Model 3 of Panel B: 0.0017). This finding suggests that – in contrast to U.S. firms – tax avoidance in EU firms may have decreased over time.

Regarding the control variables, we find that for both the EU and U.S. samples, an increase in *ROA* and *PPE* is associated with an increase in tax avoidance (i.e., a lower *ETR*). Additionally, consistent with our expectations, our findings suggest that relatively complex tax regulations (*COMPLEXITY*) and the existence of CFC rules (*CFC*) are associated with higher *ETRs* (Table 4, Panel A). As expected, the coefficient on *STRENGTH_AUDIT* is positive and significant for the U.S. sample (Table 4, Panel A, Model 3), but insignificant for the EU sample (Model 2).

Comparing U.S. firms with EU firms is somewhat difficult because the EU consists of many member states that are not equally and

[15] In untabulated results, we also regress the two different measures of tax avoidance on the linear time trend (*TIME*) without including additional control variables. Similar to the results in Table 4, we find that the time trends (*TIME*) for EU and U.S. firms are significantly different and that EU firms exhibit a faster rate of *ETR* decline (0.20 percent per year) than U.S. firms (0.11 percent per year).

Table 5
Regressions of *ETR* and $DIFF_{(STR\text{-}ETR)}$ on *TIME* with indicator variables for each country.

	(1) *ETR*	(2) $DIFF_{(STR\text{-}ETR)}$
TIME	−0.0019***	−0.0005*
	(-9.73)	(-1.83)
AUSTRIA	−0.0648***	−0.0852***
	(-6.64)	(-8.70)
BELGIUM	−0.0337***	−0.0258**
	(-3.12)	(-2.39)
DENMARK	−0.0208***	−0.1271***
	(-2.74)	(-14.85)
FINLAND	−0.0274***	−0.1300***
	(-3.61)	(-14.50)
FRANCE	0.0049	−0.0712***
	(0.88)	(-12.64)
GERMANY	0.0052	−0.0856***
	(1.16)	(-6.92)
NETHERLANDS	−0.0531***	−0.0836***
	(-6.85)	(-8.29)
POLAND	−0.0889***	−0.1186***
	(-21.40)	(-31.03)
SPAIN	−0.0384***	−0.0555***
	(-4.56)	(-4.29)
SWEDEN	−0.0375***	−0.1077***
	(-7.26)	(-15.20)
SWITZERLAND	−0.0667***	−0.1283***
	(-9.99)	(-14.76)
U.K.	−0.0373***	−0.0984***
	(-6.95)	(-13.06)
Firm characteristics	YES	YES
CONTROL	NO	NO
Industry FE	YES	YES
N	59,926	59,926
Adj. R^2	11.3%	19.6%

Notes: In Table 5, we expand regression equation (3), which is an OLS regression of *ETR* (Model 1) and $DIFF_{(STR\text{-}ETR)}$ (Model 2) on a linear time trend (*TIME*) with indicator variables for each country and firm characteristics. All variables are defined in Appendix A. In both models, standard errors are clustered by firm and year. T-statistics are reported in parentheses below the coefficient estimates. *, **, *** indicate significance at 10 percent, 5 percent, and 1 percent, respectively. Country characteristics (*CONTROL*) are not included. Firm characteristics and industry fixed effects are included in the estimations, but they are not reported.

homogenously developed. For example, economic importance (measured as nominal GDP) varies across EU countries. The countries of Western and Central Europe (e.g., Germany, the U.K., France, and Spain) have a higher GDP, whereas Eastern European countries (e.g., Poland) have less economic power.

Thus, to examine the association in greater detail, we expand regression equation (3) by including indicator variables for each country rather than applying our initial division of EU and U.S. firms. Table 5, Model 1 shows that during our sample period, U.S. firms exhibit higher *ETRs* than most European countries, with the exception of France (*FRANCE* = 0.005 and t-value: 0.88) and Germany (*GERMANY* = 0.005 and t-value: 1.16). The mean *ETRs* of French, German, and U.S. firms do not differ significantly. This is in line with the findings presented in Fig. 1. Regarding $DIFF_{(STR\text{-}ETR)}$, we find (Table 5, Model 2) that the average U.S. firm shows a greater difference between the *STR* and the *ETR* than that of firms in all European countries.

In untabulated results, we also calculate the average difference between the *STR* and *ETR* for each country. We obtain this result by regressing the difference between the *STR* and the *ETR* (i.e., $DIFF_{(STR\text{-}ETR)}$) on the mean-centered continuous control variables for each country.[16] In this case, the *Intercept* captures the average difference between the *STR* and the *ETR* for a hypothetical firm in each country over the sample period. We find (in untabulated results) that only six of the 12 European countries analyzed, as well as the U.S. (*Intercept*: 0.111), have an *Intercept* that is statistically greater than zero (Austria: 0.015, Belgium: 0.081, France: 0.019, Germany:

[16] Industry fixed effects are not included.

Table 6
Per country regressions of $DIFF_{(STR\text{-}ETR)}$ on *TIME* with firm and country characteristics.

	(1) Austria	(2) Belgium	(3) Denmark	(4) Finland	(5) France	(6) Germany	(7) Netherlands	(8) Poland	(9) Spain	(10) Sweden	(11) Switzerland	(12) U.K.
TIME	−0.0010	0.0021	−0.0027*	−0.0030**	0.0031	−0.0072***	−0.0048***	0.0000	−0.0071***	−0.0038***	−0.0045***	−0.0050***
	(-0.53)	(1.23)	(-1.87)	(-2.30)	(1.56)	(-3.21)	(-3.51)	(0.03)	(-5.11)	(-3.45)	(-3.77)	(-3.32)
ROA	1.4707***	0.4474**	0.5712***	0.8766***	0.8269***	0.8742***	0.6238***	0.7281***	0.2904	0.5203***	0.7614***	0.6246***
	(3.86)	(2.45)	(5.38)	(5.39)	(6.45)	(10.05)	(2.71)	(13.69)	(1.34)	(6.16)	(7.54)	(11.02)
SIZE	0.0050	0.0050	−0.0069	0.0056	0.0030	0.0022	0.0030	0.0038	0.0021	−0.0039*	−0.0044	−0.0037**
	(0.99)	(0.68)	(-1.63)	(1.61)	(1.48)	(1.12)	(0.72)	(1.45)	(0.43)	(-1.77)	(-1.37)	(-2.30)
LEV	0.1845**	0.0562	0.0589	0.0808	0.0234	−0.0390	−0.0445	−0.0011	−0.0062	0.0217	−0.0315	0.0347**
	(2.17)	(0.67)	(1.29)	(1.21)	(0.68)	(-1.34)	(-1.20)	(-0.06)	(-0.18)	(0.64)	(-1.21)	(2.01)
PPE	−0.1276*	0.0401	−0.0146	0.0683	0.0084	0.0391	0.1476***	0.0347*	−0.0678	0.0161	0.1248***	0.0486**
	(-1.77)	(0.62)	(-0.37)	(1.12)	(0.32)	(1.38)	(2.92)	(1.94)	(-1.24)	(0.47)	(3.56)	(2.17)
INTAN	0.0576	−0.0233	−0.0271	0.0156	0.0054	0.0177	0.0723	0.0396	−0.1493**	0.0373*	0.0462	0.0249
	(0.77)	(-0.35)	(-0.96)	(0.26)	(0.19)	(0.53)	(1.39)	(1.29)	(-2.08)	(1.79)	(1.32)	(1.57)
R&D	0.6809*	0.1694	−0.3795**	−0.2485	0.5859***	−0.1612**	0.1750	−0.1062	0.9550*	−0.0963	0.2846***	0.2843***
	(1.85)	(0.73)	(-2.22)	(-1.15)	(4.77)	(-2.09)	(0.81)	(-0.56)	(1.92)	(-0.74)	(2.62)	(3.42)
CAPEX	−0.0226	0.0141	0.0019	0.0129	0.0038	0.0099*	0.0057	−0.0026	0.0021	0.0209*	−0.0274	0.0033
	(-1.06)	(0.37)	(0.09)	(0.77)	(0.44)	(1.68)	(0.28)	(-0.43)	(0.06)	(1.76)	(-1.16)	(0.42)
CONTROL	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	498	661	737	903	4,072	3,939	922	2,849	837	2,289	1,550	6,460
Adj. R^2	20.4%	11.5%	14.4%	15.5%	10.2%	13.6%	10.8%	9.8%	17.3%	12.1%	17.2%	9.7%

Notes: In Table 6, we report the results of regression (3), which is an OLS regression of $DIFF_{(STR\text{-}ETR)}$ on a linear time trend (*TIME*) with firm and country characteristics. We run the regression for all European countries (Models 1–12). All other variables are as defined in Appendix A. In all models, standard errors are clustered by firm and year. T-statistics are reported in parentheses below the coefficient estimates. *, **, *** indicate significance at 10 percent, 5 percent, and 1 percent, respectively. *CONTROL* and Industry fixed effects are included in the estimations, but they are not reported.

0.015, the Netherlands: 0.017, and Spain: 0.043). In other words, while difference between the *STR* and the *ETR* of a hypothetical U.S. firm is more than 11 percentage points, the highest deviation observed for the EU is for a hypothetical Belgian firm, which has a difference of approximately 8 percentage points. These findings are in line with the results presented in Fig. 4. The remaining six European countries show either no significant difference between the *STR* and *ETR* (Denmark, Sweden, and the U.K.) or an even higher *ETR* (Finland, Poland, and Switzerland). Thus, only six countries have an average *ETR* that is lower than the respective *STR* (i.e., Austria, Belgium, France, Germany, the Netherlands and Spain), and only two countries have a deviation of larger than 2 percentage points (i.e., Belgium and Spain).

One striking result is evident with respect to the European sample. In Table 6, we examine time trends in differences between *STRs* and *ETRs* across the European countries. Stated differently, Table 6 reports the results of the per-country regressions of $DIFF_{(STR-ETR)}$ on *TIME*. For eight of the 12 analyzed European countries, differences between the *STR* and the average firm's *ETR* have declined over time (*TIME* < 0). Therefore, in contrast to the predominant perception, this suggests that tax avoidance in these European countries may actually have decreased over time. With respect to the four remaining countries (i.e., Austria, Belgium, France, and Poland), the coefficient on *TIME* is insignificant, indicating that the gap between *STR* and *ETR* is relatively constant over time. By contrast, and as mentioned above (Table 4, Panel B, Model 3), U.S. firms show a significant average increase of 0.17 percent per year.

In summary, these findings contradict the commonly held belief that a decline in *ETRs* over time must be due to increased corporate tax avoidance behavior. For all European countries, we find that the time trends in the differences between *STRs* and *ETRs* are constant or have even decreased over time. Additionally, few countries in Europe show an *ETR* that is lower than the corresponding *STR*. Only six countries, Austria, Belgium, France, Germany, the Netherlands, and Spain, show marginal deviations. Compared to the gap between the mean *ETR* and the *STR* in the U.S. (11 percentage points), the differences in Austria, France, Germany, and the Netherlands (less than 2 percentage points) appear to be negligible.

Two additional points are worth mentioning. First, when considering our tax avoidance proxy $DIFF_{(STR-ETR)}$, the U.S. is labeled the most tax-avoiding country. This finding should be interpreted with extreme caution. This measure uses the *STR* as its reference point. Given that the STR of the U.S. is one of the highest in the world, U.S. companies would have a competitive disadvantage if the mean *ETR* was as high as the *STR*. When considering our tax avoidance proxy, *ETR*, we find that most European countries have lower mean *ETRs* than that of the U.S. Additionally, the mean U.S. *ETR* is comparable to those of the most economically strong European countries, such as Germany and the U.K. (Fig. 1). The trends in the mean *ETRs* of U.S. firms and the average European *STRs* do not differ significantly. Therefore, the tax burdens of U.S. and European firms appear to be relatively equal.

Second, the abovementioned analysis suggests that our findings not only contradict the commonly held belief that European firms have average *ETRs* that are substantially below the *STR* but also that the *ETRs* of European firms essentially mimic their respective *STRs*. Like U.S. firms, European firms can engage in activities (e.g., non-deductible expenses or tax-exempt income) that cause their *ETR* to differ substantially from their *STR*. Therefore, it is surprising that European firms present *ETRs* that are remarkably similar to their corresponding *STRs*. Particularly for European MNCs, which operate in several tax jurisdictions with varying STRs, it seems unlikely that the consolidated multinational corporate group's *ETR* would be close to the parent company's STR. Therefore, in the following section, we explore potential explanations for the synchronous trends observed.

4. In-depth analysis of European firms

4.1. Potential explanations for the synchronic trends

As noted above, a surprising result is that the deviation observed between the *ETRs* and the respective *STRs* of European corporate groups has decreased over time and is – at least for the last years of our sample period – marginally small. Therefore, Fig. 5 presents the results of a battery of additional tests conducted to assess whether the observed synchronic trend in the *ETR* and *STR* is robust. To measure different firm characteristics, we divide our sample into two subsamples based on whether a variable is higher or lower than the median (e.g., small versus large firms (*SIZE*)). In all tests, the tenor of the results remains the same. The only exception is the median split for profitable and less profitable firms (*ROA*); we find that profitable firms report substantially lower *ETRs* than less profitable firms.

Additionally, synchronic trends in *ETRs* and *STRs* could result from purely domestic firms. The *ETRs* of multinational European firms could deviate from *STRs* due to their subsidiaries in foreign countries with foreign STRs. By contrast, the *ETRs* of purely domestic firms cannot be driven by the STRs of foreign countries by definition.

However, Compustat Global does not provide any information regarding the locations of subsidiaries within a European corporate group. Hence, the Bureau van Dijk Amadeus database is used for this additional test. It is important to note that we maintain the same data requirements for the Amadeus dataset as for Compustat data (described in Table 1). Additionally, to ensure comparability, we exclude all private firms from the Amadeus dataset because the Compustat databases only consider public firms. Therefore, by using the Amadeus dataset, the European sample can be divided into domestic and multinational corporate groups (*MULTINATIONAL*, an indicator variable equal to one for all corporate groups with at least one subsidiary operating outside of the parent company's country and zero otherwise).

Fig. 6 (Panel A) plots the mean *ETRs* of domestic and MNCs from 2005 to 2016. We generally find that both domestic and multinational European corporate groups appear to mimic their parent companies' STRs. This is particularly surprising for MNCs, as such firms have subsidiaries in foreign countries with different STRs. More formally, in untabulated regression results, we find that the coefficient on *MULTINATIONAL* is slightly positive (0.02) and significant (t-value: 6.93), indicating that the MNCs during our 12 year sample period show, on average, an even higher *ETR* than do purely domestic firms. This finding contradicts the commonly

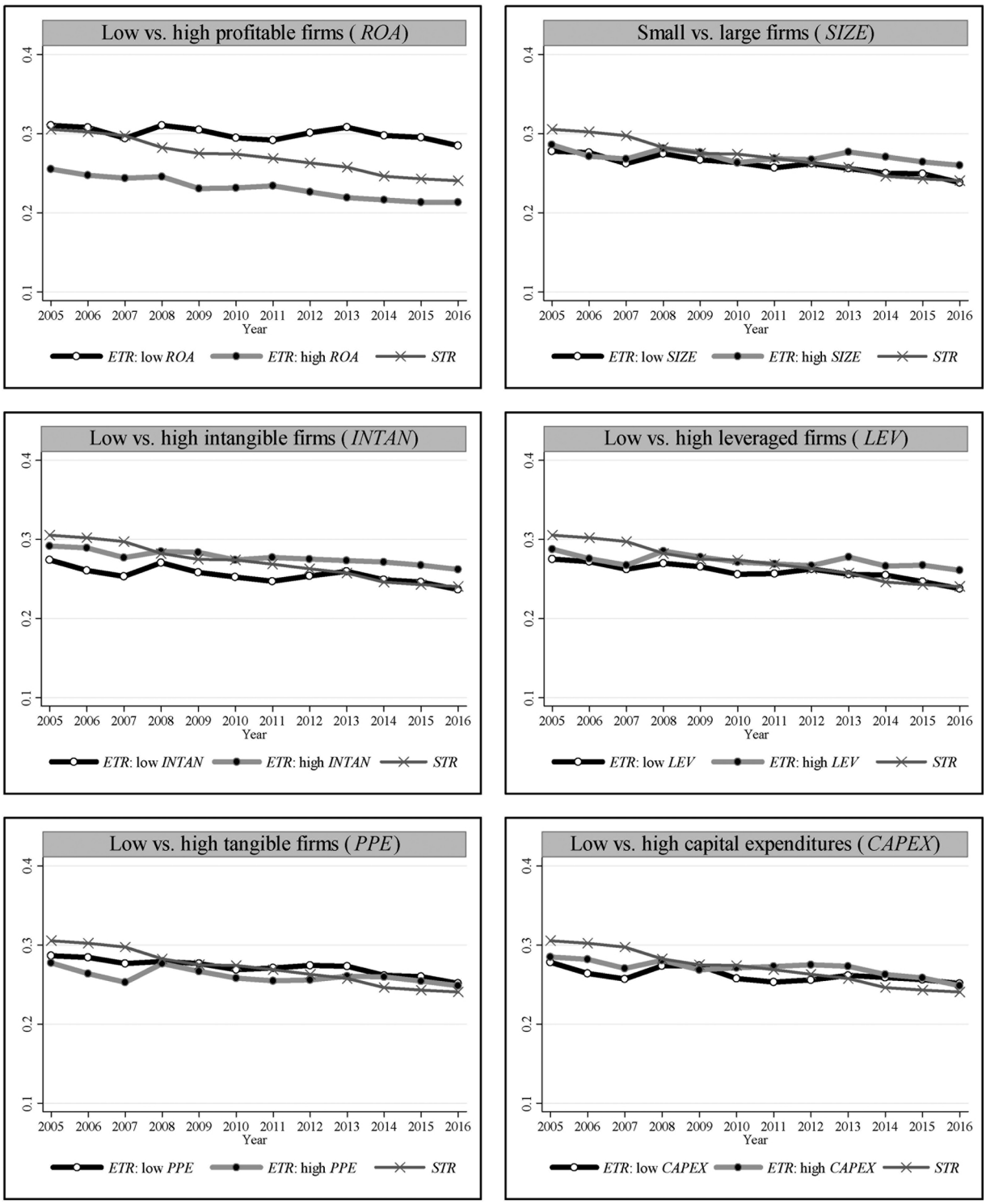

Fig. 5. Synchronic trends of *ETR* and *STR* for EU firms based on different firm characteristics.
Note: For each variable, we split the sample into two subsamples (i.e., median split for each variable).

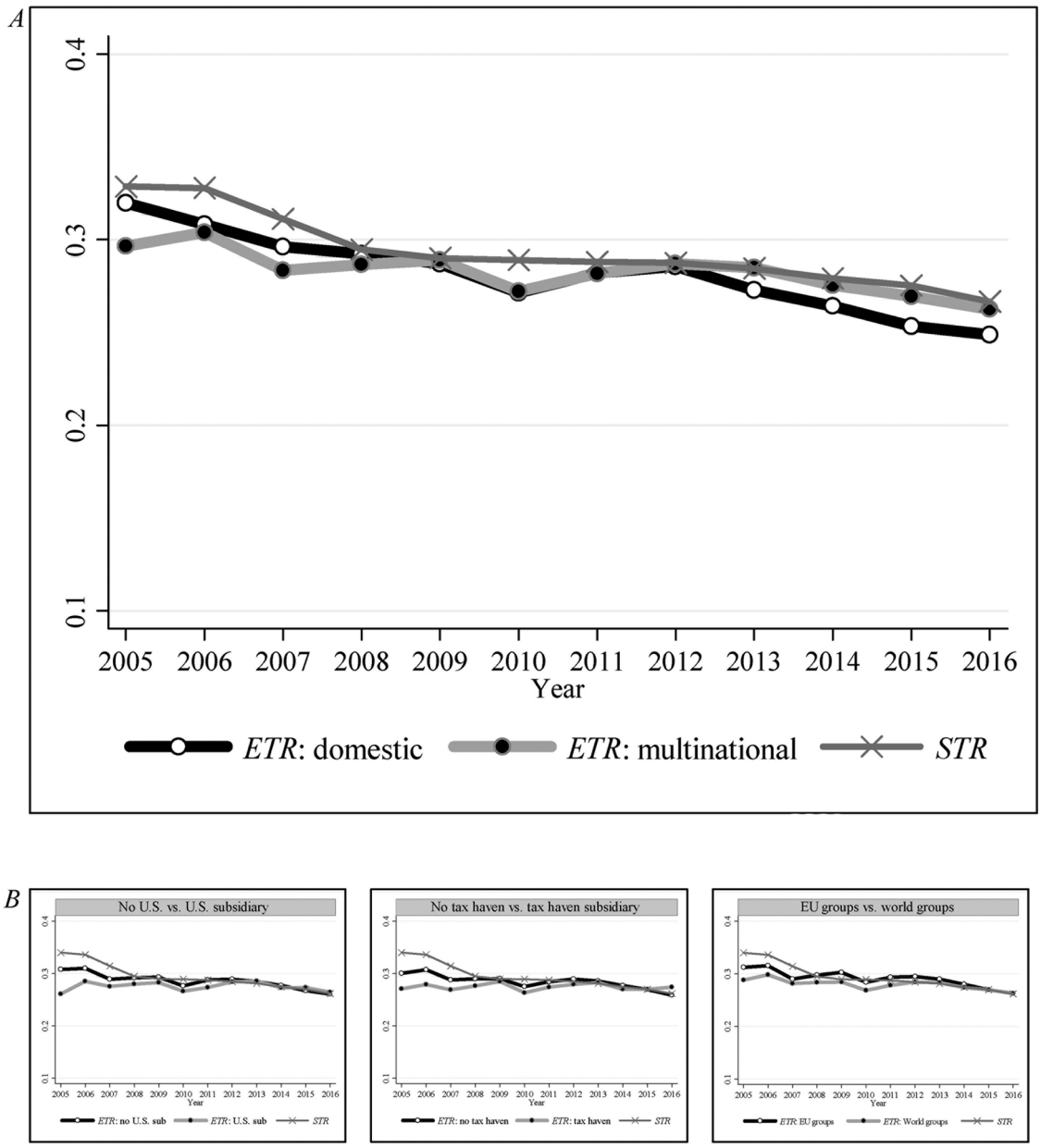

Fig. 6. *Panel A:* Synchronic trends of *ETR* and *STR* for EU domestic and multinational public firms.
Panel B: Within multinational firms: Synchronic trends of *ETR* for different firm characteristics.
Notes: Panel B investigates three different firm characteristics *within* multinational firms in greater detail. The trends of *ETRs* for MNCs (i.e., *MULTINATIONAL* = 1) are analyzed: (1) with and without subsidiaries located in the U.S., (2) with and without tax haven subsidiaries, and (3) EU groups (i.e., all subsidiaries within the EU) and world groups (i.e., at least one subsidiary outside the EU).

held belief that MNCs avoid more taxes than firms that are purely domestic and is in line with Dyreng et al. (2017), who find that the average U.S. MNC has a slightly higher cash *ETR* than the average U.S. domestic firm.

In contrast to domestic firms, MNCs have access to international tax planning opportunities. Therefore, in the next step (Fig. 6, Panel B), we try to explain why MNCs do not seem to avoid more taxes than purely domestic firms. More precisely, we investigate whether the development of the mean multinational *ETR* is different for three firm characteristics. First, we test whether it makes a substantial difference for a MNC to have much of its income taxed in the U.S., which could raise the mean *ETR*. In other words, we investigate whether MNCs with (at least) one subsidiary domiciled in the U.S. (*US_SUBSIDIARY*) exhibit a higher *ETR* compared to MNCs without a U.S. subsidiary. In Table 7(Model 1), the coefficient on *US_SUBSIDIARY* is positive (0.008) and significant (t-value: 1.99), suggesting that MNCs with at least one U.S. subsidiary show higher *ETRs* than MNCs without a U.S. subsidiary. Second, we

Table 7
EU subsample: Regressions of *ETR* on *TIME* within multinational firms.

	(1) *US_SUBSIDIARY*	(2) *TAXHAVEN*	(3) *WORLD_GROUP*
TIME	−0.0023*** (-4.15)	−0.0023*** (-4.17)	−0.0023*** (-4.18)
US_SUBSIDIARY	0.0082** (1.99)		
TAXHAVEN		0.0061 (1.63)	
WORLD_GROUP			−0.0002 (-0.05)
ROA	−0.7326*** (-16.23)	−0.7332*** (-16.33)	−0.7316*** (-16.30)
SIZE	−0.0094*** (-9.53)	−0.0092*** (-8.79)	−0.0088*** (-8.75)
LEV	0.0506*** (5.31)	0.0496*** (5.10)	0.0498*** (5.25)
PPE	0.0017 (0.19)	0.0011 (0.12)	0.0004 (0.04)
INTAN	−0.0030 (-0.29)	−0.0012 (-0.11)	−0.0005 (-0.05)
R&D	−0.0134 (-0.09)	0.0471 (0.35)	0.0775 (0.56)
COMPLEXITY	0.0168*** (3.52)	0.0166*** (3.54)	0.0164*** (3.42)
CFC	0.0123*** (2.91)	0.0130*** (3.13)	0.0131*** (3.08)
STRENGTH_AUDIT	0.0070* (1.72)	0.0075* (1.87)	0.0074* (1.84)
Industry FE N Adj. R^2	YES 24,065 10.9%	YES 24,065 10.8%	YES 24,065 10.8%

Notes: In Table 7, three different firm characteristics (*US_SUBSIDIARY*, *TAXHAVEN*, and *WORLD_GROUP*) *within* multinational firms are analyzed. Because Compustat Global does not provide any information regarding the location of subsidiaries within a corporate group, the Bureau van Dijk Amadeus database is used for this test. It is important to note that we use the same data requirements for the Amadeus dataset as we use for Compustat data (described in Table 1). For reasons of comparability, we also exclude all private firms from the Amadeus dataset because the Compustat databases only include public firms. Table 7 shows an OLS regression of *ETR* on a linear time trend (*TIME*) with firm and country characteristics. Compared to regression (3), the only difference is that *CAPEX* is not included as control variable, as *CAPEX* cannot be calculated when using the Amadeus database. All variables defined in Appendix A. In all three models, standard errors are clustered by firm and year. T-statistics are reported in parentheses below the coefficient estimates. *, **, *** indicate significance at 10 percent, 5 percent, and 1 percent, respectively. Industry fixed effects are included in the estimations, but they are not reported.

analyze whether the use of tax haven subsidiaries (*TAXHAVEN*) is associated with substantially lower mean *ETR*s. However, the coefficient on *TAXHAVEN* (Table 7, Model 2) is insignificant, indicating that the mean *ETRs* of MNCs with or without tax haven subsidiaries do not differ significantly.[17] Third, we investigate whether MNCs with at least one subsidiary outside the EU (i.e., *WORLD_GROUP* = 1) show higher or lower *ETR*s compared to MNCs whose subsidiaries are all located within the EU. However, the development of the mean *ETRs* for world groups and EU groups show only a slight divergence over time (Fig. 6, Panel B); the shapes of the curves are very similar and nearly parallel. Thus, we do not find a significant difference between these two types of multinational groups (Model 3 of Table 7).[18]

Regarding the control variables, consistent with our expectations, we find that MNCs headquartered in countries with relatively

[17] We also find that EU firms use tax havens less than U.S. firms. Regarding U.S. firms, Dyreng and Lindsey (2009) report that about 60% of U.S. firms maintain at least one material operation in a tax haven country. Using the same tax haven definition, we are able to show that less than half of all EU firms (i.e., 48%) maintain at least one tax haven subsidiary.

[18] In untabulated tests, we interact the three explanatory variables (i.e., *US_SUBSIDIARY*, *TAXHAVEN*, and *WORLD_GROUP*) with *TIME*. In all three models, we find negative coefficients on *TIME* and positive coefficients on the interaction terms (e.g., *US_SUBSIDIARY*TIME*). These findings indicate a change in the time trends of some types of firms.

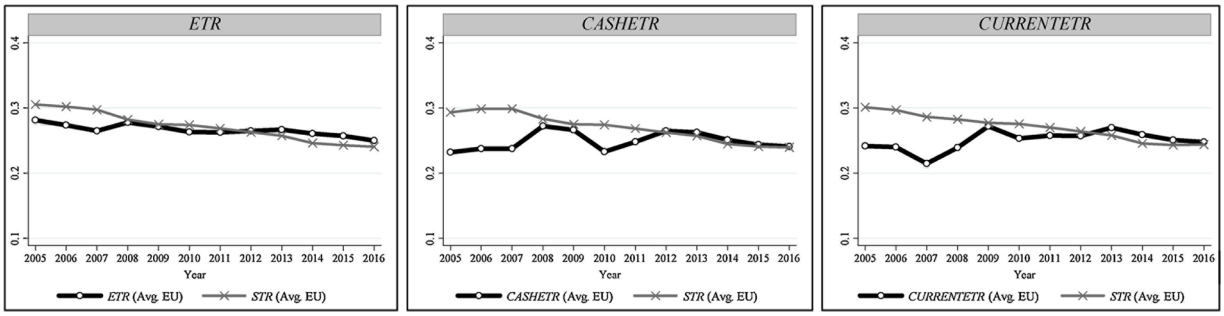

Fig. 7. Comparison of the development of mean EU *ETR*, *CASHETR*, and *CURRENTETR* to the mean statutory tax rate (*STR*) in Europe.

complex tax regulations (*COMPLEXITY* = 1) present, on average, higher *ETRs*. Similarly, our findings suggest that multinationals domiciled in countries with CFC rules (*CFC* = 1) and relatively strong financial auditing and reporting standards (*STRENGTH_AUDIT* = 1) engage in less tax avoidance (i.e., have higher *ETRs*).[19]

4.2. Temporary versus permanent tax planning of European firms

The purpose of our study is to investigate the general indicators and trends of tax avoidance. Therefore, to gain additional insights and to understand the trends of tax avoidance in the EU at its full extent, we extend our analysis by considering two additional measures of tax avoidance. First, we calculate *CASHETR* as the ratio of cash taxes paid **(TXPD)** to pretax book income **(PI)** (e.g., Chen et al., 2010; Graham, Hanlon, Shevlin, & Shroff, 2014). Unlike *ETR*, *CASHETR* uses a cash-based numerator. As a cash-based measure, *CASHETR* is unaffected by changes in tax accounting accruals and reflects tax strategies that defer taxes to future periods (Dyreng et al., 2008); it also more directly measures the actual amount of taxes paid to tax authorities (Hanlon & Heitzman, 2010). Second, based on prior research (e.g., Dyreng & Lindsey, 2009; Markle & Shackelford, 2012; Dyreng et al., 2017), we calculate *CURRENTETR* as the ratio of current income tax expense **(TXC)** to pretax book income **(PI)**. *CURRENTETR* measures the amount of current income tax expense and, in contrast to the abovementioned *ETR,* excludes deferred income tax expense. Thus, *CURRENTETR* reflects tax strategies that defer taxes, while *ETR* does not reflect deferred tax planning strategies (Hanlon & Heitzman, 2010).

Fig. 7 compares trends in the mean *STR* with the mean EU *ETR*, *CASHETR*, and *CURRENTETR*. As noted above (e.g., see Fig. 4), we find synchronic trends between the mean *ETR* and the mean *STR* in Europe. However, this result differs from the findings for *CASHETR* and *CURRENTETR*; on average, the mean *CASHETR* and *CURRENTETR* seem to be lower than the corresponding *STRs*. Both *CASHETR* and *CURRENTETR* differ substantially from the respective *STR*, especially in the earlier years of the European sample period (i.e., 2005 to 2011). For the last five years of the sample period (i.e., 2012–2016), this discrepancy decreases, and both measures are remarkably close to the mean *STR*.

For the EU subsample, we rerun regression equation (3) to analyze whether the observed effects for *ETR* still hold when using *CASHETR* and *CURRENTETR*. We do not find a significant downward trend for either *CASHETR* (Table 8, Model 1) or *CURRENTETR* (Table 8, Model 2).[20] However, the significant negative coefficients on *TIME* shown in Models 3 and 4 indicate that the difference between the *STR* and *CASHETR* (i.e., $DIFF_{(STR\text{-}CASHETR)}$) and the difference between the *STR* and *CURRENTETR* (i.e., $DIFF_{(STR\text{-}CURRENTETR)}$), respectively, decrease over time. These findings are similar to our main findings (Table 4, Panel B, Model 2) and suggest that EU firms may avoid taxes less over time. In untabulated tests, both mean EU *CASHETR* (25.04 percent) and mean EU *CURRENTETR* (25.60 percent) are lower than mean EU *ETR* (26.67 percent) and the *STR*.[21]

It is important to note that *CASHETR* and *CURRENTETR* measure temporary tax planning, whereas *ETR* measures permanent

[19] Also using the Amadeus database, in untabulated results, we are able to show that private MNCs are less associated with tax avoidance than public MNCs are (*PRIVATE* = 0.011, t-value = 4.75). Economically, within the subsample of MNCs, the mean *ETR* of private firms is about 1.1 percent higher than that of public firms. At least two important features of publicly traded firms clearly differentiate them from private firms: the owner-manager (agency) conflict (e.g., Jensen & Meckling, 1976; Villalonga & Amit, 2006) and exposure to capital market pressure (e.g., Desai, 2005; McGuire, Omer et al., 2014, 2014b). Therefore, private firms (with more concentrated ownership) might engage in different levels of tax avoidance than public firms (with more dispersed ownership). Additionally, public firms face different incentives (e.g., equity compensation, bonus schemes) compared to private firms. Based on these aspects and in line with our findings, prior studies find that public firms are more likely than private firms to adopt non-conforming tax strategies (e.g., Cloyd, Pratt, & Stock, 1996; Mills & Newberry, 2001; Badertscher et al., 2013).

[20] In untabulated results, we also gain insight into the U.S. sample of firms. As these results are primarily known from prior research (e.g., Markle & Shackelford, 2012; Dyreng et al., 2017) and as Section 4 focuses on tax avoidance in European firms, the U.S. findings are not discussed in detail. In untabulated results, we find that the time trend for U.S. *CASHETR* (-0.17 percent per year) is significant, negative and similar to the average decline observed in U.S. *ETR* (also -0.17 percent per year). This result is generally in line with the findings of Dyreng et al. (2017). Additionally, we find that U.S. *CURRENTETR* also shows a significant decline over time.

[21] In additional (untabulated) tests, we find that EU firms show significantly lower *CURRENTETR* compared to U.S. firms for our sample period (*EU* = -0.024; t-value: -2.54). Regarding the *CASHETR*, the difference between the average EU and the average U.S. firm is not significant (*EU* = 0.003; t-value: 0.37).

Table 8
EU subsample: Regressions of *CASHETR*, *CURRENTETR*, $DIFF_{(STR\text{-}CASHETR)}$ and $DIFF_{(STR\text{-}CURRENTETR)}$ on *TIME* with firm and country characteristics.

	(1) *CASHETR*	(2) *CURRENTETR*	(3) $DIFF_{(STR\text{-}CASHETR)}$	(4) $DIFF_{(STR\text{-}CURRENTETR)}$
TIME	−0.0010	−0.0003	−0.0061***	−0.0054***
	(-1.03)	(-0.42)	(-4.67)	(-5.04)
ROA	−0.7241***	−0.8320***	0.6584***	0.7599***
	(-10.64)	(-11.66)	(8.96)	(9.82)
SIZE	0.0069***	0.0094***	−0.0027**	−0.0055***
	(5.17)	(7.63)	(-2.23)	(-4.84)
LEV	−0.0357***	−0.0427**	0.0513***	0.0560***
	(-2.67)	(-2.51)	(3.48)	(3.24)
PPE	−0.0594***	−0.0874***	0.0336***	0.0582***
	(-4.58)	(-4.89)	(2.64)	(3.15)
INTAN	0.0083	−0.0308	−0.0293*	0.0076
	(0.55)	(-1.60)	(-1.77)	(0.39)
R&D	−0.0602	−0.0629	0.1032	0.0980*
	(-0.92)	(-1.13)	(1.58)	(1.77)
CAPEX	−0.0080	−0.0059	0.0162**	0.0120**
	(-1.44)	(-1.00)	(2.45)	(2.00)
COMPLEXITY	0.0051	0.0127**	0.0097	0.0060
	(0.96)	(2.18)	(1.22)	(0.97)
CFC	0.0375***	0.0340***	0.0215***	0.0387***
	(7.28)	(6.16)	(3.35)	(7.20)
STRENGTH_AUDIT	−0.0099**	−0.0022	−0.0115	−0.0273***
	(-2.13)	(-0.39)	(-1.40)	(-2.91)
Industry FE	YES	YES	YES	YES
N	18,963	10,131	18,963	10,131
Adj. R^2	8.8%	11.0%	7.7%	9.7%

Notes: In Table 8, we focus on the EU subsample and report the results of an OLS regression of *CASHETR* (Model 1), *CURRENTETR* (Model 2), $DIFF_{(STR\text{-}CASHETR)}$ (Model 3) and $DIFF_{(STR\text{-}CURRENTETR)}$ (Model 4) on a linear time trend (*TIME*) with firm and country characteristics. All variables are defined in Appendix A. In all three models, standard errors are clustered by firm and year. T-statistics are reported in parentheses below the coefficient estimates. *, **, *** indicate significance at 10 percent, 5 percent, and 1 percent, respectively. Industry fixed effects are included in the estimations, but they are not reported.

differences. More precisely, a tax avoidance strategy that defers taxes to future periods results in a decrease in the current income tax expense (e.g., lower *CURRENTETR*) but simultaneously results in an increase in the deferred income tax expense. The *ETR* would remain unchanged in this scenario, as it captures the sum of the current and deferred tax expense in the numerator. Therefore, *ETR*, as a proxy for tax avoidance, only measures permanent differences. In general, aggressive tax planning strategies (e.g., the use of tax havens or income shifting) should result in permanent book-tax differences. For the European sample, we find that *CASHETR* and *CURRENTETR* are, on average, lower than *ETR*; the latter also seems to mimic the average *STR*. This suggests that the average European firm seems more focused on temporary tax planning than on permanent tax planning. In other words, it appears that European firms are not engaging in very aggressive (i.e., permanent) tax planning activities. Additionally, our results suggest that both temporary and permanent tax planning in EU firms may have decreased over time, as the gap between *STR* and *ETR*, *CASHETR*, and *CURRENTETR* has actually diminished over time.

There are at least two potential explanations for this finding. First, tax enforcement (*TAXENFORCEMENT*, calculated as governmental expenditures on executive and legislative organs, financial and fiscal affairs, and external affairs scaled by gross domestic product) may have changed over time within the EU. While we find that governmental expenditures on tax enforcement for our EU dataset do not substantially differ between 2005 (1.92 percent) and 2016 (1.91 percent), we show in Table 9 that firm-years with relatively high *TAXENFORCEMENT* are generally associated with less tax avoidance. This finding is constant across all three models (i.e., *ETR*, *CASHETR*, and *CURRENTETR*).[22]

Second, tax planning can generally be viewed as a description of the efforts undertaken to reduce the amount of money paid to tax authorities. However, undertaking efforts to achieve a certain goal is always associated with costs. Therefore, tax planning can be viewed as a tradeoff in which firms weigh the marginal benefits of tax planning against the marginal costs. Tax planning costs include tax expert compensation, the costs of implementing and monitoring individual tax strategies, the penalties imposed by tax courts, and reputational costs (e.g., Gallemore et al., 2014). Compared to the U.S., the STRs in the EU countries are lower. Thus, engaging in

[22] In untabulated results, we find that the association between $DIFF_{(STR\text{-}CASHETR)}$ ($DIFF_{(STR\text{-}CURRENTETR)}$) and *TAXENFORCEMENT* is significant and negative. The association between $DIFF_{(STR\text{-}ETR)}$ and *TAXENFORCMENT* is insignificant (t-value: -0.73).

Table 9
EU subsample: Regressions of *ETR*, *CASHETR*, and *CURRENTETR* on *TAXENFORCEMENT*.

	(1) *ETR*	(2) *CASHETR*	(3) *CURRENTETR*
TIME	−0.0029*** (-9.27)	−0.0016 (-1.61)	−0.0008 (-1.07)
TAXENFORCEMENT	0.0249*** (3.12)	0.0176** (2.35)	0.0157* (1.89)
ROA	−0.7005*** (-15.11)	−0.7117*** (-10.33)	−0.8078*** (-11.56)
SIZE	0.0020** (2.53)	0.0066*** (5.01)	0.0089*** (6.54)
LEV	−0.0059 (-0.58)	−0.0371*** (-2.78)	−0.0420** (-2.34)
PPE	−0.0415*** (-3.79)	−0.0542*** (-4.12)	−0.0770*** (-4.25)
INTAN	−0.0223** (-2.18)	0.0130 (0.86)	−0.0240 (-1.23)
R&D	−0.0474 (-1.06)	−0.0337 (-0.49)	−0.0533 (-0.78)
CAPEX	−0.0015 (-0.46)	−0.0087 (-1.54)	−0.0061 (-1.02)
COMPLEXITY	0.0096** (2.54)	0.0024 (0.41)	0.0106* (1.80)
CFC	0.0759*** (9.05)	0.0593*** (6.61)	0.0601*** (6.45)
STRENGTH_AUDIT	−0.0009 (-0.21)	−0.0096** (-2.07)	−0.0035 (-0.70)
Industry FE	YES	YES	YES
N	24,167	17,762	9,261
Adj. R^2	12.5%	8.9%	11.0%

Notes: In Table 9, we focus on the EU subsample and report the results of an OLS regression of *ETR* (Model 1), *CASHETR* (Model 2) and *CURRENTETR* (Model 3) on a linear time trend (*TIME*) and *TAXENFORCEMENT* with firm and country characteristics. We must note that the number of observations was reduced for this test (e.g., Model 1: N = 24,167 instead of 25,717). The Eurostat COFOG database provides yearly data on each European country, with Switzerland being the only exception. Therefore, the EU sample is reduced by 1,550 firm-years (Model 1), 1,201 firm-years (Model 2), and 870 firm-years (Model 3). All variables defined in Appendix A. In all three models, standard errors are clustered by firm and year. T-statistics are reported in parentheses below the coefficient estimates. *, **, *** indicate significance at 10 percent, 5 percent, and 1 percent, respectively. Industry fixed effects are included in the estimations, but they are not reported.

aggressive tax planning is less beneficial (i.e., less attractive) for European firms when the abovementioned costs that accompany such planning are considered (e.g., penalties or a damaged reputation).

4.3. Robustness tests

To validate our main findings, we calculate two additional tax avoidance measures. First, we scale the difference between the *STR* and the *ETR* by the *STR*. Second, following Frank et al. (2009), we calculate the annual permanent book-tax difference (BTD) of firm *i* in year *t* scaled by lagged total assets. This measure overcomes the shortcoming of the total BTD because permanent BTDs are rarely suspected of being influenced by accruals manipulation. Researchers typically consider *PermBTD*, a subset of BTD, to be more aggressive because *PermBTD* reduce a firm's tax liability while increasing its financial income (Lisowsky et al., 2013). Frank et al. (2009) note that a limitation of permanent BTDs is that they reflect items that are not considered aggressive tax reporting, such as state income taxes and tax credits (Khurana & Moser, 2013).

In untabulated results, we find that both measures are in line with our main findings. The scaled difference between the *STR* and the *ETR* is much smaller for the average EU firm than for the average U.S. firm. Additionally, the average U.S. firm has higher *PermBTD* compared with the average EU firm. While the amount of *PermBTD* is relatively constant over time for the U.S. sample, the time trend for the EU sample is negative, indicating that the amount of *PermBTD* for European firms decreases over time.

In additional (untabulated) tests, we also scale *ETR* by a number of alternative scalars, including book assets and book equity, rather than pretax income. We can show that our initial results remain more or less economically and statistically unchanged. We also find similar results after setting the *ETR* equal to zero in the case of tax refunds and equal to one when the ETR is greater than one instead of excluding firms with extreme *ETRs* (i.e., 0 and 1). Low *ETRs* can result from either low tax expenses or upward earnings

management, particularly for U.S. MNCs. Therefore, we also use discretionary accruals as a proxy for the degree of earnings management to control for earnings management. We calculate discretionary accruals using the standard Jones model (Jones, 1991). Although the number of observations is reduced (especially in the European subsample), the main results remain unchanged.

Furthermore, we repeat our analyses using different country-level effects. Rather than *COMPLEXITY*, *CFC*, and *STRENGTH_AUDIT,* we consider the indicator variables *EXCHANGE*, *DTA*, and *ECON_FREEDOM*. Nearly 70 percent of the European firm-years participate in the exchange of tax information (*EXCHANGE*), whereas the exchange of tax information is observed over the whole sample period (i.e., 2005–2016) for the U.S.[23] Additionally, for each year from 2005 to 2016, the U.S. had fewer double taxation agreements (*DTA)* than the average of the sample. Overall, economic freedom (*ECON_FREEDOM*) is higher for the U.S. than for the EU. In sum, our main regression results remain economically and statistically similar when using these country characteristics instead of *COMPLEXITY*, *CFC*, and *STRENGTH_AUDIT*.

4.4. Political implications

We investigate the development of firms' tax avoidance behaviors in the U.S. and the EU to draw conclusions regarding the indicators of and trends in international tax avoidance. By investigating trends in the *ETR*, our findings do not imply that U.S. firms avoid more taxes than European firms; on average, U.S. firms show higher *ETR*s than EU firms during our sample period. Additionally, although *ETR*s are declining in the U.S., this decline is slower than that of the average EU *ETR*.

Additionally, when considering the STR via our second measure of tax avoidance ($DIFF_{(STR\text{-}ETR)}$), we find that the differences between the *STR*s and *ETR*s for European corporate groups decrease over time and are remarkably small. More precisely, we find a nearly synchronic development of the average *ETR* and the *STR* in each country, at least for the years since 2009. This finding cannot fully be explained by domestic firms because multinational corporate groups show very similar curves over time. Surprisingly, the consolidated *ETR* of multinational corporate groups is similar to the parent company's STR, especially for European MNCs, which operate in several tax jurisdictions with varying STRs. At least three explanations for why the *ETR*s of MNCs mimic home countries' STRs appear reasonable. First, although MNCs generate and realize most of their sales abroad, most of their profits are taxed in their home countries. Second, a psychological effect could cause MNCs to view their home countries' STRs as a target value and thus attempt to report *ETR*s that are similar to those STRs. Third, the abovementioned cost-benefit tradeoff could make it less beneficial for European firms to engage in aggressive (i.e., permanent) tax planning relative to the potential costs of tax planning.

However, these findings do not imply that European firms do not avoid taxes. While most European firms, on average, do not seem to exhibit aggressive (i.e., permanent) tax avoidance behavior, some European firms have (long-run) *ETR*s of less than 10 percent (e.g., Fig. 3). Thus, while firms in European countries attempt to avoid taxes for several reasons, specific mechanisms appear to counteract these effects. For example, the partially inevitable practice of double taxation when investing abroad and the speed of the European legislative process in closing tax loopholes might restrict firms' opportunities to engage in tax avoidance. We also find that the use of U.S. subsidiaries increases the average *ETR*.

Readers should draw any inferences from this study cautiously for at least two reasons. First, the $DIFF_{(STR\text{-}ETR)}$ measure captures differences between the *STR* and the *ETR*. While a broadening of the tax base and a successive lowering of the tax rate have already been implemented in most European countries, the discussion in the U.S. is ongoing. Until recently, the U.S. had one of the highest STRs among the largest worldwide economies. Thus, the reason for the larger differences between the *STR*s and *ETR*s of U.S. firms relative to EU firms appears straightforward: without such a difference, U.S. firms would face a competitive disadvantage.

Second, as with any empirical study, simplifying assumptions are necessary. We use accounting data and not actual tax returns. Compared to financial statement data, survey and tax data are likely to be far superior. Therefore, our dataset likely leaves out some tax avoidance problems, and our findings should be interpreted with these caveats in mind. Our use of financial statement data represents another limitation because accounting rules vary across countries, especially between U.S. and EU firms (U.S. GAAP versus IFRS). However, we argue that these standards are similar in terms of their objectives to inform capital market participants and to consider and value assets and liabilities.

5. Conclusion

Using data from the U.S. and the EU, we examine systematic changes in tax avoidance over a 12 year period. We assess the widespread belief that firms are increasingly able to reduce their ETRs, and we find a downward trend in the ETRs in nearly all OECD countries included in our sample. Our results show that the mean ETRs of U.S. firms and of firms in large European countries, such as France and Germany, are similar despite their widely differing STRs. Furthermore, we show that the difference between STRs and ETRs is larger for the U.S. than for European countries. Surprisingly, in most European countries, the difference between the STR and the average firm's ETR has declined over time. This finding does not seem to be driven by purely domestic firms because both domestic and multinational European corporate groups apparently mimic their parent companies' STRs. This result is particularly surprising for MNCs, as they maintain subsidiaries in foreign countries with foreign STRs. Therefore, European MNCs do not seem to have advantages over domestic firms with regard to tax planning.

[23] With respect to *EXCHANGE*, two countries (Austria and Switzerland) do not participate in the convention on mutual administrative assistance in tax matters; in four countries, the convention enters into force during our sample period (France in 2005, U.K. in 2008, Spain in 2010, and Germany in 2015).

Policy implications should be drawn from our results with caution. All policy implications are dependent on whether one advocates for tax competition. Any form of tax harmonization can reduce a firm's compliance costs and help raise government revenues. However, strong arguments have also been made that tax competition serves to safeguard a free society by limiting the government's share of the national product. In a competitive world, governments should be free to combine a broad tax base with a moderate tax rate (as in Germany) or to combine tax incentives, such as R&D credits, with a high tax rate (as in the U.S.).

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Appendix A. Definition of Variables

Compustat data item mnemonics are reported in parentheses and are written in all caps and bold font (i.e., **COMPUSTAT**).

Dependent Variables

ETR = total income tax expense (**TXT**) divided by pretax income (**PI**)
$DIFF_{(STR\text{-}ETR)}$ = difference between the *STR* in a country and the *ETR* of firm *i* in year *t*
CASHETR = cash taxes paid (**TXPD**) divided by pretax income (**PI**)
$DIFF_{(STR\text{-}CASHETR)}$ = difference between the *STR* in a country and the *CASHETR* of firm *i* in year *t*
CURRENTETR = current income tax expense (**TXC**) divided by pretax income (**PI**)
$DIFF_{(STR\text{-}CURRENTETR)}$ = difference between the *STR* in a country and the *CURRENTETR* of firm *i* in year *t*
$rel\_DIFF_{(STR\text{-}ETR)}$ = difference between the *STR* in a country and the *ETR* of firm *i* in year *t* scaled by the *STR*
PermBTD = annual permanent book-tax difference of firm *i* in year *t* scaled by lagged total assets **(TA)** and calculated as

$$PermBTD_{i,t} = \frac{PI - (\frac{TXT}{STR})}{Total\ Assets_{t-1}}$$

Test Variables

TIME = the fiscal year for a given firm-year observation minus the number 2005, which is the first year in the dataset. Thus, *TIME* takes on values of 0–11, which correspond to sample years 2005–2016.
EU = dummy variable coded 1 if a company is located in the EU and zero otherwise (i.e., located in the U.S.).
MULTINATIONAL = dummy variable coded 1 if a company has at least one subsidiary outside the parent company's country and zero otherwise. Data are taken from the Bureau van Dijk Amadeus database.
US_SUBSIDIARY = dummy variable coded 1 if a company has at least one subsidiary domiciled in the U.S. and zero otherwise. Data are taken from the Bureau van Dijk Amadeus database.
TAXHAVEN = dummy variable coded 1 if a company has at least one subsidiary domiciled in a tax haven country. Data are taken from the Bureau van Dijk Amadeus database. The categorization (i.e., whether a country is defined as tax haven) is based on the prior literature (e.g., Hines & Rice, 1994; Dharmapala & Hines, 2009).
WORLD_GROUP = dummy variable coded 1 if a company has at least one subsidiary outside the EU and zero otherwise. Data are taken from the Bureau van Dijk Amadeus database.
TAXENFORCEMENT = calculated as the governmental expenditures for executive and legislative organs, financial and fiscal affairs, and external affairs scaled by gross domestic product. Data are taken from the Eurostat COFOG database (General government expenditure by function). Yearly data are provided for each European country, with Switzerland being the only exception (http://ec.europa.eu/eurostat/cache/infographs/cofog/).

Control Variables

ROA = return on assets, i.e., net income (**NI**) divided by total assets (**TA**).

SIZE = natural logarithm of total assets (**TA**). To ensure that our results are not driven by currency changes within a given country (Atwood et al., 2012), we convert all data to Euro (using the year-end currency translation rates) before computing *SIZE*.

LEV = the ratio of long-term debt plus the debt included in current liabilities (**DLC** + **DLTT**) to total assets (**TA**).

PPE = the ratio of current year's net property, plant and equipment (**PPENT**) to total assets (**TA**).

INTAN = the level of intangible assets **(INTAN)** scaled by total assets (**TA**).

R&D = R&D intensity, i.e., the ratio of R&D expenses (**XRD**) in a given year scaled by total assets (**TA**). Missing R&D data are coded as 0.

CAPEX = capital expenditures, i.e., the amount spent on capital assets **(CAPX)** scaled by net property, plant and equipment **(PPENT).**

COMPLEXITY = dummy variable coded 1 if the tax regulations in a country are more complex than the annual average of the sample and zero otherwise. Data are taken from the yearly "Executive Opinion Survey" of the World Economic Forum (2005) to 2016). Respondents to the Executive Opinion Survey are asked every year to identify and rank the five factors that are most problematic to doing business in their country. The score of "Complexity of tax regulations" ranges from 5.1 (the Netherlands in 2012) to 23.4 (Germany in 2008).

CFC = dummy variable coded 1 if a country has established controlled foreign company rules and zero otherwise (for an overview, see Johansson, Skeie, & Sorbe, 2016). Within our sample, five countries (namely, Austria, Belgium, the Netherlands, Poland, and Switzerland) have not implemented CFC rules.

EXCHANGE = dummy variable coded 1 if a country participates in the convention on mutual administrative assistance in tax matters and zero otherwise (for an overview, see OECD: http://www.oecd.org/tax/exchange-of-tax-information/Status_of_convention.pdf). Within our sample, two countries (namely, Austria and Switzerland) do not participate in this convention; in four countries, the convention enters into force during our sample period (France in 2005, the U.K. in 2008, Spain in 2010, and Germany in 2015).

DTA = dummy variable coded 1if the number of double taxation agreements of a country is higher than the annual average of the sample and zero otherwise. Data are taken from the website of the United Nations Conference on Trade and Development (http://unctad.org) up to the year 2011 and the Worldwide Tax Summaries of PwC (2010) to 2016). France and the U.K. have signed more than 100 double tax agreements, respectively.

ECON_FREEDOM = dummy variable coded 1 if the economic freedom of a country is higher than the annual average of the sample and zero otherwise. Data are taken from the website of the global economy (http://www.theglobaleconomy.com/rankings/economic_freedom/). The overall index of economic freedom has ten components grouped into four broad categories: rule of law, limited government, regulatory efficiency, and open markets. The overall economic freedom is scored on a scale of 0 to 100, where 100 represents the maximum freedom.

STRENGTH_AUDIT = dummy variable coded 1 if the financial auditing and reporting standards of a country are stronger than the annual average of the sample and zero otherwise. Data are taken from the yearly "Executive Opinion Survey" of the World Economic Forum (2005) to 2016). Respondents to the Executive Opinion Survey are asked the following question: In your country, how strong are financial auditing and reporting standards? [1 = extremely weak; 7 = extremely strong]. The score of "Strength of auditing and reporting standards" ranges from 4.2 (Poland in 2006) to 6.6 (the U.K. in 2005 and Finland in 2016).

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