The Effects of the Tax Cuts and Jobs Act on the Tax-Competitiveness of Multinational Corporations

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Abstract

We exploit the 2017 US tax reform to learn about the tax-competitiveness of US multinational corporations (MNCs) relative to their international peers. Matching on the propensity score, we compare pairs of similar US and European firms listed on the S&P500 or StoxxEurope600 in a difference-in-differences setting. Our results suggest significantly lower effective tax rates of US MNCs compared to their European competitors after the US tax reform. Additional tests show (i) that US MNCs have gained substantially in what we call tax-competitiveness, (ii) that the reform effect is more pronounced for MNCs with a high share of domestic activity, and (iii) that the tax reform did not change the international tax-planning behavior of US MNCs. We provide evidence that US MNCs already successfully engaged in international tax planning prior to the reform, and this behavior is unchanged after the tax reform.

JEL-Codes: H250, H260, K340.

Keywords: effective tax rate, tax reform, tax-competitiveness, tax avoidance, pair matching, difference-in-differences analysis, profit shifting.

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I. INTRODUCTION

In December 2017, the "Tax Cuts and Jobs Act" (TCJA) changed the US corporate income tax in a fundamental way. One key argument many US policymakers made in favor of this major tax reform was that US firms, compared to their international peers, were at a disadvantage because of the high US tax on corporate income. This prompted the substantial corporate tax rate cut from 35% to 21%. Multinational corporations (MNCs) may be particularly affected by the TCJA because of significant changes in the taxation of foreign income. Most importantly, a territorial tax system (TTS) has been introduced to replace the old worldwide system.[1] At the same time, new anti-tax-avoidance rules aim to limit the tax avoidance and profit-shifting behavior of MNCs.

This paper provides an empirical analysis of the consequences of the TCJA for MNCs. Our study focuses on effective tax expenses, and especially effective tax rates (ETRs) measured at the firm (i.e., group) level. We follow a literature that has analyzed the 'tax-position' or 'tax-competitiveness' of US firms by comparing average tax rates of US firms to non-US benchmark firms (Collins and Shackelford 1995, 2003). A particular goal of our paper is to learn whether the TCJA has indeed improved the tax-competitiveness of US MNCs compared to their direct international competitors.[2] We also analyze how the changes in international taxation have affected the tax avoidance and profit-shifting behavior of US MNCs.

A few previous papers have studied the consequences of the TCJA for US firms. Dyreng, Gaertner, Hoopes, and Vernon (2022) analyze the effect of the TCJA on different ETR measures within US firms. They show for a broad sample of US firms that both domestic and international firms have benefited from the reform, but domestic firms reduced their ETRs to a greater extent

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[1] As for the US tax system in practice, the distinction between worldwide and territorial system has never been completely clear. Prior to the TCJA, US MNCs could avoid worldwide taxation by deferring profit repatriations; the new system still features elements of a worldwide tax system such as the GILTI provisions (see below).

[2] See, for example, Collins and Shackelford (2003, 1995) and Section II for the use of the term *tax-competitiveness*.

than US multinational firms. Garcia-Bernardo, Janský, and Zucman (2022) investigate potential changes in profit-shifting activities of US firms after the TCJA. Their findings suggest that the share of foreign income reported by US firms in tax haven countries remains stable in the aftermath of the tax reform. Our analysis is the first to examine the influence of the TCJA on the tax-competitiveness of US MNCs in comparison to their international peers.

Studies examining the situation before the TCJA suggest that US firms were at a competitive disadvantage compared to their international peers due to the high US corporate tax rate (PriceWaterhouseCoopers 2011; Markle and Shackelford 2012; Overesch, Strueder, and Wamser 2020). Overesch et al. (2020) show, however, that US MNCs were able to largely compensate for this disadvantage through international tax avoidance. Recent papers by Gaertner, Hoopes, and Williams (2020) and Brusco (2021) investigate capital market reactions to the TCJA. Gaertner et al. (2020) find positive returns not only in the US market, suggesting that investors believe that also non-US firms could benefit from the US tax reform. The study by Brusco (2021) suggests that especially profitable firms, and those in concentrated industries, benefited the most from the reform.

To avoid potential confounding effects, we compare similar firms from the US and Europe. The latter group of European firms is chosen in such a way that it constitutes a well-defined benchmark against which we can evaluate the effects of the TCJA in a difference-in-differences setting. We employ a dataset of the largest US MNCs, listed in the *S&P500*, and the largest European firms, listed in the *STOXXEurope600*. Additionally, we use propensity-score matching to compare pairs of similar US and European MNCs. For example, in our matched sample, we compare the US motor company *GM* with German *BMW* or the defense corporation *Lockheed Martin* with the British *BAE Systems*. One goal of this approach is to make sure that matched firms

are ultimately international competitors.

Before running difference-in-differences regressions, we show in unconditional tests that the ETRs of matched treated (US) and control (European) firms move in a parallel way until the implementation of the TCJA – an empirical fact that can be ascribed to our matching approach and the absence of major tax reforms in the periods before the TCJA.

Regression analyses of our matched sample suggest substantial reform effects: the average *GAAP ETR* of US MNCs decreases by about 7.5 percentage points (as a result of the reform). Regarding the competitive position, the average *GAAP ETR* of US MNCs is about 4.2 percentage points lower than that of European MNCs after the TCJA. Our results also apply to the *CURRENT ETR* as an alternative tax measure. We interpret this as evidence that the reform succeeds in improving the tax-competitiveness of US MNCs. The competitive tax advantage corresponds to an average annual tax saving of about $ 24.5 million per US firm (in our sample).

We then focus on the international activities of US MNCs. We particularly investigate how the move away from worldwide taxation and new anti-abuse provisions have affected the international tax avoidance of US MNCs compared to their direct peers. Compared to the findings by Dyreng et al. (2022) for a broader sample of US firms, our results suggest smaller TCJA effects for our sample of large listed firms. While Dyreng et al. (2022) already showed that US international firms benefited less than purely domestic firms, our analysis shows that the TJCA effect also declines with the share of foreign activities – firms with a strong international focus benefit less. Dividing US firms into groups given the distribution of foreign activities allows us to estimate tax pass-through ratios; that is, how much of the 14 percentage points of the US tax cut is reflected in ETRs. The pass-through ratios range from about 0.84 (84%) (for firms with a small share of foreign

business) to only about 0.21 (21%) (for firms with a high share of foreign business).[3]

In additional analyses, we investigate potential effects of the new anti-abuse legislation, called GILTI (Global Intangible Low Tax Income). If a firm is affected by the regulation, it is subject to higher US taxes or can adjust their international tax structures (see e.g. Donohoe, McGill, and Outslay 2019; Clausing 2020).[4] We find some evidence that US MNCs benefit less from the TCJA in terms of a lower ETR if GILTI is likely to be binding.

To learn more about income-shifting behavior before and after the reform, we use additional subsidiary-level data of our matched sample of US and European MNCs. Based on the approach of Hines and Rice (1994), our findings suggest that the TCJA has not changed the profit-shifting behavior of US MNCs. Thus, the results indicate that the combination of abolishing the worldwide tax system (WWTS) and the new GILTI regulation did not change the tax-avoidance behavior of US MNCs. What our estimates do show conclusively, however, is that US MNCs are generally more tax-sensitive in their tax-planning behavior compared to their international peers – both before and after the TCJA. Quantitatively, we estimate a tax semi-elasticity of reported profits, which is about twice as high as that of European firms (and the benchmark estimates provided in earlier contributions).[5]

Our results complement recent findings by Garcia-Bernardo et al. (2022). Their analysis suggests that the share of profits reported by US firms in typical tax haven countries has remained unchanged after the TCJA. Our analysis supports this view to the extent that US MNCs continue to benefit from their profit-shifting activities in mainly non-haven countries. In other words, compared to their European peers, US MNCs still have a competitive advantage in terms of international tax avoidance.

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[3] Note that full pass-through (i.e. 14 percentage points) would correspond to a pass-through ratio of 1 (100%).
[4] Clausing (2020) provides a simulation of GILTI effects, and expects that profit shifting of US MNCs should decline.
[5] For consensus estimates, see Heckemeyer and Overesch (2017), and Beer, Mooij, and Liu (2020).

In addition to an evaluation of the US tax reform, we contribute to (i) the discussion on the tax-competitiveness of US firms, (ii) our understanding of the consequences of the international tax system, and finally to (iii) the controversy about 'aggressive' tax-avoidance behavior of US MNCs. Moreover, our empirical approach can be utilized in future research to evaluate the effects of other tax reforms on the tax-competitive position of MNCs.

The remainder of the paper is organized as follows. In the next section, we present testable hypotheses. In Section III, we describe our data and our research design. We then present the results. We first provide a broad and thorough explorative analysis of our dataset. Thereafter, we estimate reform effects using our difference-in-differences setting. In additional analyses, we address questions of international tax avoidance at the subsidiary level. In Section V, we discuss the effects of the TCJA on the tax-competitiveness of US MNCs. Section VI concludes.

II. CONSEQUENCES OF THE 2017 TAX CUTS AND JOBS ACT

TCJA and Effective Tax Rates of US MNCs

The TCJA was signed into law on December 22nd, 2017. Most provisions of this major tax reform came into force in 2018. One of the main objectives of the TCJA has been to improve the competitiveness of US firms (and many tax experts argued before the reform that the old system put US firms at a disadvantage compared to European ones). US companies should benefit from several elements of the TCJA. Most importantly, the bill features a corporate tax rate cut from 35% to 21% and immediate expensing of certain new capital investments.

The TCJA effect could significantly depend on the degree of a firm's internationalization. One fundamental change, with substantial consequences for the international business activities of US MNCs, is that the WWTS for foreign income was abolished and replaced by a TTS. The distinction between WWTS and TTS and the associated effects are far from clear, though. First, foreign

income was only subject to US taxation if it was repatriated.[6] Several studies suggest that US MNCs had postponed repatriations (see e.g. Desai, Foley, and Hines 2003; Desai, Foley, and Hines 2004; Foley, Hartzell, Titman, and Twite 2007; Azémar 2010). Second, many US firms recognized their foreign income as permanently reinvested earnings, and avoided the disclosure of deferred taxes.

The TCJA also retained elements of a WWTS – in case foreign taxes are fairly low. Effectively, a new rule called GILTI applies if foreign income is subject to a tax level lower than 13.125%. If so, 50% of the foreign income is subject to US taxation if it exceeds a certain return, depending on its qualified business assets. Lyon and McBride (2018) argue that the GILTI regime may at least partly offset the benefits of the new territorial system.

Finally, firms with international activities can now benefit from a special tax regime called FDII (Foreign Derived Intangible Income). Income received by a US firm from sales of goods and services outside the US is then effectively taxed at a lower rate of 13.125%. However, the effective tax expenses of MNCs may also increase if they are subject to another new provision called BEAT (Base Erosion and Anti-Abuse Tax). BEAT aims at limiting the deductibility of intercompany payments to low tax countries. Therefore, the final income tax due is the maximum of the regular tax liability or 5% on the pre-tax income adjusted for international intercompany payments (starting in 2019 with 10% and after 2025 with 12.5%).

In this paper, we analyze in a first step how effective taxes of large US MNCs have been affected by the TCJA. We measure a corporation's tax burden to learn about the TCJA consequences using the *GAAP ETR* that is disclosed in accordance with generally accepted accounting principles in the consolidated financial accounts of each MNC. The *GAAP ETR* is

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[6] However, prior to the TCJA, there were already anti-abuse provisions in place (e.g. Subpart F and Section 956), triggering immediate taxation of certain foreign earnings without actual repatriation.

easily available in the financial reports of MNCs and often referred to in public debate.[7] A particular feature of the *GAAP ETR* is that it is unaffected by tax base rules. For example, in the context of the TCJA, the current tax benefit from the immediate expensing of new capital investment is offset by additional deferred taxes. Alternatively, we therefore consider the *CURRENT ETR* and the *CASH ETR*. These tax measures exclude, by definition, any influence of deferred taxes.

It is well known that many US firms with foreign activities used international tax avoidance schemes to reduce their overall tax burden. Compared to before the reform, we may thus expect that US domestic firms actually benefit more from the TCJA than US MNCs (see also Dyreng et al. 2022, for this argument). The benefits from the significant tax rate cut might be at least partly offset by the new tax provisions for international activities. Moreover, the asymmetric effect of the international tax provisions should rise in the scope of international activities. Therefore, we state our first hypothesis (H1):

> **H1**: *US MNCs with substantial foreign activities benefit relatively less from the US tax reform than US MNCs with smaller foreign activities.*

In additional tests, we also distinguish between ETR measures of purely domestic taxes (*DOMESTIC ETR*) and foreign taxes (*FOREIGN ETR*). The tax-rate cut, expensing of capital investments, and the FDII, should mainly have an effect on the *DOMESTIC ETR*; foreign taxes may be unaffected by the tax reform. Foreign taxes may even increase if international tax avoidance is reduced (see below). We therefore state hypothesis 2 (H2):

> **H2**: *Domestic effective taxes of US MNCs decrease after the TCJA, while foreign effective taxes are unaffected or increase.*

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[7] In the accounting literature, the *GAAP ETR* is defined as the ratio of tax expenses (Compustat variable: txt) to pre-tax income (pi). Pre-tax income is adjusted for extraordinary items (xi).

Tax-Competitiveness Effects of the US Tax Reform

We continue with an analysis of how the reform has affected the competitive position of US MNCs. Studies by Collins and Shackelford (1995, 2003) were the first to investigate what they call 'tax-competitiveness' of US firms by comparing average tax rates of US MNCs to non-US benchmark firms. Higher taxes of US firms compared to their international peers places US MNCs in a competitive disadvantage because taxes are associated with a cash outflow. For example, Donohoe, Jang, and Lisowsky (2022) confirm negative economic effects for competitors that could not benefit from lower taxes.

Many tax experts argue that US MNCs had a global disadvantage before the TCJA. A number of previous studies also provide conditional and unconditional comparisons of ETRs of US MNCs and foreign companies before the TCJA (for example, PriceWaterhouseCoopers 2011; Markle and Shackelford 2012; Avi-Yonah and Lahav 2012; Overesch et al. 2020). Most closely related to our setting is the study by Overesch et al. (2020), suggesting – prior to the TCJA – higher ETRs of US MNCs in terms of the *GAAP ETR*, but lower *CURRENT* and *CASH ETRs* of US MNCs compared to their European peers. The study also reveals that US MNCs could already benefit from increased tax avoidance, while they suffered from the high statutory corporate tax rate of 35% until 2017 (the high statutory tax rate would naturally reflect in ETRs).

Foreign MNCs may also benefit from the TCJA if they are operating in the United States. In particular, to the extent that US subsidiaries and branches of foreign MNCs are subject to the US corporate income tax. Recent research by Gaertner et al. (2020) examines capital market reactions to the TCJA and finds that investors believe that non-US firms could also benefit from the US tax reform.

To explore the question of whether US firms have gained tax-competitiveness through the

TCJA, we move on with a sample of large US MNCs and their European competitors. The latter allows us to define a benchmark against which we can measure the TCJA effect, and thus, learn about the causal consequences thereof (note that in additional tests, we choose the European controls in a way to ensure that these are, most likely, unaffected by the TCJA). Let us state hypothesis 3 (H3):

H3: US MNCs report lower ETRs than their European competitors after the US Tax Reform.

Effects on Foreign Taxes and International Tax Avoidance

Subsidiaries or branches of US MNCs are subject to taxation in their respective host countries. As a consequence, US MNCs could benefit from low tax rates or tax haven countries. We therefore place a particular focus on the international aspects of the TCJA. The most important change in the context of international taxation is the switch from a WWTS to a TTS.

Previous studies suggest that the incentive effects through the new TTS may not be large. This is because US firms already avoided US taxes by deferring or recognizing foreign income as permanently reinvested earnings. Furthermore, international activities are subject to certain rules introduced by the TCJA, in particular the GILTI, BEAT and FDII provisions (see above). In particular, GILTI leads to US taxation if US MNCs are successfully avoiding international taxes, and the effective foreign tax level is low. We therefore test hypothesis 4 (H4):

H4: The TCJA effect on ETRs is smaller for those US MNCs that are probably affected by the new GILTI regime.

An important aspect of international tax avoidance is profit shifting. MNCs use several techniques such as intrafirm interest payments, royalties or transfer pricing, to report taxable profits in low tax locations or even tax havens. While the introduction of the exemption system could incentivize US MNCs to intensify their income shifting, anti-avoidance rules such as GILTI

should limit profit-shifting incentives. A simulation by Clausing (2020) suggests a decline in the profit shifting of US MNCs as a consequence of GILTI. However, an analysis of aggregated country-by-country reporting (CbCR) data by Garcia-Bernardo, Janský, and Tørsløv (2021) rejects the hypothesis that incentives for tax-driven profit allocation are removed. Their findings show that the share of foreign income booked in tax havens by US firms has remained stable between 2015 and 2020. In contrast, a study by Atwood and Johnson (2021) suggests that US MNCs increased their income shifting activities in the first two years after the TCJA.

In additional tests, we utilize *subsidiary-level* data and examine the potential consequences of the TCJA on profit shifting within MNCs. Previous studies examine the relationship between the local tax level and the reported profitability of affiliates (see Hines and Rice 1994; Huizinga and Laeven 2008; Dowd, Landefeld, and Moore 2017). Similar to our previous analysis, we again compare US and European MNCs and state the following hypothesis (H5):

H5: *US MNCs reduce their profit-shifting activities after the TCJA.*

III. DATA AND RESEARCH DESIGN

Data and Explorative Analysis

Our sample consists of firms headquartered in the US or the EU. We consider firms that were either listed in the *S&P500* or the *StoxxEurope600* at least once during the period 2000 to 2020 and with at least one foreign subsidiary. Our base sample consists of 433 US and 754 European multinational firms (see Table 1). We consider consolidated financial data taken from *Compustat* and *Compustat Global*. The main benefit of using consolidated information is the inclusion of all worldwide activities of an MNC, including tax planning in tax havens. These activities are often missing in subsidiary-level datasets (Fuest, Hugger, and Neumeier 2022; Tørsløv, Wier, and Zucman 2022). However, we also consider subsidiary-level and non-consolidated financial

information of these respective multinational groups, taken from the *Amadeus* database.

[Table 1]

For most empirical tests, we use alternative ETR measures as indicators for tax expenses (Hanlon and Slemrod 2009; Dyreng, Hanlon, and Maydew 2010). The computation of ETRs is based on information provided in consolidated financial statements.[8] In our main analysis, we focus on the *GAAP*, *CURRENT* and *CASH ETR* of firms. The *GAAP ETR* is defined as the ratio of tax expenses (Compustat variable: *txt*) and pre-tax income (*pi*).[9] The variable tax expense includes both current and deferred tax expenses. The *GAAP ETR* is easily available in the financial reports of MNCs and often referred to in public debate. A particular feature of the *GAAP ETR* is that it is unaffected by tax base rules because financial accounts consider deferred taxes for temporary differences between financial and taxable profits. Therefore, we also consider the *CURRENT ETR* and the *CASH ETR*. These alternative tax measures exclude, by definition, any influence of deferred taxes. The *CURRENT ETR* excludes deferred taxes from the numerator. The *CURRENT ETR* is defined as the ratio of current taxes (*txt-txdi*) and pre-tax income (*pi*). The *CASH ETR* only takes taxes paid in the current period into account. We define the *CASH ETR* as taxes paid (*txpd*) divided by pre-tax income (*pi*).

We additionally use the *FOREIGN ETR* defined as the ratio of foreign taxes (*txfo*) and foreign income (*pifo*). Foreign taxes and foreign income are only reported for some European MNCs. For the other European MNCs, we follow an approach proposed in Overesch et al. (2020). We obtain domestic taxes and domestic income taken from the *Amadeus* database, and then subtract those

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[8] Note that the consolidated information provided by *Compustat* and *Compustat Global* is based on different accounting standards. European firms normally account for IFRS rules and US firms report in accordance to US-GAAP. We exclude firm-year observations where the ETR is negative or greater than one. Further, we exclude the observation if the numerator or denominator is negative.

[9] We adjust pre-tax income for extraordinary items (*xi*). Missing values in the extraordinary items are replaced by including zeros.

from the overall taxes and income.[10]

In order to obtain some first insights into whether the TCJA changed the ETRs of firms, we simply compare the *GAAP*, *CASH* and *FOREIGN ETRs* for our base sample of US and European MNCs during the period 2012 to 2019. We distinguish between a pre- and a post-reform period, that is, the fiscal years before and after the US tax reform. We include the fiscal years ending between 2012 and November 2017 in the period before the TCJA, and fiscal years ending between December 2018 and 2019 in the period after the TCJA. Former President Donald Trump signed the TCJA on December 22nd, 2017. Firms with a fiscal year ending after December 22nd, 2017, thus had to recognize the changes in law within their annual reports. Consequently, we assume that all fiscal years ending between December 2017 and November 2018 are affected by potential one-time effects, and are therefore excluded from our main analysis.

[Figure 1]

Figure 1 depicts the development of the mean and median *GAAP ETR* for US MNCs over time. We distinguish between three time sections.[11] During the first section, before the TCJA, 2012-2016, the *GAAP ETR* is at a constant level. For the period after the TCJA, 2018-2019, Figure 1 suggests significantly lower ETRs. In 2017, the year the TCJA was enacted, US MNCs experienced a significant increase in the *GAAP ETR*. This effect may be attributed to one-time effects such as the adjustment of deferred tax liabilities.[12] Further adjustments could be related to the introduction of the transition tax, payable over eight years. We therefore generally disregard

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[10] Overesch, Strueder, and Wamser (2020) provides a number of examples and tests regarding whether this approach leads to a plausible and sufficient coverage of firms. For some European MNCs, foreign taxes and foreign income is directly reported in *Compustat*. In this case, we directly use the reported data.

[11] Please note that in Figure 1, the year 2017 is defined as the reporting periods ending between December 2017 and November 2018. Reporting periods ending prior to December 2017 are therefore included in 2016 and periods ending between January and November 2018 are included in 2017.

[12] For example, the cut in the statutory tax rate leads to an adjustment of the deferred tax assets on loss carry forwards. Further, US MNCs without permanent reinvested earnings outside the US prior to the TCJA should experience a decrease in deferred tax liabilities. On the other hand, US MNCs with permanent reinvested earnings should experience an increase in deferred tax liabilities.

the first year after the enactment as a transition period in the empirical analysis.

Figure 2 plots the *GAAP*, *CASH* and *FOREIGN ETRs* for the base sample by period (before the TCJA and afterwards) and group (US and European MNCs). The average *GAAP ETR* of US MNCs is equal to 27.6% (median 28.9%) prior to the TCJA, while the average for European firms is 26.1% (median 24.8%). The distribution of the US *GAAP ETRs* is left-skewed, and consequently there are some US firms with low *GAAP ETRs* but many others which report relatively high ETRs compared to the European MNCs. After the TCJA, the mean *GAAP ETR* of US MNCs is equal to 20.1%, compared to a mean of 25.3% for European MNCs. The (mean) tax differential between the two groups thus amounts to 5.2 percentage points. This explorative analysis suggests that US MNCs faced a significant reduction in their effective tax payments compared to European MNCs.

[Figure 2]

The description of the *CASH ETR* supports this view. Prior to the TCJA, the mean *CASH ETR* of US MNCs is equal to 25.3%, while European MNCs report a mean *CASH ETR* of 27.6%. After the TCJA, our data suggests a significant decrease in terms of the *CASH ETR*. The mean *CASH ETR* is now equal to 21.5% for US MNC (median: 19.3%) compared to 25.9% (23.2%) for European MNCs.

The average *FOREIGN ETR* is 22.9% (median: 21.2%) for US MNCs and 31.4% (median: 28.4%) for European MNCs, prior to the TCJA. After the TCJA, the average *FOREIGN ETRs* amount to 23.4% (median: 21.3%) for US MNCs and 30.1% (median: 26.1%) for European MNCs. This indicates that, while the average *FOREIGN ETR* of US MNCs does not change significantly, the *FOREIGN ETRs* of European MNCs decrease, on average.

Our explorative analysis suggests that, even though the ETRs of European MNCs have declined over time, those of US MNCs fall quite substantially after the TCJA. At this point,

however, note that these unconditional comparisons might be biased due to systematic differences in firm characteristics and firm operations between US and European MNCs.

Therefore, we include several firm characteristics as control variables in the regression analysis below: the return on assets (ROA), size ($SIZE$), R&D expenditures (RD), leverage (LEV) and the share of intangible assets ($INTAN$)[13] (see Appendix A.1 for a detailed variable description). Table 2 provides summary statistics for all firms for the years prior to the TCJA (Panel A), as well as after the TCJA (Panel B). Very broadly, Panel A indicates that US MNCs are, on average, bigger and more profitable than the European MNCs; however, both increase in size after the TCJA. Panels C and D include only the matched sample of similar firms (see below), again reporting the years before and after the TCJA, respectively.

[Table 2]

Empirical Approach

Key to our empirical analysis of the tax reform effects is a comparison of US MNCs and their international peers from Europe. We therefore consider US MNCs listed in the *S&P500* and European firms listed in the *STOXXEurope600*. While this pre-selection already guarantees subsamples of similar US and European firms, we additionally apply matching techniques to generate pairs of very similar firms. More precisely, for each US MNC, we search in our data for the best European match, and require that the two MNCs belong to the same industry and have very similar firm characteristics.[14] Conditional on the matched pairs, we then run panel regressions that additionally control for time-varying firm characteristics.

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[13] *ROA* is defined as the ratio of pre-tax income (*pi*) and total assets (*at*), *SIZE* is the logarithm of total assets, *RD* are the research and development expense (*xrd*) divided by total assets, *LEV* is total debt (*dlc + dltt*) divided by total assets, and *INTAN* is the ratio of intangible assets (*intan*) to total assets.

[14] Earlier findings suggest that differences in ETRs are naturally related to differences in industry membership and firm characteristics (Gupta and Newberry 1997; Plesko 2003; Rego 2003; Richardson and Lanis 2007; Stickney and McGee 1982).

Propensity Score Matching

Let us first introduce an indicator variable US_i, which determines whether firm i is US-based ($US_i = 1$) or Europe-based ($US_i = 0$) during the time period 2012 to 2019.[15] Then, to find pairs of firms, we estimate the probability $\hat{p}_i$ of MNC i being US-based, given a vector of observables. We specify the linear probability index as:

$$US_{i,2016} = \boldsymbol{\beta X}_{i,2016} + \varepsilon_{i,2016} \tag{1}$$

The vector $\boldsymbol{X}_{i,2016}$ in equation (1) indicates several firm-i-specific characteristics. We ultimately estimate (1) using a probit model. The use of the regressors is in accordance with prior literature (Augurzky and Schmidt 2001; Caliendo and Kopeinig 2008) and is based on tax expense determinants. These are firm size ($SIZE_i$), profitability (ROA_i), leverage (LEV_i), intangible assets ($INTAN_i$), and R&D expenses (RD_i).[16] All variables are measured in 2016, the last year before to the US tax reform.

The estimation of equation (1) results in two vectors of propensity scores, $\widehat{\boldsymbol{p}}^{US}$ for all US firms and $\widehat{\boldsymbol{p}}^{EU}$ for all European firms. We then use the estimated propensity scores to find a nearest neighbor for each US firm within the exact same industry.[17] We therefore obtain the best comparable match from the European firms for each US firm. Let ω_i denote a matched European firm m as the best identified match for an US firm i, that is, $\omega_i = \min_{\{m\}}(|\hat{p}_i^{US} - \hat{p}_m^{EU}|), i \neq m$. Put differently, if m is i's nearest neighbor or best match, for each i, ω_i denotes the i-m firm-pair that is the best comparable combination found in the data, based on observables $\boldsymbol{X}_{i,2016}$. In line with the literature (Austin 2011), we further require a difference in propensity scores (caliper) of less than 0.03. This approach generates firm pairs $\{US_i = 1; US_m = 0\}$, where the individual firms are

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[15] Our sample includes only MNCs that do not change the location of their headquarters over the sample period.
[16] *INTAN* and *RD* are set equal to zero for missing data.
[17] We use the *Fama and French* classification of 17 different industry groups.

comparable.[18]

[Table 3]

Aggregate Time Effects of the TCJA

To gain a first purely descriptive understanding of the effects of the TCJA, let us start with estimating the following regression for US and European firms separately:

$$ETR_{it} = \alpha_1 POST_t + \boldsymbol{\rho} \boldsymbol{Z}_{it} + \mu_i + u_{it} \tag{2}$$

The dependent variable is an ETR measure of firm i in year t. The variable of interest is $POST_t$, which equals one if the year of observation is after the TCJA came into force, and zero otherwise.[19] The vector $\boldsymbol{Z}_{it}$ includes different time-varying firm-level characteristics. The coefficient α_1 measures the aggregate effect on the respective ETR after the TCJA, conditional on firm-specific effects (μ_i).

Estimating Conditional ETR Differentials – Difference-in-Differences Setting

Based on a matched sample (see above) of similar US and European MNCs, we next propose the following regression equation:

$$ETR_{it} = \alpha_1 US_i + \alpha_2 POST_t \times US_i + \boldsymbol{\rho} \boldsymbol{Z}_{it} + \theta_t + \omega_i + u_{it} \tag{3}$$

The dependent variable is again the ETR of firm i in year t; α_1 captures the general tax differential between US and European MNCs. Although we consider a matched sample, we still control for the time variation of firm-level characteristics by a vector $\boldsymbol{Z}_{it}$. The coefficient we are most interested in is α_2, measuring the change in the differential after the TCJA, both conditional

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[18] Note that if propensity score matching is used to estimate treatment effects, this is based on two central assumptions. The first assumption is called 'ignorability of treatment'. The second assumption is the so-called balancing property. The latter assumption is testable (see Table 3). Note, however, that we implement a different approach to estimate the TCJA effect. In our analysis, the idea of matching on the propensity score is to make firms more comparable, and it ultimately helps in establishing a common trend (between *treated* and *untreated*). Identification in our difference-in-differences setting rests on the latter.

[19] As discussed before, we exclude the transition year, therefore $POST_t$ equals one if the reporting period ends after November 2018, and equals zero if the reporting period ends before December 2017.

on pair- (ω_i) and year- (θ_t) specific effects. The pair fixed effects (ω_i) ensure that we estimate a potential difference in ETRs within pairs of very similar US and European firms. Note that the coefficient on the interaction $POST_t \times US_i$ is effectively estimated by averaging over firm pairs, and measures the differential response of US MNCs relative to European MNCs.

Subsidiary-Level Data and Profit-Shifting Behavior

In additional tests, we draw on the influential contributions of Hines and Rice (1994) and Huizinga and Laeven (2008) to identify the profit-shifting behavior of MNCs. We therefore resort to a subsidiary-level dataset of the MNCs included in our matched sample. That is, we consider the data of the subsidiaries of each US and EU MNC included in our matched sample. Due to data restrictions, our sample is limited to the respective subsidiaries located in Europe. We estimate the following regression model:

$$ln(profit_{jt}) = \delta_1 US\ SUB_j + \delta_2 POST_t \times US\ SUB_j + \delta_3 STR_{jt} + \delta_4 US\ SUB_j \times STR_{jt}$$

$$+\delta_5 US\ SUB_j \times STR_{jt} \times POST_t + \boldsymbol{\rho W}_{jt} + \theta_t + \omega_i + u_{jt} \qquad (4)$$

Outcomes in (4) are alternative measures of profits, such as the earnings before interest and taxes ($EBIT$) and earnings before taxes (EBT) of subsidiary j. The vector $\boldsymbol{W}_{jt}$ in equation (4) includes subsidiary as well as country characteristics. To capture the main inputs of production, we use $CAPITAL_{jt}$ – defined as fixed assets (*fias*) –, and $LABOR_{jt}$ – calculated as total payroll expenses (*staf*) – as well as $GDP\ PER\ CAPITA_{jt}$ as regressors. Again, the coefficients are conditional on the group-level-pair- (ω_i) and year- (θ_t) fixed effects. The interaction of interest is $US\ SUB_j \times STR_{jt} \times POST_t$. The estimate represents the change in the semi-elasticity of the statutory tax rate STR_{jt} of US MNCs after the TCJA in comparison to European MNCs.

IV. RESULTS

Effects of the US Tax Reform on the ETRs of US MNCs

We begin with a simple test of how the TCJA has affected ETR measures of US MNCs. We consider our sample of US firms as described in Section III and run regressions following equation (2). The regression results are presented in Table 4. In columns (1) – (2), we consider the *GAAP ETR* as the dependent variable, in columns (3) – (4) the *CURRENT ETR,* and in (5) – (6) the *CASH ETR.*[20] The variable *POST* indicates whether a fiscal year falls into the period post TCJA ($POST = 1$), or before TCJA was enacted ($POST = 0$).[21]

[Table 4]

The effect of the *POST* variable is negative across all specifications. These findings suggest significantly lower ETRs of US MNCs after the tax reform. Column (2) shows that the *GAAP ETR* of US firms decreased by 7.5 percentage points. Note, though, that our goal here is simply to document the variation in our data – findings are conditional on some firm-level controls, but we cannot distinguish this effect from an aggregate time shock.

What we can learn from Table 4, however, is that the substantial 14 percentage points US tax cut is not fully reflected in the ETRs of MNCs. One explanation for this finding may be that part of the MNCs' income is associated with international business activities, and foreign income is primarily subject to foreign taxes. US MNCs with a large share of foreign income could therefore benefit less from the US tax reform, and mainly from the cut in the corporate tax rate at home. Our data allows us to make a distinction between domestic and foreign tax rates for US MNCs. The *DOMESTIC ETR* is defined as domestic income taxes divided by domestic income, and the

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[20] In additional robustness checks for Tables 4 to 10, we (i) keep the sample size fixed and we (ii) include a linear time trend. The results (not tabulated) confirm our findings and document that the statistical significance is not sensitive to a linear time trend and in general not to variation in sample size. However, in Table 8 we find a lower TCJA effect on the CURRENT ETR.

[21] We exclude the transition year 2017.

FOREIGN ETR as foreign income taxes divided by foreign income.[22] We consider these ETR measures – distinguishing between domestic and foreign taxes – as dependent variables in Table 5.

[Table 5]

In column (1), the dependent variable is the *DOMESTIC GAAP ETR*, and in column (2) the *DOMESTIC CURRENT ETR*.[23] The estimated coefficients on *POST* indicate that both ETR measures are significantly lower after the TCJA. The magnitudes come relatively close to the 14 percentage points cut in the US statutory corporate tax rate. While the *DOMESTIC GAAP ETR* only recognizes permanent tax differences such as the tax rate cut, the *DOMESTIC CURRENT ETR* also reflects temporary differences in the immediate expensing of new investment. The results are of similar magnitude for both measures. This finding supports the view that the tax rate cut explains most of the reduction in the ETRs of US MNCs.

In column (3), the dependent variable is the *FOREIGN ETR*. The estimate suggests no significant difference in the *FOREIGN ETR*, post-TCJA. The foreign taxes of US MNCs basically remain at the same level as prior to the TCJA. The result is still somehow surprising as the US international tax system has changed significantly with the TCJA. We will come back to this issue in the following subsections.

The results of Table 5 support Hypothesis *H2* – that the domestic taxes of US MNCs decrease after the TCJA, while foreign taxes are, to a large extent, unaffected. Even if these estimates are not measured relative to an appropriate control group, they seem to provide first insights that the variation in US ETRs actually reflects the changes associated with the US tax reform, and not just some aggregate time shock.

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[22] See Appendix A.1, for details on the calculation of these measures.
[23] The *DOMESTIC GAAP ETR* includes deferred and current domestic taxes (similar to the *GAAP ETR*), and the *DOMESTIC CURRENT ETR* includes only current domestic taxes (similar to the *CURRENT ETR*).

Effects of the US Tax Reform on European Competitors of US MNCs

This subsection focuses on the international competitors of US MNCs – European firms. The goal is to provide some insight into whether the TCJA affects European firms (knowing this will ultimately help us to better construct a valid control group for the analysis below). We start with a brief replication of Table 4, but now consider only the European firms.

[Table 6]

Table 6 presents the respective regression results. The variable of interest is again the indicator variable $POST$. Across specifications (1) to (4), the results in Table 6 suggest that the TCJA may have affected the European MNCs as well because some of their business is located in the US. While statistically significant, the estimated effect on $POST$ is small.

Comparison of US MNCs and their European Competitors

Our analysis above provides some initial indications that the TCJA has affected US MNCs, and also, to some extent, European MNCs. In the following, we will investigate how the competitive tax-position of US MNCs – relative to their peers in Europe – has been changed by the TCJA. We thus compare a matched sample of US MNCs and their counterparts in Europe that are from the same industry, and similar in several firm characteristics (as described in Section III).

Identification in our difference-in-differences setting requires a parallel trend in ETRs between control and treatment units. Using the mean values of the *GAAP ETR* over time, separately for *treated firms* (US MNCs) and *control firms* (European MNCs), Figure 3 suggests that the assumption of a parallel trend holds. In fact, in the periods prior to the TCJA, 2012 until November 2017, US and European MNCs move in a fairly parallel way.[24] Note that while Figure 3 is based on our matched sample, it depicts an unconditional comparison of means.

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[24] Please note that we exclude the transition year.

[Figure 3]

The regression analysis then also conditions on firm-specific, time-varying controls. The regression results are presented in Table 7. In columns (1) – (2), we consider the *GAAP ETR* as the dependent variable, in columns (3) – (4) the *CURRENT ETR*, and in (5) – (6) the *CASH ETR*. While columns (1), (3) and (5) include only year and pair fixed effects, all other columns include also the set of firm characteristics.[25]

[Table 7]

Using this set up, our identification approach rests on the notion that a firm pair moves in a parallel way until the TCJA. Given pair-fixed effects, the coefficient on the indicator variable *US* reflects an average level effect that can be attributed to US MNCs (i.e., identification is based on *within-pair* variation). The additional TCJA effect is then measured by the estimated coefficient on $POST_t \times US_i$.

The results for the indicator *US* in columns (1) to (4) suggest that prior to the US tax reform, US MNCs report significantly *higher GAAP ETRs* and *CURRENT ETRs* compared to their European peers. In terms of the *CASH ETR*, we find no or only slightly significant tax differentials between US firms and their European counterparts (see discussion below). The coefficient on *US* in column (2) suggests that the average *GAAP ETR* of US MNCs is about 2.5 percentage points higher than European ones – prior to the TCJA. The result of a somewhat higher *GAAP ETR* of US MNCs compared to European firms confirms previous findings (Overesch et al. 2020).

The interaction term $US \times POST$ is negative and statistically significant for all specifications. The estimates on $US \times POST$ in columns (1) and (2) suggest that the tax differential in terms of the *GAAP ETR* is about 6.7 percentage points lower in the post TCJA periods. Similar magnitudes

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[25] Both firms of a pair operate within the same industry, i.e. pair fixed effects also nest industry fixed effects.

are found for the *CURRENT ETR* in columns (3) and (4). Considering the tax rate differentials prior to the tax reform, our results suggest that US MNCs have a competitive advantage of about 3 to 4 percentage points in terms of their *GAAP ETRs* (or *CURRENT ETRs*) compared to their European peers.[26] This corresponds to a competitive tax advantage of about $24.5 million less annual taxes per US firm after the TCJA was enacted.[27] Hence, we can confirm *H3*.

In terms of the *CASH ETRs* we also find a competitive advantage of about 3 percentage points after the TCJA. This finding should be interpreted carefully, however. Cash taxes are more volatile, and we consider only a relatively short time period after the TCJA. Although we excluded the transition year 2017, cash taxes might be more affected by one-time or at least short-term effects – for example, by the transition tax.

We carry out a great number of additional tests (see Table A.2 in the appendix) that all confirm the robustness of our main findings in Table 7. We consider different types of fixed effects, alternative matching procedures, and also regressions based on our base sample of all *S&P 500* and *StoxxEurope600* firms without matching.

We are well aware of the fact that, in our difference-in-differences setting, it is not ideal to include all European firms (the *control group*) in our sample. While we believe that the findings in Table 7 are very relevant (given the research question on tax-competitiveness), identifying the "true" TCJA effect on the ETRs of US firms requires that the control group is completely unaffected by the TCJA. Unfortunately, we lack the data to precisely isolate US taxes and US income of European firms. But a subgroup of European firms should be unaffected by the US tax reform because they do not have any substantial business in the US. We use information disclosed in geographical segment reports taken from the *Refinitiv Eikon* database as an approximation for

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[26] The findings are in accordance with the summary statistics presented in Table 2 (Panels C and D) and indicate an average annual tax saving of 28.6% in tax expenses measured by the *GAAP ETR* for US MNCs.

[27] Average tax expenditures of MNCs multiplied by the competitive tax advantage ($612.825 million × 0.04).

the US activities of a European firm.[28]

In Table 8, we use the same setting as in Table 7, but include only pairs for which the European MNCs do not report revenues or fixed assets in the US.[29] The point estimates for the TCJA effect are, to a certain extent, greater in absolute values. For example, column (1) suggests a competitive advantage of about 7.5 percentage points in terms of the *GAAP ETRs* of US MNCs compared to their European peers in the period after the TCJA.

[Table 8]

The findings suggest that our estimates in Table 7 suffer from a small downward bias. Since we are mainly interested in tax reform effects on the tax-competitiveness of US MNCs, we return to the larger sample, including all European peers. However, the small downward bias needs to be considered in the further analysis.

Foreign Activity and Tax-Competitiveness of US MNCs

Our results presented in Table 5 suggest a larger effect of the TJCA on the *DOMESTIC ETRs* of US MNCs. In Table 9 we consider our matched sample but distinguish between US MNCs with a high share of foreign income – measured as share of foreign income in total earnings – by defining the two binary variables, $HIGHFORACT$ and $LOWFORACT$, indicating those US MNCs above and below the median of the foreign income share, respectively.

[Table 9]

The coefficients on $LOWFORACT$ and $HIGHFORACT$ measure the general difference in the tax differentials between US MNCs with either a low ($LOWFORACT = 1$) or a high

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[28] We should note that the reporting of the geographical data is not fully consistent across all reports. Sometimes firms do not report at the country level, but on a regional or continental level, e.g. North America or the EMEA region. We assume US activities where the MNC reports fixed assets in the US or in (North) America.
[29] Further, we exclude pairs for which no data is available for European MNCs in the *Refinitiv Eikon* database.

($HIGHFORACT = 1$) foreign income, compared to their respective European peers.[30] The results suggest that US MNCs with a lower share of foreign income had significantly higher ETRs compared to European competitors before the reform. Prior to the tax reform, the US corporate tax rate was ranked among the highest corporate tax rates worldwide. Consequently, US firms with a low share of foreign activities suffered from the unfavorable domestic tax rate. US MNCs with a high share of foreign income could benefit more from lower foreign tax rates.

The treatment indicator $LOWFORACT \times POST$, capturing those US MNCs with a low share of foreign income, suggests a significant drop in the tax differentials of US MNCs after the reform and relative to their European competitors. If the share of foreign income is high ($HIGHFORACT \times POST$), then the reform effect is smaller in terms of the *GAAP ETR* and *CURRENT ETR*.

Figure 4 presents point estimates and confidence intervals for the TCJA effect on the *GAAP ETR* for different quintiles of our measure for foreign activities (ratio of foreign to total income). It supports the view that those firms with a low share of foreign income benefit most from the TCJA. In other words, the 14 percentage point tax cut seems to be almost fully reflected in the ETRs of US MNC if the main part of their income is subject to domestic US taxation. The estimates presented in Figure 4 allow us to calculate statutory tax pass-through ratios. For example, about 84% of the tax cut is reflected in the ETRs of firms with the lowest share of foreign income (estimated coefficient/tax cut = 0.118/0.14). The pass-through ratio corresponds to about 0.55 for those firms that are located in the middle of the foreign income distribution. The firms with the highest share of foreign income benefit least, as only about three of the 14 percentage points tax cut shows up in their ETRs. This corresponds to a pass-through ratio of about 0.21.

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[30] Please note that our data allow us to define the variables $HIGHFORACT$ and $LOWFORACT$ only for US MNCs. This is sufficient to address our research question, however.

[Figure 4]

Effects of GILTI on the Tax-Competitiveness of US MNCs

The TCJA includes several important changes in the taxation of international activities of US MNCs. How these changes affect ETRs is unclear, and depends on a number of things. For example, the abolishment of the WWTS could incentivize more international tax avoidance because foreign tax savings are no longer offset by US taxes upon repatriation. Our findings, so far, suggest that US MNCs with a high share of foreign activities benefit less from the TCJA. Moreover, the *FOREIGN ETRs* of US MNCs remain relatively unchanged after the TCJA. One explanation for the results may relate to the introduction of GILTI. The new GILTI regime leads to the additional US taxation of foreign income if effective foreign taxes are low.

Unfortunately, the identification of subsidiaries and foreign income subject to GILTI is rather difficult, beside the general problem that firms might adjust unobserved tax avoidance margins or tax haven operations to avoid GILTI treatment. In the following, to be specific, we make use of the fact that MNCs with a low *FOREIGN ETR* prior to the TCJA are most likely affected by the new GILTI regime – either by direct treatment or because these firms are most likely the ones that adjust at unobserved margins to avoid treatment. We therefore construct a dummy variable *GILTI*, that is one for all US MNCs with a *FOREIGN ETR* below the sample median of 22.8% during the period 2012 to 2016 (the period before the TCJA).[31]

In Table 10, we replicate our main analysis and use the matched sample from Table 7 but consider the additional interaction terms $US \times GILTI$ and $US \times POST \times GILTI$. An effect of the former term indicates a difference between US MNCs, depending on the level of their foreign taxes prior to the TCJA, while the effect of the latter measures any difference in the response to

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[31] In additional tests, we also use the GILTI threshold of 13.125%. The untabulated results are in line with the results presented.

the TCJA under potential GILTI treatment.

[Table 10]

In columns (1) – (3), the dependent variables are our standard ETR measures. Let us briefly go through the results. First, the estimates on US confirm the higher ETRs of US MNCs compared to European competitors prior to the TCJA. Second, the ETRs of those US MNCs that reported below median *FOREIGN ETRs*, that is, the coefficient on $US \times GILTI$, are significantly lower, as we would expect. Third, the treatment effect depends on GILTI. Compared to Table 7, estimates in columns (1) – (3) of Table 10 suggest larger TCJA effects in absolute values for US MNCs that are unaffected by GILTI. The positive and significant coefficients for the triple interactions ($US \times POST \times GILTI$) in columns (2) and (3) suggest that the reform effect is smaller if the MNC is (probably) GILTI treated.

In columns (4) – (5), the dependent variable is the *FOREIGN ETR*. Prior to the reform, the foreign taxes of US MNCs were significantly lower compared to their European peers, of course mainly for US firms with low *FOREIGN ETRs* (by construction). The aggregate effect of the TCJA in column (4) is insignificant. If, however, we distinguish between a potential GILTI treatment, our estimates in column (5) suggest a negative effect of $US \times POST$. The negative effect is fully offset for the US firms that are likely to be subject to GILTI. We may conclude that our findings support the view that abolishing the WWTS is associated with some additional avoidance of foreign taxes (estimate on $US \times POST$). However, if GILTI treatment is likely, foreign taxes increase.

TCJA Effect on Profit Shifting

Finally, we investigate whether the TCJA affects the international profit shifting of US MNCs, and will now resort to *subsidiary-level data*. Our goal is to better understand how intrafirm tax

planning and tax avoidance activities are affected by the TCJA.

We consider only subsidiaries that belong to the MNCs included in our matched sample of US and European MNCs used before. Due to data restrictions, we focus on subsidiaries in Europe.[32] We use the *Amadeus* database to obtain information on ownership relationships and non-consolidated accounting data at the level of European subsidiaries.[33] That is, we consider the European subsidiaries of our large US and European MNCs in our previously matched sample.

We generally follow the approach as described in Section III using equation (4). Regression results are presented in Table 11. In our base regressions in columns (1) – (3), the dependent variable is $EBIT$. In all regressions, we condition on pair- and year-fixed effects. To capture the main inputs of production, we use $CAPITAL$ (defined as fixed assets in logs), and $LABOR$ (total payroll expenses in logs) as well as $GDP\ PER\ CAPITA$ as regressors. The sum of the coefficients on $LABOR$ and $CAPITAL$ is about 0.75, which may be interpreted as decreasing returns to scale (see Huizinga and Laeven 2008).

[Table 11]

The variable we are mostly interested in is the local statutory tax rate (STR) of the respective host country. The coefficient on STR reflects the tax semi-elasticity of the reported profits of a subsidiary. We find negative estimates on STR across all specifications. This finding is usually interpreted as evidence of profit shifting. The estimate in column (1) suggests that the reported $EBIT$ of a subsidiary is about 1.4 percent smaller if the local tax rate is one percentage point higher.

We then define the dummy variable $US\ SUB$, indicating whether an observation is a subsidiary

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[32] International subsidiary-level data is only available to a limited extent. While the *Orbis* dataset records worldwide firm activities, it only includes insufficient data for the US MNCs in our sample. We therefore use the *Amadeus* database and focus on European subsidiaries.

[33] We include a subsidiary if at least 50 percent of the shares are held by an MNC in our sample. Where an MNC has several subsidiaries in one country, the relevant variables are aggregated at the country level. The sample is restricted to subsidiaries only, i.e. we exclude the parent companies from our sample.

of an US MNC ($US\ SUB = 1$), and the interaction $US\ SUB \times POST$. In Specification (2), we also include the interactions $STR \times US\ SUB$ and $STR \times US\ SUB \times POST$. Estimates for these interaction terms reflect differences in the tax semi-elasticities of reported profits for subsidiaries of US firms, compared to European firms. The coefficient on the first interaction (-0.917) suggests that subsidiaries of US MNCs are significantly more tax responsive than those of European MNCs. The insignificant coefficient on the triple interaction indicates that US firms have, however, not become less (or more) responsive after the TCJA.

In column (3), we further distinguish between US subsidiaries belonging to US MNCs being affected by GILTI and subsidiaries of US MNCs unaffected by GILTI (based on the definition of the $GILTI$ variable above). Our results suggest a higher tax semi-elasticity only for those US subsidiaries that belong to US MNCs with a low $FOREIGN\ ETR$. Although, these are the MNCs that are probably affected by GILTI, we cannot find a significant change in the tax semi-elasticities post TCJA. Consequently, our results do not support the view that GILTI changed the income-shifting behavior of US subsidiaries.

In columns (4) and (5) of Table 11, we consider a subsidiary's EBT as the dependent variable. While EBIT does not, by definition, include shifting opportunities associated with inter-company financing, the estimated semi-elasticity on EBT reflects a overall profit shifting responsiveness. The results in columns (4) and (5) support the previous findings, and confirm that US MNCs are more tax sensitive. Again, the TCJA has not changed this pattern.

The results in Table 11 confirm that the foreign subsidiaries of US MNCs have always been responsive to tax incentives, even under the WWTS, before the TCJA. Overall, we may interpret the results as the more successful profit shifting of US MNCs, compared to their European peers – prior to as well as after the TCJA. TCJA has not changed the tax-avoidance behavior of US

MNCs, conditional on their European peers. Compared to their European peers, US MNCs achieve a competitive advantage in terms of international tax avoidance. We therefore reject *H5*.

While the new TTS does not incentivize US MNCs to more aggressively exploit profit shifting opportunities, we cannot confirm that GILTI prevents income shifting. There could be several reasons for this. The subsidiaries for which we have financial data in *Amadeus* mainly cover operative business in high-tax countries. Conduit entities and tax-haven subsidiaries are often not included in *Amadeus/Orbis* data.[34] Clausing (2020) only expects moderate GILTI effects in high-tax countries but significant effects in tax havens.

Our analysis therefore allows the analysis of tax avoidance through profit shifting at locations of subsidiaries with mainly operative business. However, our results are also consistent with the recent study by Garcia-Bernardo et al. (2021). The study focus on the locations towards which profits are shifted and also finds no evidence of significant changes in the tax haven operations of US MNCs post-TCJA. Both perspectives contribute to a better understanding of profit-shifting behavior before and after the major US tax reform. On the other hand, Atwood and Johnson (2021) suggest an increase in the income shifting of US MNCs in the first two years after the TCJA. Contrary, their study uses consolidated data, while our approach recognizes financial data from operative subsidiaries.

V. TCJA EFFECTS ON THE TAX-COMPETITIVENESS OF US MNCS

Equipped with our results, we can discuss how the TCJA has changed the tax-position or tax-competitiveness of US MNCs compared to their European competitors. Figure 5 provides an overview of the relative tax-position of US MNCs in terms of our three ETR measures, based on

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[34] For a comparison between publicly available data, such as *Orbis* or *Amadeus*, and *country-by-country reporting* data, see Fuest, Hugger, and Neumeier (2022). Tørsløv, Wier, and Zucman (2022) also suggest that subsidiary-level data is not well-suited to be used for aggregation exercises, in this context.

the regression results in Tables 7, 9 and 10. In the figure, a cross indicates the ETR difference between US and European MNCs prior to the TCJA. Dots depict the ETR difference after the TCJA (the sum of the two coefficients on *US* and $US \times POST$). Positive values indicate a competitive disadvantage of US MNCs due to the higher ETRs of US firms compared to their European competitors. Negative values suggest an advantage of US firms.

[Figure 5]

The pattern in Figure 5 is clear. US MNCs had a relative disadvantage mainly in terms of higher *GAAP ETRs* and *CURRENT ETRs* before the TCJA. The tax-competitiveness of US firms has significantly improved. After the TCJA, the *GAAP ETRs* of US MNCs are approximately 4.2 percentage points lower than the ETRs of their European competitors. The results for the *CURRENT ETR* suggest similar effects. US MNCs with a low share of foreign activity or a low level of international tax avoidance experience the greatest improvement in their tax-competitiveness. Only US MNCs that have already reported low foreign tax rates (i.e. probably affected by GILTI) show a decline in their competitive tax-position.

Even though the main focus of our study is on the 2017 tax reform, our results may be interpreted in light of tax policy proposals such as the Biden administration's 'American Jobs Plan'. The proposal has included, for example, a higher statutory tax rate of 28%, which would undo half of the TCJA's tax cut. Disregarding other effects and presuming a similar sensitivity, we can use our results to make predictions about the potential effects of an increase in the statutory tax burden. First, the average *GAAP ETR* of US MNCs would increase by approximately 3.7 percentage points. Second, compared to European MNCs, the benefit of the TCJA would decrease by about 3.4 percentage points. Third, the average advantage in terms of the *GAAP ETR* would shrink to approximately 0.6 percentage points. The average advantage in terms of the *CURRENT*

ETR would vanish. However, increasing the *STR* would of course lead to heterogeneous effects, depending on firm characteristics, and particularly the extent to which a firm is exposed to the higher tax burden.

Additional effects on the tax-competitiveness of US MNCs might be associated with more international tax regulation or the introduction of the corporate minimum tax of 15% for certain corporations under the 'Inflation Reduction Act' of August 7th, 2022. The approach presented in this study could also be used to evaluate potential reform effects on the tax position of US MNCs.

VI. CONCLUSION

The 2017 US tax reform has changed the US tax system in a fundamental way. We add to studies evaluating the consequences of the TCJA by comparing ETRs of US MNCs to their international peers. One of the main objectives of the reform has been to improve the tax-competitiveness of US MNCs. Our estimation approach is based on a comparison of US MNCs and their European peers in a counterfactual framework.

The results support the view that US MNCs benefited substantially from the TCJA in terms of lower total ETRs. The mean FOREIGN ETR, however, remains almost unchanged. US MNCs with low foreign activities benefited most from the tax reform compared to MNCs with high foreign activities. While the latter have lower initial tax levels, the pass-through ratios for the former are about 84% (given the 14 percentage points tax cut).

A central goal of the TCJA was to strengthen the tax-competitiveness of US MNCs against their global competitors. This clearly has been achieved through the substantial tax cut. While ETRs at the MNC level seem to be the best measures to study tax-competitiveness, they can also be analyzed to study behavioral responses to tax reforms – as they reflect international profit-shifting activities, for example. Earlier studies suggest that US MNCs were avoiding taxes and

shifting profits before the TCJA. Abolishing the WWTS may incentivize them to become even more aggressive in this behavior. At the same time, the new GILTI rules have been introduced to reverse these incentives. Consistent with this, our findings show that firms benefit most from the TCJA if the GILTI regulation is most probably not binding. However, it is for future research to investigate whether the effects are permanent.

In additional tests, we also consider subsidiary-level data of our matched sample of MNCs. The results suggest that US MNCs were massively avoiding taxes through profit shifting before the reform (consistent with previous findings), and this behavior did not change thereafter.

Our paper is, to the best of our knowledge, the first that studies TCJA effects on ETRs in an international setting, which allows us to measure firm responses relative to a well-defined benchmark, and make statements about tax-competitiveness. Furthermore, our empirical approach allows us to evaluate the effects of future tax reforms on the tax-competitiveness position of MNCs. For instance, this can be utilized to infer the potential competition effects of recent tax changes including the minimum tax as part of the 'Inflation Reduction Act'.

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APPENDIX

Table A.1

Variable Definitions

|	
GAAP ETR	txt / (pi – xi), i.e., income taxes divided by pretax income, adjusted for extraordinary items (set to zero if missing); exclude outliers
CURRENT ETR	(txt - txdi) / pi, i.e., current taxes divided by pretax income; exclude outliers
CASH ETR	txpd / pi, i.e., taxes paid divided by pretax income; exclude outliers
FOREIGN ETR	txfo / pifo for US MNCs, i.e., foreign income taxes divided by foreign pretax income; exclude outliers; (txt – txdom) / (pi – pidom) for European MNCs, i.e., domestic taxes subtracted from total taxes divided by pretax income excluding domestic pretax income; exclude outliers
DOMESTIC GAAP ETR	(txt-txfo) / (pi-pifo-xi), i.e., foreign taxes subtracted from total taxes, divided by pretax income excluding foreign income and adjusted for extraordinary items (set to zero if missing); excludes outliers
DOMESTIC CURRENT ETR	(txt-txfo-txdfed-txds) / (pi-pifo), i.e., foreign taxes, deferred federal taxes and deferred state taxes subtracted from total taxes, divided by pretax income excluding foreign income; exclude outliers
ROA (Return on Assets)	pi / at, i.e., pretax income divided by total assets
SIZE	log (at), i.e., logarithm of total assets
RD (Research & Development)	xrd / at, i.e., research and development expense divided by total assets (set to zero if missing xrd)
LEV (Leverage)	(dlc + dltt) / at, i.e,. total debt divided by total assets
INTAN (Intangibles)	intan / at, i.e., intangibles divided by total assets (set to zero if missing intan)
STR (Statutory Tax Rate)	Statutory corporate tax rate of the MNC's/subsidiaries home country
US	Dummy, which is one for US MNCs and zero for European MNCs
POST	Dummy, which is one for the period after the TCJA was enacted; exclude transition year
HIGHFORACT	Dummy, which is one for US MNCs identified with high foreign activities, and zero otherwise
LOWFORACT	Dummy, which is one for US MNCs identified with low foreign activities, and zero otherwise
GILTI	Dummy, which is one for US MNCs identified with average FOREIGN ETRs lower than the sample median, prior to the TCJA and zero otherwise
US SUB	Dummy, which is one for a subsidiary of an US MNC, and zero otherwise
LABOR	ln(staf), i.e., logarithm of the total labor compensation
CAPITAL	ln(fias), i.e., logarithm of fixed assets
GDP PER CAPITA	ln(GDPPC), i.e., logarithm of GDP per Capita

Notes: Data are taken from Compustat and Compustat Global. Foreign taxes and pretax income for European MNCs, European taxes and subsidiary level information were calculated by combining the Compustat and *Amadeus* databases.

Table A.2

Additional Sensitivity Checks (Treatment: US)

Specification		Coefficient on $US \times POST$		
		GAAP ETR	CURRENT ETR	CASH ETR
		1	2	3
(1)	Exact matching by industry Base specification	-0.0670*** (0.0100)	-0.0581*** (0.0116)	-0.0317*** (0.0119)
(2)	No matching Year and industry FE	-0.0647*** (0.0077)	-0.0514*** (0.0096)	-0.0203** (0.0102)
(3)	Standard matching Only year FE	-0.0649*** (0.0097)	-0.0584*** (0.0114)	-0.0275** (0.0120)
(4)	Standard matching Year FE and industry FE	-0.0639*** (0.0098)	-0.0570*** (0.0114)	-0.0274** (0.0121)
(5)	Standard matching Year-Pair-FE	-0.0726*** (0.0116)	-0.0579*** (0.0143)	-0.0272* (0.0142)
(6)	No exact industry matching	-0.0670*** (0.0091)	-0.0545*** (0.0106)	-0.0206* (0.0117)
(7)	Matching including 2nd order polynomial	-0.0688*** (0.0095)	-0.0551*** (0.0114)	-0.0280** (0.0121)
(8)	Matching including 3rd order polynomial	-0.0645*** (0.0092)	-0.0555*** (0.0109)	-0.0246** (0.0118)
(9)	Matching including size interactions	-0.0713*** (0.0097)	-0.0609*** (0.0117)	-0.0349*** (0.0125)
(10)	Matching including size interaction and 2nd order polynomial	-0.0670*** (0.0089)	-0.0515*** (0.0114)	-0.0202 (0.0125)

Notes: Regressions are based on the matched sample (except specification (2)), where MNCs are included in the *S&P500* or *StoxxEurope600* stock market indices at least once during the period 2000 to 2020 and the MNCs are headquartered either in the US or in Europe; years from 2012 to 2019 are included; the transition year is excluded. We report only results for the interaction $US \times POST$. Unless otherwise described, we include year and firm-pair fixed effects in all specifications. The dependent variable is *GAAP ETR* in column (1), *CURRENT ETR* in column (2) and *CASH ETR* in column (3). In all columns, we control for the respective firm characteristics, *SIZE*, *ROA*, *LEV*, *RD* and *INTAN*. Specifications in row (1) repeat our basic regression (Panel B in Table 2), while row (2) considers the unmatched sample (Panel A, Table 2). In row (3), only year fixed effects are included, in row (4) industry fixed effects are added, and in row (5) year-pair fixed effects are considered. In rows (6) to (10), different matching procedures apply. Row (6) does not require an exact industry matching of firm-pairs. Rows (7) to (10) consider higher-order polynomials of (all) explanatory variables as well as interaction terms between size and explanatory variables when computing propensity scores. Number of matched pairs in rows (1) and (3) – (5) 242, in (6) 287, in (7) 224, in (8) 238, in (9) 235, and in (10) 240. Robust standard errors clustered at the firm level are reported in parentheses. *, **, and *** indicate significance at the level of 10 %, 5 %, and 1 %, respectively.

Figure 1

GAAP ETR
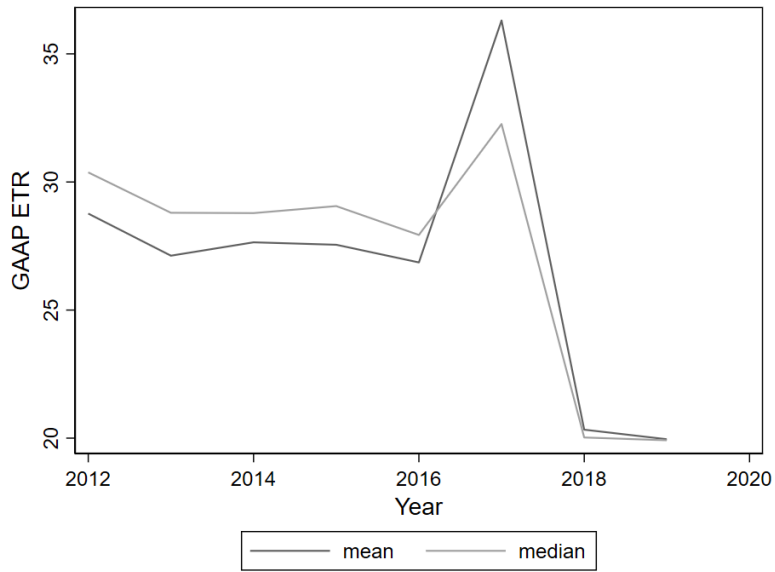
Notes: Trends in the mean and median *GAAP ETRs* of US MNCs listed in the *S&P500* at least one time during the period 2000 to 2020. The figure is based on the data for the years 2012 to 2019, including several adjustments in the transition year: The year 2017 is defined as the reporting periods ending between December 2017 and November 2018. Reporting periods ending prior to December 2017 are therefore included in 2016 and periods ending between January and November 2018 are included in 2017.

Figure 2

GAAP ETR, CASH ETR and FOREIGN ETR
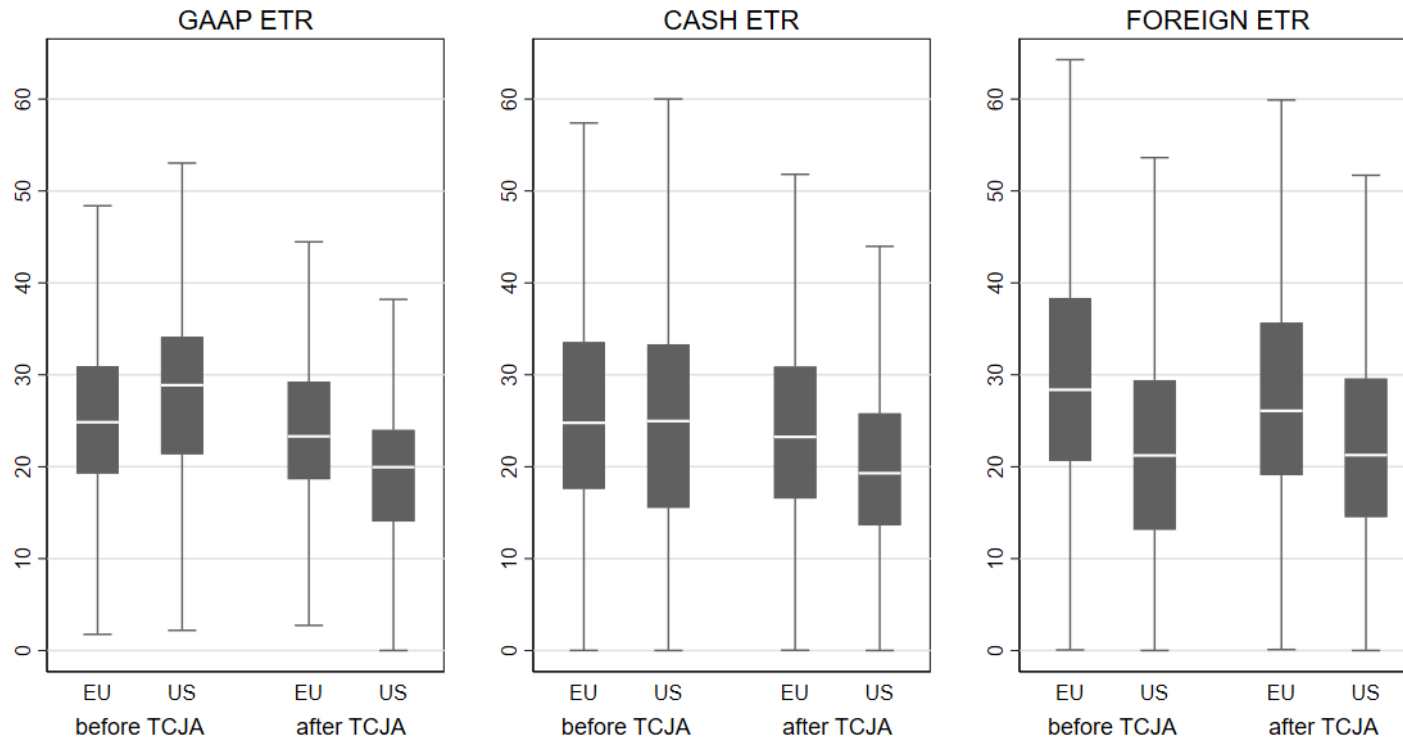
Notes: Comparison of *GAAP*, *CASH* and *FOREIGN ETR* between US and European MNCs, before and after the TCJA. The figure is based on data for the years 2012 to 2019, excluding the transition year. A box portrays the interquartile range of the ETR distribution. The horizontal line in the box represents the median. Outside values are excluded.

Figure 3

Unconditional Test
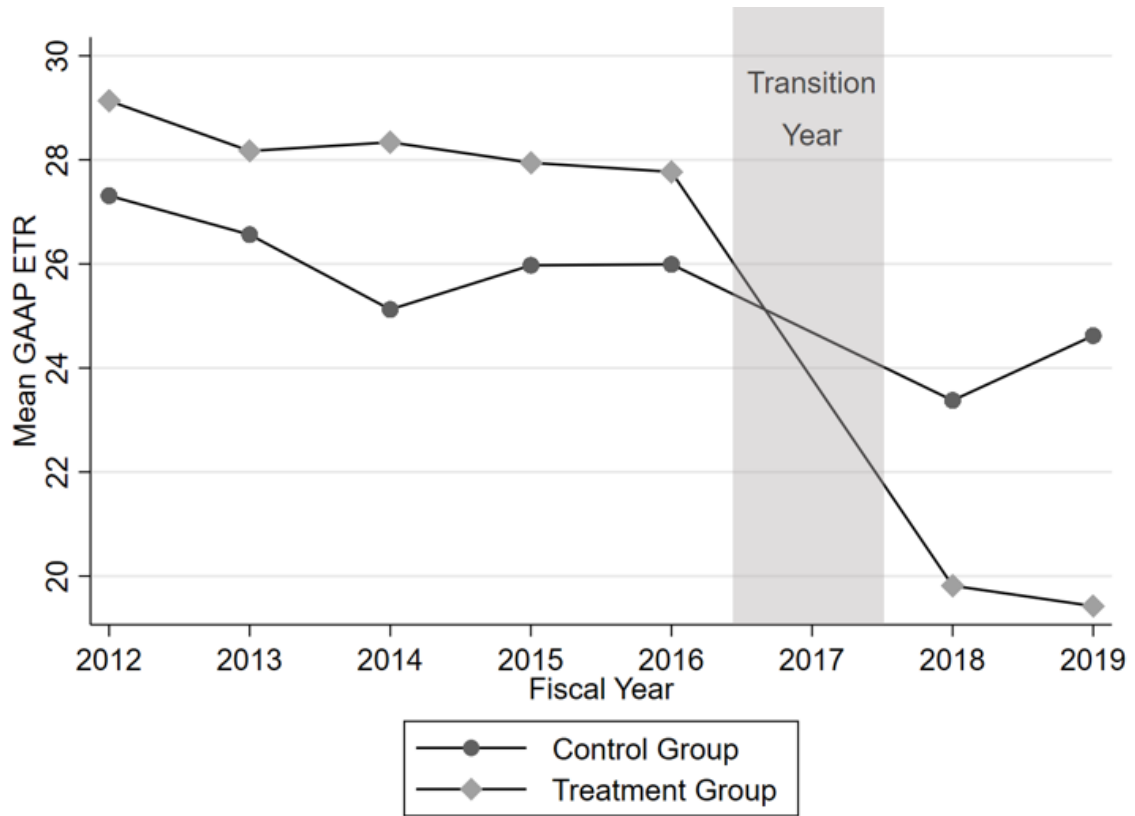
Notes: Unconditional mean *GAAP ETRs* of US MNCs (*Treatment Group*) and European MNCs (*Control Group*) over the years. Excluding transition year.

Figure 4

Effects of the TCJA Depending on Foreign Activities
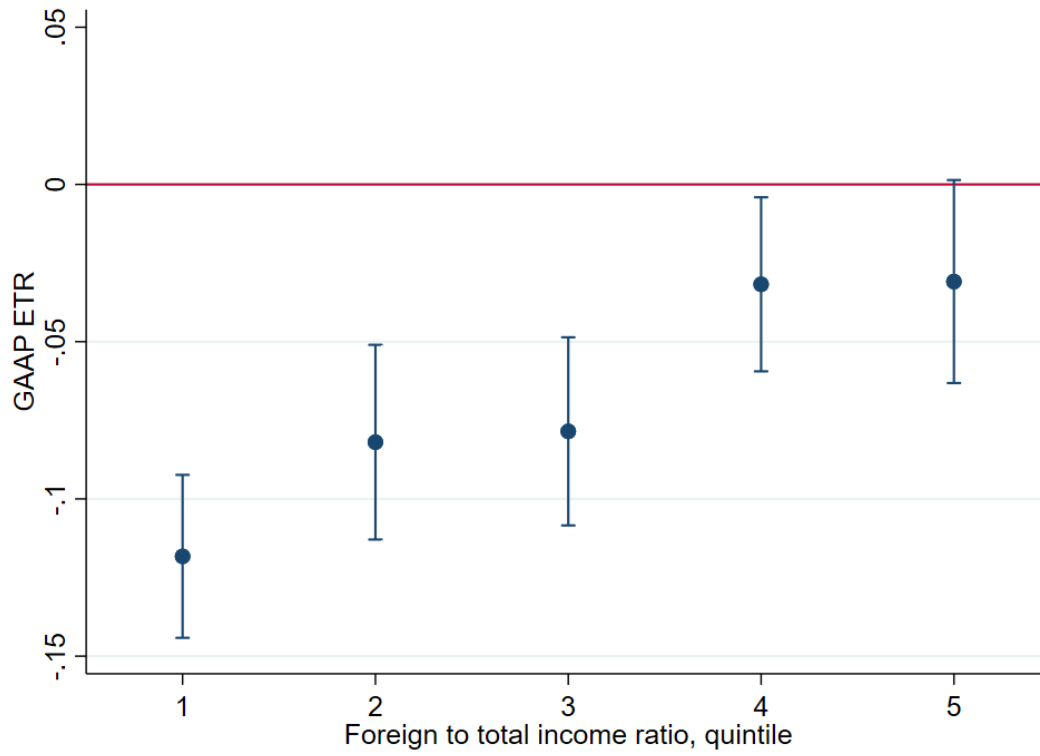
Notes: Point estimates and confidence intervals for the TCJA effect for quintiles of our measure of foreign activity (the ratio of foreign to total income). Regression specification as column (1) in Table 9. The dependent variable is the *GAAP ETR*.

Figure 5

Tax-Competitive Position of US MNCs Before and After the TCJA

	GAAP ETR	CURRENT ETR	CASH ETR
(1) Table 7	-0.0416*** ●——× 0.0254***	-0.0377*** ●——× 0.0204***	-0.0370*** ●—× -0.0053
(2) Table 9 HIGHFORACT	-0.0465*** ×●→ -0.0083	-0.0359*** ●×→ -0.0079	-0.0283*** ×●→ -0.0175
(3) Table 9 LOWFORACT	-0.0416*** ●——× 0.0566***	-0.0450*** ●——× 0.0474***	-0.0497*** ●——× 0.0193*
(4) Table 10 GILTI	-0.0728*** ×→● -0.0530***	-0.0895*** ×——→● -0.0366***	-0.0934*** ×——→● -0.015
(5) Table 10 without GILTI	-0.0137 ●——× 0.0584***	-0.0234 ●——× 0.0661***	-0.0178 ●——× 0.0434***

● after TCJA   × before TCJA
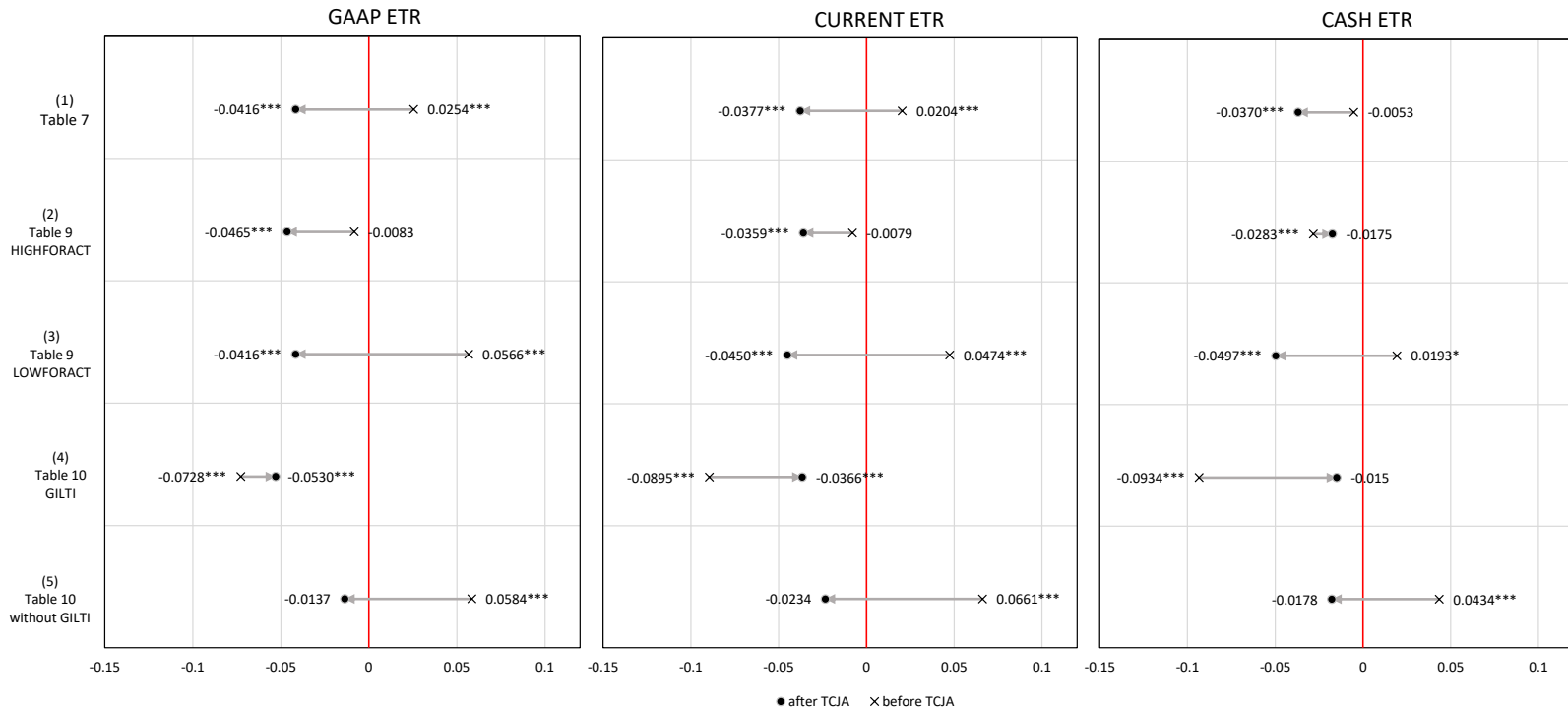
Notes: Tax-competitiveness of US MNCs compared to their European competitors before and after enactment of the TCJA. *GAAP*, *CURRENT* and *CASH ETR* in columns. The rows indicate different specifications in accordance with prior results. The crosses (dots) denote the tax-competitiveness of US MNCs compared to European MNCs prior to (after) the TCJA. The values specify the relative competitive dis-/advantage in terms of different ETR measures. A negative value indicates a competitive advantage compared to the European MNCs. *, **, and *** indicate significance at the level of 10%, 5%, and 1%, respectively. The significance levels prior the TCJA indicate the significance of the *US* dummy in rows (1) and (5), *HIGHFORACT* in row (2), *LOWFORACT* in row (3) and *US × GILTI* in row (4). Significance levels post TCJA indicate the joint significance of the coefficient on the before TCJA dummy and the coefficient on the change due to the TCJA. Note that row (1) corresponds to the coefficients on *US* prior to the TCJA and *US + US × POST* after the TCJA; in row (2) the coefficients correspond to *HIGHFORACT* and *HIGHFORACT + HIGHFORACT × POST*. In row (3), the coefficients correspond to *LOWFORACT* and *LOWFORACT × POST*, respectively. Further, in row (4), we display the coefficients on *US × GILTI* prior to the TCJA and *US × GILTI + US × POST × GILTI* after the TCJA, depicting the competitive position of US MNCs when the *GILTI* regime most probably apply. In row (5), we report the corresponding coefficients on *US* and *US + US × POST* for US MNCs where anti-tax-avoidance rules do not apply (most probably).

Table 1

Sample

Description	European Firms		US Firms	
	Firms	Firm-Years	Firms	Firm-Years
Index Firms	991	-	927	-
Included in Compustat and Amadeus	831	15,367	464	8,956
Headquarters in EU / USA	754	13,649	433	8,129
Non-Miss. Controls	744	11,503	433	7,194
Non-Miss. Controls & GAAP ETR	742	10,754	431	6,691

Notes: The sample is based on firms that were included in the *S&P500* or *StoxxEurope600* stock market indices at least once during the period 2000 to 2020.

Table 2

Summary Statistics

| | **Panel A:** unmatched, years from 2012 to 2016 | | | | | | **Panel B:** unmatched, years from 2018 to 2019 | | | | | |
| | **European Firms** | | | **US Firms** | | | **European Firms** | | | **US Firms** | | |
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
SIZE *	2,999	9.16	1.90	1,941	9.58	1.51	1,249	9.51	1.82	686	9.91	1.47
ROA *	2,999	0.08	0.13	1,941	0.10	0.08	1,249	0.08	0.13	686	0.09	0.08
LEV *	2,999	0.25	0.18	1,941	0.27	0.19	1,249	0.26	0.17	686	0.32	0.19
RD *	2,999	0.02	0.04	1,941	0.03	0.05	1,249	0.01	0.03	686	0.03	0.05
INTAN *	2,999	0.23	0.21	1,941	0.27	0.22	1,249	0.23	0.22	686	0.28	0.23
GAAP ETR	2,783	0.26	0.14	1,808	0.28	0.12	1,170	0.25	0.14	614	0.20	0.12
CURRENT ETR	2,494	0.26	0.16	1,783	0.27	0.14	1,150	0.25	0.15	617	0.21	0.14
CASH ETR	2,313	0.28	0.16	1,821	0.25	0.14	950	0.26	0.16	633	0.22	0.15
FOREIGN ETR	1,722	0.31	0.18	1,477	0.23	0.15	771	0.30	0.16	496	0.23	0.14

| | **Panel C:** matched, years from 2012 to 2016 | | | | | | **Panel D:** matched, years from 2018 to 2019 | | | | | |
| | **European Firms** | | | **US Firms** | | | **European Firms** | | | **US Firms** | | |
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
SIZE *	1,044	9.53	1.95	1,171	9.40	1.47	423	9.89	1.78	389	9.78	1.44
ROA *	1,044	0.08	0.09	1,171	0.11	0.09	423	0.08	0.08	389	0.10	0.07
LEV *	1,044	0.28	0.19	1,171	0.25	0.17	423	0.28	0.18	389	0.30	0.19
RD *	1,044	0.02	0.05	1,171	0.02	0.04	423	0.02	0.04	389	0.02	0.04
INTAN *	1,044	0.28	0.22	1,171	0.26	0.22	423	0.27	0.22	389	0.28	0.23
GAAP ETR	1,037	0.26	0.12	1,148	0.28	0.11	420	0.24	0.12	378	0.20	0.10
CURRENT ETR	933	0.26	0.14	1,091	0.27	0.13	403	0.25	0.13	360	0.20	0.11
CASH ETR	818	0.27	0.15	1,128	0.26	0.13	336	0.25	0.13	372	0.21	0.12
FOREIGN ETR	725	0.30	0.17	882	0.24	0.15	311	0.31	0.19	289	0.23	0.13

Notes: Sample sizes differ usually because of data availability. All variables with "*" are used to calculate the propensity scores. Panel A includes the unmatched sample prior to the TCJA, and Panel B includes the unmatched sample after the TCJA. Panels C and D include the matched sample of 238 pairs; matching year is 2016. Panel C includes the observations prior to the TCJA, Panel D includes the observations after the TCJA.

Table 3

Nearest Neighbor Matching, Balancing Property (2016)

Nearest Neighbor 1:1		Mean		Bias	Bias Reduction	t-test	
		Treated	Control	(in %)	(in %)	t	p>t
SIZE	Unmatched	9.6551	9.3021	21.2		3.00	0.003
	Matched	9.5074	9.6603	-9.2	56.7	-1.01	0.314
ROA	Unmatched	0.1023	0.0852	15.6		2.13	0.034
	Matched	0.0970	0.0821	13.6	13.0	1.95	0.052
LEV	Unmatched	0.3025	0.2508	28.9		4.25	0.000
	Matched	0.2757	0.2722	2.0	93.1	0.22	0.828
INTAN	Unmatched	0.2934	0.2343	26.5		3.87	0.000
	Matched	0.2697	0.2757	-2.7	89.8	-0.29	0.770
RD	Unmatched	0.0264	0.0148	27.3		4.14	0.000
	Matched	0.0192	0.0216	-5.9	78.4	-0.66	0.508

Notes: Balancing property tests. The tests are based on observations from the year 2016. The matching applies one-to-one nearest neighbor matching within the same industry, which requires a difference in propensity scores of less than 0.03.

Table 4

Regression Analysis, only US MNCs

Variables	GAAP ETR		CURRENT ETR		CASH ETR	
	1	2	3	4	5	6
POST	-0.0870***	-0.0747***	-0.0769***	-0.0729***	-0.0467***	-0.0509***
	(0.0051)	(0.0062)	(0.0062)	(0.0074)	(0.0063)	(0.0073)
SIZE		-0.0506***		-0.0350**		-0.0075
		(0.0126)		(0.0150)		(0.0173)
ROA		-0.2578***		-0.5829***		-0.4909***
		(0.0771)		(0.1087)		(0.0931)
LEV		0.0039		-0.0025		0.0132
		(0.0374)		(0.0407)		(0.0430)
INTAN		0.0408		-0.0009		0.0255
		(0.0434)		(0.0552)		(0.0557)
RD		0.0593		1.3748***		1.0283**
		(0.3813)		(0.3924)		(0.4471)
Firm FE	✓	✓	✓	✓	✓	✓
N	1,526	1,526	1,451	1,451	1,500	1,500
Adj. R²	0.51	0.52	0.43	0.48	0.42	0.45

Notes: Regressions are based on a matched sample, where we only use the MNCs headquartered in the US; years from 2012 to 2019, excluding the transition year. Dependent variable is the *GAAP ETR* in columns (1) – (2), *CURRENT ETR* in columns (3) – (4) and the *CASH ETR* in columns (5) – (6). Robust standard errors are shown in parentheses. *, **, and *** indicate significance at the level of 10%, 5%, and 1%, respectively.

Table 5

Alternative ETR Measures, only US MNCs

Variables	DOMESTIC GAAP ETR	DOMESTIC CURRENT ETR	FOREIGN ETR
	1	2	3
POST	-0.1202***	-0.0935***	-0.0123
	(0.0099)	(0.0134)	(0.0092)
SIZE	-0.0293	-0.0588**	0.0090
	(0.0224)	(0.0281)	(0.0205)
ROA	-0.0359	-0.2726*	-0.2320
	(0.1099)	(0.1646)	(0.2075)
LEV	0.0142	0.0481	-0.0383
	(0.0449)	(0.0564)	(0.0514)
INTAN	-0.0392	-0.0558	-0.0186
	(0.0777)	(0.1008)	(0.0567)
RD	-0.7829	0.3183	0.1012
	(0.6700)	(0.5871)	(0.3952)
Firm FE	✓	✓	✓
N	1,001	850	1,171
Adj. R²	0.47	0.44	0.48

Notes: Regressions are based on a matched sample, where we only use the MNCs headquartered in the US; years from 2012 to 2019, excluding the transition year. Dependent variables are the $DOMESTIC\ GAAP$, $DOMESTIC\ CURRENT$ and the $FOREIGN\ ETR$. The $DOMESTIC\ GAAP\ ETR$ is defined as the sum of the deferred and current US domestic income taxes divided by US domestic income. $DOMESTIC\ CURRENT\ ETR$ is defined as the current US domestic income taxes divided by US domestic income. Robust standard errors are shown in parentheses. *, **, and *** indicate significance at the level of 10%, 5%, and 1%, respectively.

Table 6

Regression Analysis, only European MNCs

Variables	GAAP ETR		CURRENT ETR	CASH ETR
	1	2	3	4
POST	-0.0242***	-0.0276***	-0.0203***	-0.0249***
	(0.0065)	(0.0080)	(0.0078)	(0.0092)
SIZE		0.0013	-0.0061	-0.0017
		(0.0132)	(0.0121)	(0.0158)
ROA		-0.5547***	-0.8242***	-0.8226***
		(0.1042)	(0.1685)	(0.1782)
LEV		0.1292**	0.1413**	0.1263
		(0.0573)	(0.0657)	(0.0774)
INTAN		-0.0823	-0.1190	-0.0588
		(0.0628)	(0.0898)	(0.0743)
RD		0.3447*	0.4489	0.3472
		(0.1947)	(0.3161)	(0.3225)
Firm FE	✓	✓	✓	✓
N	1,457	1,457	1,336	1,154
Adj. R²	0.34	0.38	0.45	0.36

Notes: Regressions are based on a matched sample, where we only use the MNCs headquartered in Europe; years from 2012 to 2019, excluding the transition year. Dependent variable is the *GAAP ETR* in columns (1) – (2), *CURRENT ETR* in column (3) and *CASH ETR* in column (4). Robust standard errors are shown in parentheses. *, **, and *** indicate significance at the level of 10%, 5%, and 1%, respectively.

Table 7

Matched Sample, ETR Differentials

Variables	GAAP ETR		CURRENT ETR		CASH ETR	
	1	2	3	4	5	6
US	0.0222***	0.0254***	0.0143*	0.0204***	-0.0147*	-0.0053
	(0.0064)	(0.0065)	(0.0077)	(0.0078)	(0.0078)	(0.0078)
US × POST	-0.0660***	-0.0670***	-0.0554***	-0.0581***	-0.0287**	-0.0317***
	(0.0101)	(0.0100)	(0.0117)	(0.0116)	(0.0122)	(0.0119)
SIZE		0.0048		-0.0056		0.0030
		(0.0044)		(0.0051)		(0.0055)
ROA		-0.1182**		-0.2743***		-0.2997***
		(0.0531)		(0.0717)		(0.0615)
LEV		-0.0030		-0.0191		0.0193
		(0.0333)		(0.0362)		(0.0402)
INTAN		0.0448*		0.0736***		0.0666**
		(0.0243)		(0.0275)		(0.0327)
RD		-0.1162		0.0180		0.0036
		(0.1605)		(0.1687)		(0.1882)
Year FE	✓	✓	✓	✓	✓	✓
Pair FE	✓	✓	✓	✓	✓	✓
N	2,983	2,983	2,787	2,787	2,654	2,654
Adj. R²	0.22	0.23	0.23	0.25	0.22	0.25

Notes: Regressions are based on the matched sample, where MNCs are headquartered either in the US or in Europe; years from 2012 to 2019, excluding the transition year. Dependent variable is the *GAAP ETR* in columns (1) – (2), the *CURRENT ETR* in columns (3) – (4) and the *CASH ETR* in columns (5) – (6). Robust standard errors clustered at the firm level are shown in parentheses. *, **, and *** indicate significance at the level of 10%, 5%, and 1%, respectively.

Table 8

Matched Sample, only European MNCs without US Activities

Variables	GAAP ETR	CURRENT ETR	CASH ETR
	1	2	3
US	0.0414**	0.0385**	0.0128
	(0.0159)	(0.0191)	(0.0179)
US × POST	-0.1165***	-0.1117***	-0.0509**
	(0.0252)	(0.0271)	(0.0227)
Firm characteristics	✓	✓	✓
Year FE	✓	✓	✓
Pair FE	✓	✓	✓
N	664	626	575
Adj. R²	0.29	0.31	0.34

Notes: Regressions are based on the matched sample, where MNCs are headquartered either in the US or in Europe; years from 2012 to 2019, excluding the transition year. We exclude pairs, where the European MNC reports fixed assets or revenues in the US in 2016 and pairs where no data is reported in the *Refinitiv Eikon* database for the European MNC. Dependent variable is the $GAAP\ ETR$ in column (1), the $CURRENT\ ETR$ in column (2) and the $CASH\ ETR$ in column (3). We control for the full set of firm characteristics (i.e. $SIZE, ROA, LEV, INTAN$ and RD). Robust standard errors clustered at the firm level are shown in parentheses. *, **, and *** indicate significance at the level of 10%, 5%, and 1%, respectively.

Table 9

Matched Sample, Foreign Activities

Variables	GAAP ETR	CURRENT ETR	CASH ETR
	1	2	3
HIGHFORACT	-0.0083	-0.0079	-0.0283**
	(0.0088)	(0.0103)	(0.0113)
LOWFORACT	0.0566***	0.0474***	0.0193*
	(0.0077)	(0.0101)	(0.0106)
HIGHFORACT × POST	-0.0382***	-0.0280*	0.0108
	(0.0121)	(0.0154)	(0.0151)
LOWFORACT × POST	-0.0982***	-0.0924***	-0.0690***
	(0.0117)	(0.0138)	(0.0151)
Firm characteristics	✓	✓	✓
Year FE	✓	✓	✓
Pair FE	✓	✓	✓
N	2,497	2,402	2,285
Adj. R²	0.24	0.25	0.22

Notes: Regressions are based on the matched sample, where MNCs are headquartered either in the US or in Europe; years from 2012 to 2019, excluding the transition year. Dependent variables are the *GAAP ETR*, the *CURRENT ETR* and the *CASH ETR*. The indicator variable *HIGHFORACT* (*LOWFORACT*) equals one for US MNCs with above-median (below-median) share of foreign income. Robust standard errors clustered at the firm level are shown in parentheses. *, **, and *** indicate significance at the level of 10%, 5%, and 1%, respectively.

Table 10

Matched Sample, GILTI Regime

Variables	GAAP ETR	CURRENT ETR	CASH ETR	FOREIGN ETR	
	1	2	3	4	5
US	0.0574***	0.0643***	0.0416***	-0.0856***	0.0080
	(0.0082)	(0.0104)	(0.0111)	(0.0117)	(0.0136)
US × GILTI	-0.0717***	-0.0869***	-0.0909***		-0.1861***
	(0.0113)	(0.0135)	(0.0146)		(0.0168)
US × POST	-0.0716***	-0.0783***	-0.0604***	-0.0043	-0.0361**
	(0.0140)	(0.0154)	(0.0162)	(0.0152)	(0.0179)
US × POST × GILTI	0.0192	0.0515***	0.0773***		0.0510***
	(0.0141)	(0.0176)	(0.0178)		(0.0151)
Firm characteristics	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Pair FE	✓	✓	✓	✓	✓
N	2,350	2,269	2,150	2,207	2,013
Adj. R²	0.23	0.26	0.23	0.28	0.33

Notes: Regressions are based on the matched sample, where MNCs are headquartered either in the US or in Europe; years from 2012 to 2019, excluding the transition year. Dependent variable is the *GAAP ETR* in column (1), *CURRENT ETR* in column (2), *CASH ETR* in column (3), *FOREIGN ETR* in columns (4) – (5). We use the *FOREIGN ETRs* as an indicator to learn about the effects of international anti-tax-avoidance rules, especially the GILTI regime. We exclude US MNCs that do not report data on the *FOREIGN ETR*. The dummy variable *GILTI* indicates whether the average *FOREIGN ETR* of an US MNC is lower than the median (0.228) of the average *FOREIGN ETR* of US MNCs during the time period 2012 to 2016. We control for the full set of firm characteristics (i.e. *SIZE, ROA, LEV, INTAN* and *RD*). Robust standard errors clustered at the firm level are shown in parentheses. *, **, and *** indicate significance at the level of 10%, 5%, and 1%, respectively.

Table 11

Profit Shifting Opportunities, Subsidiary Level

Variables	EBIT			EBT	
	1	2	3	4	5
STR	-1.3707***	-0.9007***	-0.8962***	-0.6052**	-0.6058**
	(0.2471)	(0.2687)	(0.2694)	(0.2764)	(0.2772)
STR × US SUB		-0.9171***		-0.9412***	
		(0.2934)		(0.3286)	
STR × US SUB × POST		0.0177		-0.6543	
		(0.5827)		(0.6974)	
STR × US SUB × GILTI			-1.7557***		-2.4615***
			(0.3166)		(0.4319)
STR × US SUB × (1-GILTI)			-0.3535		0.0288
			(0.4060)		(0.4398)
STR × US SUB × GILTI × POST			-0.1453		-0.4794
			(1.0534)		(1.3327)
STR × US SUB × (1-GILTI) × POST			0.1959		-0.6346
			(0.7294)		(0.8433)
US sub	0.0627*	0.3041***		0.3569***	
	(0.0379)	(0.0959)		(0.0969)	
US SUB × POST	0.0297	0.0001		0.1368	
	(0.0388)	(0.1465)		(0.1824)	
US SUB × GILTI			0.4881***		0.7704***
			(0.0939)		(0.1265)
US SUB × (1-GILTI)			0.2192		0.0849
			(0.1458)		(0.1451)
US SUB × (GILTI) × POST			0.0218		0.0621
			(0.2632)		(0.3465)
US SUB × (1-GILTI) × POST			-0.0304		0.1592
			(0.1935)		(0.2223)
LABOR	0.5512***	0.5510***	0.5512***	0.5448***	0.5449***
	(0.0125)	(0.0125)	(0.0125)	(0.0156)	(0.0155)
CAPITAL	0.1938***	0.1937***	0.1932***	0.2150***	0.2134***
	(0.0069)	(0.0069)	(0.0069)	(0.0089)	(0.0087)
GDP PER CAPITA	0.1335***	0.1262***	0.1265***	0.1139***	0.1114
	(0.03527)	(0.0346)	(0.0347)	(0.0395)	(0.0393)
Pair FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
N	25,198	25,198	25,198	17,788	17,788
Adj. R²	0.56	0.56	0.56	0.56	0.56

Notes: Subsidiary level data, based on the matched sample (at the group level); years from 2012 – 2019, excluding the transition year. Dependent variables are the *logarithm of earnings before interest and taxes* in columns (1) – (3), and the *logarithm of earnings before taxes* in columns (4) – (5). *LABOR* is the log of the total labor compensation. *CAPITAL* is the log of the fixed assets. *GDP PER CAPITA* is the log of GDP per capita. All regressions include industry dummies at the 2-digit NACE industry code level, year fixed effects and pair fixed effects on the group level. Robust standard errors clustered at the host-country year level are shown in parentheses. *, **, and *** indicate significance at the level of 10%, 5%, and 1%, respectively.