

Unravel Tax Planning Differences between Multinational and Domestic Firms

Working Paper

– January 2019 –

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Abstract: Prior literature primarily identifies tax planning via an analysis of the firms' effective tax rate (ETR) or variations of it. However, several disadvantages go along with ETRs like the exclusion of loss-firms (equal to 30% of the sample) or a mismeasurement of corporate tax planning which stems from truncating ETRs as pointed out by Henry and Sansing (2014). In this paper, we develop a new measure suitable to overcome these shortcomings. Another advantage is the separation of a firm's tax planning activity into a time-invariant idiosyncratic component and a characteristic-varying component. The first should be associated with the firm's tax strategy as a firm characteristic while the second should show any single-year effects as a reaction to a change of firm characteristics or external events/shocks. We present a comparison between the new measure and other tax planning measures like single-year/long-rung *GAAP*- and *Cash ETR* or *Book-Tax Differences*. By manually seeding artificial tax planning activity into the data, we provide evidence that the new measure might be a better indicator to identify tax planning than variations of the ETR. Further, we apply the measure in a subsequent analysis to evaluate differences between tax planning behavior of multinational and domestic firms. We provide evidence that no structural difference exist between both groups and present a possible explanation for differences resulting from an analysis with ETRs. We identify effects of double taxation and foreign tax credits to be of major importance if comparing multinational and domestic firms.

JEL Classification: H21, H25, H26, M40, M41

Keywords: Tax Planning, Measure Tax Planning, Simulated Data, Seeding Artificial Tax Planning, Time-invariant versus Characteristic-varying Tax Planning, Multinationals vs. Domestic

Acknowledgments: We thank the participants of the 41st Annual Congress of the European Accounting Association in Milan, the 2018 Annual Conference of the Canadian Academic Accounting Association in Calgary, the Sixth International Conference of the Journal of International Accounting Research in Venice, the Tax Research Network 2018 Annual Conference in Birmingham and the National Tax Association's 111th Annual Conference in New Orleans for their helpful comments. We especially appreciate the valuable suggestions by Alex Edwards and Cristi Gleason. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sector.

1 Introduction

Starting with the elementary question whether taxes matter or not, a wide stream of literature has risen to find answers to this question. The problem with evaluating the corporate tax planning behavior is the nature of this characteristic. No company reports the amount of taxes they avoided due to tax planning, nor do they report the effort they put into tax savings strategies. The firms' tax planning activities are unobservable for researchers or policy makers, while highly relevant on the other hand. However, the basic question, how to infer the underlying strategies when you cannot observe tax planning, does not seem to be answered. Hanlon and Heitzman (2010) call for further research in the area of how to measure tax planning.

Prior literature primarily employs the effective tax rate (ETR) as an indicator to measure tax planning activities. Dyreng, Hanlon, Maydew and Thornock (2017) provide an analysis of the Cash ETR's changes over the past 25 years and interpret a negative slope as a hint towards growing tax planning activity across the sample. The technical construction of an ETR means several limitations resulting in a bias and misleading interpretations. Henry and Sansing (2014) show that dropping all firm-year observations with negative pre-tax income results in such a bias when it comes to evaluating tax planning activities. Prior studies regularly drop observations with negative pre-tax income. Therefore, they derive their universal inferences from a biased subsample. The handling of loss firm-years is crucial when deriving inferences valid for the whole population. The portion of loss firms is highly correlated with year-mean effective tax rates. Therefore, this paper introduces a new measure to identify the effect of tax planning and those companies associated with an engagement in such strategies while accounting for loss firms-years.

The paper contributes to the literature in three major ways. First, it introduces a new tax planning measure. The development of a new measure enables new opportunities and methods of

measuring relations and associations between certain firm characteristics and tax planning behavior. Researchers benefit from a tax planning measure, which incorporates a time-invariant tax planning component which does not change over time while simultaneously providing a characteristic-varying component which identifies single-year effects. The rationale behind this differentiation is the nature of tax planning. Some studies define tax planning as a firm characteristic which is associated with other firm specific attributes and is therefore less likely to change every year (low volatility is desired). This idea is captured by the time-invariant tax planning component and is of low¹ variation for each firm over the sample period. However, this component does not capture tax planning entirely. Due to changes in the firm specific attributes or other environmental incidents, a firm's tax planning characteristic may change. To capture this characteristic, the new tax planning measure includes a characteristic-varying tax planning component. This component expresses any tax planning activities – either a reduction or an increase – deviating from the average firm level. The combination enables the analysis of research questions where both aspects are of relevance for the researcher.

For most prior research, the source of tax related information is the GAAP financial statement. This information might differ from those reported in the tax return files due to different disclosure regulations. Additionally, the management might have some incentives to actively manage not only earnings but also reported tax information. Therefore, we do not want to rely on total tax expense or current tax expense since these information might be subject to such management activity. Dhaliwal, Gleason and Mills (2004) confirm this assumption showing that the GAAP tax accounts might be subject to earnings management. Rather, we employ cash taxes paid as the amount really paid to the tax authorities. The problem with cash taxes paid is the nature of this position because the amount paid in the current period is not only induced by the

¹ In theory there would be no variation at all. Since we scale the fixed-effects by taxes paid (which varies from year to year) the resulting time-invariant tax planning estimation also shows small variation.

current period's GAAP revenue as reported in the financial statement. The elementary idea behind the new tax planning measure is that a tax payment is determined by the corresponding GAAP-reported pre-tax income of that period and the GAAP-reported pre-tax income of previous periods due to retrospective tax payments. Dyreng, Hanlon and Maydew (2008) already present a method to account for intertemporal associations by calculating a long-run effective rate. The paramount idea was the elimination of outliers and the identification of a firm's tax planning behavior following the understanding of a more constant characteristic. However, we do not know to which extent the tax payment is related to the different periods' pretax incomes. One would suggest that the essential part of cash taxes paid in the current period depends on pre-tax income as reported in the tax return files. Back taxes and deferred revenue seem to be subordinate to current year's tax expense. However, the exact composition of cash taxes paid does not seem to be clear from a theoretical point of view. To shed light into the composition, cash taxes paid is the dependent variable in our pooled cross-sectional OLS estimation.² The lagged and current pre-tax income of this firm serve as independent variables to estimate the respective coefficients. In a second step, the estimated coefficients are used to predict cash taxes paid in a firm-fixed effects model. The firm-fixed effects serve as the proxy for time-invariant tax planning while the residuals serve as a proxy for characteristic-varying tax planning both resulting in the *Relative Tax Planning Measure (RTPM)*. Overall, this measure enables a simultaneous evaluation of both tax planning components.

Since the interpretation of negative effective tax rates is problematic and effective tax rates greater than one are difficult to handle, ETRs are regularly truncated (e.g., Bauer (2015); Cheng, Huang, Li, and Stanfield (2012); Davis, Guenther, Krull, and Williams (2016); Hoi, Wu, and Zhang (2013); McGuire, Omer, and Wang (2012); Robinson, Sikes, and Weaver (2010)) or

² Although current year's tax expense is owed on income measured by tax law cash taxes paid also contain back tax payments violating a strict matching principle.

censored at zero and one (e.g., Armstrong, Blouin, and Larcker (2012); Badertscher, Katz, and Rego (2013); Brown and Drake (2014); Dyreng, Hanlon, and Maydew (2010); Gaertner (2014); Gallemore and Labro (2015); Higgins, Omer, and Phillips (2015); Hope, Ma, and Thomas (2013); McGuire, Wang, and Wilson (2014)). The adjustment of the data results in a truncation bias, as pointed out by Henry and Sansing (2014). According to their study, observations with negative pre-tax income or tax refunds are positively associated with tax planning. If just dropping all these information or replacing the information by a value of zero limits the explanatory power and regularly underestimates the association with tax planning. Such a bias resulting in an underestimation does not occur using *RTPM*.³

Following the presentation of the new measure, we present a data manipulation method already introduced by DeSimone, Nickerson, Seidman and Stomberg (2016) to validate the appropriateness of the new measure. The enhancement of this method represents the second contribution to the literature. By artificially seeding additional tax avoidance into the sample, we evaluate in a logistic regression if our new tax planning measure identifies tax planning behavior. A comparison with some ETR variations (*single-year/long-run Cash/GAAP ETR*) and book-tax differences demonstrate the robustness and appropriateness of our new measure. We suggest that our new measure is able to identify such additionally seeded tax planning while other measures partly fail to show any significant associations while others provide weak evidence.

In the last step, we apply the new *RTPM* measure to evaluate potential differences in tax planning behavior for multinational and domestic firms. This analysis represents the third contribution to the tax planning literature. We provide evidence that no structural difference exists between both groups of firms as indicated by employing the *Cash ETR*. Differences resulting from such an analysis may be explained by a missing separation into foreign and domestic pre-tax

³ Since consecutive firm-year observations are necessary, the new way of identifying tax planning does also limit the data. However, the advantage is that the loss of data is not associated with tax planning and therefore does not result in a systematic bias and an underestimation of tax planning.

income or cash taxes paid. Our analysis hints towards different effects of foreign pre-tax income compared to domestic pre-tax income on cash taxes paid. Double taxation may explain these differences. Furthermore, tax credits granted due to foreign cash taxes paid do not reduce domestic cash taxes paid correspondingly resulting in a further need to differentiate between domestic and foreign nature. It seems that significant differences between domestics' and multinationals' tax planning behavior occur in times of crises like the Tech-Bubble, the 2008-financial crises or the Flash-Crash in 2011.

The paper proceeds as follows: In chapter 2, we present already established measures to identify tax planning. Chapter 3 introduces the new measure, its theoretical as well as the empirical construction. Chapter 4 compares the appropriateness of *RTPM* in identifying tax planning with other measures. Chapter 5 employs the new measure to analyze the development of tax planning with a comparison of multinational firms with domestic firms while chapter 6 concludes.

2 Methods of Measuring Tax Planning

Prior literature reviews (e.g., Shackelford and Shevlin (2001); Hanlon and Heitzman (2010)) provide a good overview about the widely accepted proxies presenting their strengths and limitations for tax planning. This chapter will not discuss those strengths and weaknesses in detail but summarize the most important measures to capture tax planning. The focus lies on the measure itself and not on studies evaluating any relations with other firm characteristics or further tax planning determinants.

The information source for any analysis regarding tax planning can either be the tax return file or the financial statement. Hanlon and Heitzman (2010) discuss the sources' quality in detail and state that it is nearly impossible to match information from both types due to different consolidation rules. Lots of studies state that information from the tax return files would be of relevance and the desired source. However, these information are hard to get since they are

confidential and only a very limited number of changing researchers is granted access to these information. The limited access is the next problem arising when employing confidential data since the resulting study is not replicable. As a consequence, the majority of studies utilize data from the financial statements. This approach is not uncontroversial since financial disclosure does not require any information regarding cash taxes paid for current year's return. Hanlon and Heitzman (2010) explain this lack of information by the focus of the FASB. The board aims to demand for all information necessary to evaluate the economic performance for stakeholders and to enable them to generate accurate future forecasts. It seems that cash taxes paid for a fiscal year is what investors are interested in. Hanlon (2003) and McGill and Outslay (2004) discuss such problems arising from utilizing financial data for taxable income forecasts. Nevertheless, the advantage of applying financial statement data is the broad availability and therefore, this source of information is widely accepted and used in prior literature.

Early studies employ simple measures like taxes paid or ratios like effective tax rates. The numerator defines the type of ETR. If worldwide total tax expense is scaled by worldwide total pre-tax income, the resulting ratio is the *GAAP ETR*. A disadvantage of utilizing the *GAAP ETR* is that strategies deferring taxes are not captured by the proxy since total tax expense contains the deferred tax component. Hanlon and Heitzman (2010) list some items which are typically not tax planning instruments but affect the *GAAP ETR* (e.g. changes in the valuation allowance or changes in the tax contingency reserve). Next to the *GAAP ETR*, the *Cash ETR* is the second common ratio widely used to capture tax planning, avoidance, aggressiveness or burden. Instead of worldwide total tax expense, worldwide income taxes paid is scaled by worldwide total pre-tax income. One benefit of the alternative ratio is that deferral strategies affect the *Cash ETR*. However, a mismatch of the nominator and denominator is the result of pre-tax earnings being a single (current) year information while cash taxes paid relate to several (prior and current) periods due to subsequent payments of taxes.

De Simone et al. (2016) argue that the method of limiting the ETR is essential for the statistical power of the model and for the possibility of identifying any effect. Truncating, winsorizing or deleting extreme values has a substantial effect on the model and the findings. Therefore, one should carefully think about the right method for ensuring that the data fits to the interpretability of the results. Furthermore, Henry and Sansing (2014) express skepticism to trust the *Cash ETR* because of the transformation necessary to enable the calculation of the ratio. Deleting or winsorizing extreme values decreases not only the variance, but also destructs essential information about outliers. They caution about a potential bias between extreme ETR values and the underlying tax planning behavior. A further limitation accrues from the type of tax planning the measure is capable to detect. The *Cash ETR* as well as the *GAAP ETR* measure share the disadvantage of only capturing non-conforming tax planning as the denominator is the pre-tax income, which might already be managed via conforming tax planning. Although not highly problematic for public companies it is not possible to detect conforming tax planning with both measures.

Dyreng et al. (2008) recommend averaging the information over longer periods to avoid singly-year outliers and extreme values. In their study, the authors sum up cash taxes paid as well as pre-tax income over a period of 3/10 years. This new interpretation of an effective tax rate as a measure of firm-average tax planning overcomes some interpretation problems since the ETR is smoothed over several years and outliers are also eliminated while volatility is reduced. This enhancement of the single-year ETR has another advantage for the *Cash ETR*. Hanlon and Heitzman (2010) review a reduction in the timing mismatch between cash taxes paid and pre-tax income. Due to the advantages just presented, a broad majority of researchers adopted the long-run measure for their analyses in the following years (e.g., Rego and Wilson (2012); Bardscher et al. (2013); Brown and Drake (2014)). Nevertheless, the advantage of smoothed

ETRs is a disadvantage at the same time. The loss of information content makes it nearly impossible to evaluate single-year effects or direct effects of external events.

Another modification is the calculation of a tax rate differential. Subtracting the effective tax rate from the statutory tax rate yields the differential. Those companies showing a positive differential (lower ETR than the statutory tax rate) may be engaged in tax planning activities. However, there are some limitations applying such a comparison. If the officially defined tax base is lower than the pretax income reported in the annual report due to tax exemptions and deductions, the ETR will be lower than the statutory tax rate by default.⁴ The taxation system of the United States is characterized by one of the highest tax rates in the world while allowing for several tax base deductions like permanently reinvested earnings. Due to the number of exemptions, one would not expect the average company to report an ETR of 35%⁵. To address this problem of relativity and increase comparability among firms Armstrong, Blouin, Jagolinzer, and Larcker (2015) present a peer-specific adjustment of a firm's mean or median ETR. They construct a tax avoidance proxy defined as the difference between a firm's three-year *GAAP ETR* and the average *GAAP ETR* of the firm's peer group by size and industry.

As stated in the introduction of this chapter, financial statement information and tax return information cannot be matched due to different disclosure requirements. Therefore, the difference between taxable income in the tax return file and pre-tax income in the financial statement can yield information regarding the tax planning activity. Book-tax differences (*BTD*) are calculated as pre-tax book income minus the difference of current tax expense scaled by the statutory tax rate and the change in net operating loss. This idea has already been employed by Mills (1998) who identified an association between *BTD* and the probability to being audited by the IRS. Wilson (2009) documents higher levels of *BTD* for those firms engaged in tax shelters.

⁴ De Simone et al. (2016) list some of these exemptions: tax credits, the domestic production activities deduction or an investment in tax-exempt securities reduce the tax base in a way desired and allowed by the government.

⁵ The statutory tax rate refers to the sample period until 2016 without considering recent legal changes.

The studies suggest that *BTD* – at least to some extent – capture tax planning activity. However, as Hanlon and Heitzman (2010) state, the capital market pressure limits the appropriateness of *BTD*. Therefore, only firms with similar importance on financial accounting earnings can be compared using *BTD*. This makes the measure inappropriate for samples widely differing in capital market pressure.⁶ Next to the just presented total book tax difference, temporary *BTD* are calculated by scaling deferred tax with the statutory tax rate. Similar to the detection ability of ETRs, total and temporary *BTD* are only suitable to capture non-conforming tax planning activities.

As an extension to the idea of book-tax differences, Desai and Dharmapala (2006, 2009) construct abnormal *BTD* via including a correction for accounting earnings management. They regress total *BTD* on total accruals and define the residuals as abnormal *BTD*. Also Frank, Lynch and Rego (2009) define the residuals of their first stage regression (multiply the difference between the effective tax rate and the statutory tax rate with the pre-tax income and regress this expression over a set of control variables) to be the tax planning variable of interest. They name the residuals of this regression DTAX and define it to show any intentional tax planning activity. Hanlon and Heitzman (2010) pronounce that one needs to be careful when defining such a setting. Since it is not obvious which components to include in the first stage model and which components to load in the residuals, the interpretation might be difficult. In a recent study, Chen, Hribar and Melessa (2018) call for caution when generating residuals in a first stage regression to employ them in a second stage regression. Due to the possible bias with the dependent variable in the first regression the second stage results might show incorrect inferences.

Unrecognized tax benefits (UTB) define another variable which has been used by prior literature to detect tax planning activity. The accounting reserve for uncertainty in future income

⁶ This is not as important if comparing public companies only.

taxes is highly sensitive to accounting earnings management since it affects bottom-line earnings. Therefore, this position might be relevant for earnings management rather than a proxy for tax planning activity. If employing UTB in a research setting and deriving inferences, Hanlon and Heitzman (2010) suggest to account for this dual nature and discuss the implications in detail instead of ignoring the earnings management component and declare the variable to be a tax planning indicator. Hutchens and Rego (2015) present a set of determinants to detect tax risk one of which being UTB. Employing several measures is another way to account for the unclear role of UTB for the firm's top management.

Another group of tax planning indicators are tax shelter activities which represent the "aggressive" or non-conforming end of the tax planning continuum. These methods detect firms which are engaged in specific tax shelter activities. Wilson (2009) presents a score derived from certain firm characteristics which detects tax shelter activity and predicts the probability of an engagement in tax shelter activities. Hanlon and Heitzman (2010) present two major disadvantages of such measures. The potential selection bias is a severe statistical problem. Information regarding specific tax shelters are only available, if a firm is either caught or discloses the shelter activity. The second problem with tax shelter scores is the nature of endogeneity. Only if firms are not able to achieve the desired level of tax efficiency⁷ via less "aggressive" strategies a firm is willing to engage in single tax shelter transactions. Therefore, the tax shelter activity does not directly refer to a certain level of company tax planning activity but present a punctual tax "aggressive" transaction next to a certain level of the company's tax planning behavior.

⁷ Tax efficiency refers to increasing after tax returns. Therefore taxes are evaluated as an expense position, which should be minimized to increase shareholder value.

Several different measures overcoming different shortcomings exist to capture tax planning. Although some are supposed to measure the same, the results strongly differ. Hanlon and Heitzman (2010) point out that one should be careful in choosing the right measure that fits the research question. The just presented measures show low correlations although they are supposed to measure the same. Thus, Hanlon and Heitzman (2010) call for further research on tax planning measures.

3 Development of the *Relative Tax Planning Measure*

3.1 Fundamental Idea behind “Relative Tax Planning”

We follow the understanding of tax planning as a continuum drawn by Hanlon and Heitzman (2010). Similar to other studies, the aim of this study is to identify tax planning regardless of being at the conforming or “aggressive” end of the continuum. Therefore, we use the term tax planning to describe a reduction in tax payments regardless of the strategy undertaken.

To enable a replication of our results and a broad use of the measure, our source of data are financial statements rather than tax return files. Using financial statement data calls for caution regarding the informative content. Some key data seem to be more relevant but less reliable while others seem to be more reliable but less relevant. When it comes to tax positions, the *GAAP ETR* seems to more adequately address the principle of causation and attribute the taxes to the respective periods. However, the *GAAP ETR* is not as reliable as the *Cash ETR* since it is subject to the management’s judgement. Although managed GAAP pre-tax income is the denominator for both measures, *GAAP ETR* also contains an information subject to management’s estimation in the nominator. On the other hand, the *Cash ETR* is more reliable than the *GAAP ETR* due to the nature of actually being paid. However, this ratio might be less relevant because of the timing mismatch between the nominator and denominator. The amount of cash taxes paid in a period does not only depend on the pre-tax income from that period. Due to

subsequent tax payments prior years' pre-tax income also affect current year's cash taxes paid. Prior studies like Dhaliwal et al. (2004) confirm this assumption and provide evidence that tax expense information are subject to earnings management. Therefore, we do not want to rely on total tax expense, current tax expense or deferred tax expense. Instead, the amount of taxes actually paid to the tax authority is the information of interest (higher reliability). We account for the timing mismatch via defining cash taxes paid as a function of prior years' and next year's pre-tax income. This approach allows us to employ cash taxes paid while considering the inter-temporal nature of the cash position (increase relevance). At the same time, we do not need to rely on (possibly) managed amounts in the financial reports.

The argument for employing cash taxes paid is the exclusion of current or total tax expense due to the possibility of being managed. Managed information make it impossible to interpret resulting effects. Hanlon and Heitzman (2010) argue that a differentiation between "aggressive" (upward) earnings management and "aggressive" (downward) tax planning is not possible since both result in lower ETRs. It is not clear, whether management actively optimized the nominator or denominator.

Another advantage along with our intertemporal interpretation of cash taxes paid is that we do not need to drop all firm-year observations with negative pre-tax income as done in prior studies (e.g. Badertscher et al. (2013), Cheng et al. (2012), Dyreng et al. (2010), Hoi et al. (2013), Hoopes, Mescall and Pittman (2012), Hope et al. (2013), McGuire et al. (2012) and McGuire et al. (2014)) or tax refunds (Cheng et al. (2012), Hoi et al. (2013), Hope et al. (2013) and McGuire et al. (2012)). An indicator variable for loss firms enables the special treatment of loss firms when it comes to tax questions. Therefore, results drawn from employing the new measure do not only hold for profitable firms but for loss firms as well. Further, no bias due to the exclusion of loss firms causes distorted results and estimates. Our proxy for tax planning should be unbiased with loss firms and the pre-tax income.

The tax planning measure should provide an intuition for a firm's tax planning behavior in relation to other companies as well as in relation to its own (past) tax planning behavior. Therefore, the model provides a time-invariant component expressing the firm's average tax planning level in relation to others (all other companies or the industry peer-group). It would be quite naïve not to allow for a changing tax planning behavior. Hanlon and Heitzman (2010) argue that the level of tax planning depends on certain internal and external characteristics. These might change over time. Therefore, the second tax planning component addresses this requirement and expresses any deviations from the firm specific time-invariant tax planning level.

While the relative understanding of tax planning is a major strength of the new measure, it is necessary to mention that it also has a limitation. If all firms reduce their tax liabilities analogically, the new measure might not identify the tax planning activity.

3.2 *Technical Construction of the Relative Tax Planning Measure*

The tax burden a company has to face is defined by the taxable income and the statutory tax rate (τ). For reasons of data availability and replicability, we approximate the taxable income by the GAAP pre-tax income. Since the sample consists of US corporations only, τ equals a constant term 0.35 and, technically, reduces pretax income to 35% and defines this amount as tax expense.⁸ However, several exceptions and firm specific peculiarities make it impossible to estimate taxes paid by multiplying the pre-tax income with the statutory tax rate. An unobservable factor which accounts for any deviations from the statutory tax rate needs to be considered, the adjustment term a . This term comprises tax effective reductions like permanently reinvested earnings. Prior literature therefore defines the *Cash ETR* as the product of τ and a which is

⁸ For simplicity we refrain from distinguishing between various state tax rates. Different statutory tax-rates across countries can be modeled by including in the regression function. Such an inclusion also enables tax-rate changes over time.

calculated dividing $TXPD$ by PI . Equation (1) shows the idea of thinking about tax planning as an additional term to calculate the tax burden.

$$TXPD_{it} = PI_{it} * \tau * a_{it} \quad (1)$$

As shown in the literature review section, prior studies regularly apply a variation of the expression in Equation (1) defined as worldwide cash taxes paid divided by pre-tax income (*Cash ETR*). This approach displays a , which is responsible for any deviations from the statutory tax rate, together with the statutory tax rate in one expression ($Cash\ ETR = \tau * a = TXPD/PI$). Dyreng and Lindsey (2009) rearrange this expression for their analysis to come back to the idea of calculating the tax burden. We follow their approach and do not display the adjustment term with the statutory tax rate but express a together with pretax income as shown in Equation (1).

While prior literature applies worldwide cash taxes paid, we estimate domestic cash taxes paid to enable a comparison of multinational firms with domestic firms. The amount of foreign cash taxes paid depends on the countries a company pays taxes in and the respective tax rates. In addition, the relative composition influences the foreign tax burden. Excluding foreign cash taxes paid from the left side of the equation makes companies comparable – the multinationals with one another and with domestic firms. Since the United States are characterized by a worldwide tax system the amount of domestic cash taxes paid may be explained by domestic pre-tax income and foreign pre-tax income. However, foreign taxes need to be considered as well since foreign tax credits may reduce the domestic tax burden.

Since tax regulations differentiate between gains, which are subject to taxation, and losses, which are not, Equation (2) presents this estimation considering the special role of losses via including an indicator variable $LOSS$ equal to one for firms with a negative pre-tax income and zero for firms with positive pre-tax income. Since most double taxation arrangements do not

allow a consideration of foreign losses, we apply an interaction with domestic pre-tax income instead of worldwide pre-tax income.⁹

$$TXPD_{i,t}^{DOM} = \alpha_0 + \beta_1 PI_{i,t}^{DOM} + \gamma_1 PI_{i,t}^{FO} + \delta_1 LOSS_{i,t} * PI_{i,t}^{DOM} + \vartheta_1 LOSS_{i,t} + \mu_1 TXPD_{i,t}^{FO} + \overline{Control} + \varepsilon_{i,t} \quad (2)$$

However, cash taxes paid is not only characterized by accounting transactions in year t but also includes prior year's pretax income due to subsequent tax payments. The amount of income taxes paid by company i in time t constitutes the dependent variable ($TXPD^{DOM}$). The dependent variable is explained by the domestic and foreign pretax income (PI^{DOM} and PI^{FO}) in time $t-3$, $t-2$, $t-1$, t and $t+1$. For the special treatment of loss firms we incorporate the loss indicator variable in time t and the interaction with domestic pre-tax income in time t . Equation (3) illustrates the regression model to determine the coefficients for estimating domestic cash taxes paid.

$$TXPD_{i,t}^{DOM} = \alpha_0 + \vec{\beta} \sum_{t=-3}^{+1} PI_{i,t}^{DOM} + \vec{\gamma} \sum_{t=-3}^{+1} PI_{i,t}^{FO} + \delta_1 LOSS_{i,t} PI_{i,t}^{DOM} + \vartheta_1 LOSS_{i,t} + \mu_1 TXPD_{i,t}^{FO} + \alpha_1 SIZE_{i,t} + \alpha_2 LEV_{i,t} + \alpha_3 PPE_{i,t} + \alpha_4 INTAN_{i,t} + \alpha_5 CASH_{i,t} + \alpha_6 GROWTH_{i,t} + \alpha_7 NOL_{i,t} + FirmFE_i + \varepsilon_{i,t} \quad (3)$$

The OLS estimation model yields *beta* and *gamma* coefficients 1 to 5. β_1 (γ_1) shows how the amount of domestic taxes paid in time t is influenced by domestic (foreign) pre-tax income in time $t-3$. Variable $TXPD_{i,t}^{DOM}$ indicates the amount of domestic taxes paid by company i in time t . $PI_{i,[t-3;t-2;t-1;t;t+1]}^{DOM}$ is the domestic pretax income of company i in t [-3, -2, -1, 0, +1] while $PI_{i,[t-3;t-2;t-1;t;t+1]}^{FO}$ is the foreign pretax income of company i in t [-3, -2, -1, 0, +1]. $TXPD_{i,t}^{FO}$ is the foreign cash taxes paid by company i in t . The control variables are *SIZE* which is defined as the natural logarithm of total assets, *LEV* is defined as total long-term debt scaled by total

⁹ Untabulated regression results suggest that it does not matter whether to interact loss with domestic or worldwide pre-tax income. The statistical significance is the same yielding a slightly higher coefficient.

assets, *PPE* represents property, plant and equipment also scaled by total assets, *INTAN* is defined as total intangible assets scaled by total assets and *CASH* represents the company's cash scaled by total assets. *GROWTH* is defined as the growth rate of pre-tax income and *NOL* represents the net income if it is smaller than zero.

The panel regression estimates Equation (3) as a firm-fixed effects model. By running the regression as a firm-fixed effects model, the regression estimates the coefficients, which equal a multiplier similar to the effective tax rate but only including characteristic-varying effects. Firm-specific time-invariant effects will be attributed to the firm-fixed effects.

Equation (3) provides an estimation of domestic cash taxes paid depending on several years' domestic and foreign pre-tax income. After estimating the coefficients presented in Equation (3), these coefficients are used to predict the amount of estimated domestic cash taxes paid in time t ($\widehat{TXPD}_{i,t}^{DOM}$) given the pretax income in periods $t-3$ to $t+1$ for each firm-year observation. This estimation of domestic cash taxes paid refers to the relative amount of taxes a firm should pay in year t given the information on domestic and foreign pre-tax income for the current and three prior years, foreign cash taxes paid, the loss situation and a set of control variables for the current year.

In analogy to Choudhary, Koester, and Shevlin (2016) who develop a proxy for tax accrual quality we are primarily interested in the residuals of Equation (3) instead of the coefficients. The residuals of this estimation represent the deviation of the estimated amount of taxes paid from the real amount of taxes paid. However, applying the firm-fixed effects model, the residuals are adjusted for time-invariant deviations. Therefore, the residuals show characteristic-varying deviations, only. These characteristic-varying deviations are multiplied with -1 to be positive if taxes paid is smaller than estimated taxes paid. Such an observation is labeled "tax planning". Since a certain deviation can only be evaluated in relation to the estimated amount of taxes paid, the residuals are standardized by dividing them by the amount of taxes paid. The

scaling with cash taxes paid which has been the dependent variable in the first stage regression enables an unbiased interpretation of the residuals.¹⁰

$$RTPM_{i,t}^{time} = \frac{\varepsilon_{i,t}}{\widehat{TXPD}_{i,t}^{DOM}} * (-1) \quad (4)$$

However, the second dimension needs to be considered if evaluating firm-year observations in a panel structure. Having estimated the characteristic-varying tax planning behavior, the time-invariant firm-specific tax planning behavior is also of interest. Therefore, the firm-specific estimated fixed effects serve as an indicator for time-invariant tax planning. In analogy to the characteristic-varying estimation, the time-invariant deviations are multiplied with -1 to be positive if taxes paid is smaller than estimated taxes paid. Also, a normalization with taxes paid yields a relative indicator.

$$RTPM_{i,t}^{firm} = \frac{FirmFE_i}{\widehat{TXPD}_{i,t}^{DOM}} * (-1) \quad (5)$$

Having estimated the characteristic-varying and time-invariant amount of tax planning for each company in each year, adding both effects results in the final tax planning measure $RTPM$ for firm i in time t .

$$RTPM_{i,t} = RTPM_{i,t}^{time} + RTPM_{i,t}^{firm} = \frac{-\varepsilon_{i,t}}{\widehat{TXPD}_{i,t}^{DOM}} + \frac{-FirmFE_i}{\widehat{TXPD}_{i,t}^{DOM}} = \frac{-(\varepsilon_{i,t} + FirmFE_i)}{\widehat{TXPD}_{i,t}^{DOM}} \quad (6)$$

The result of Equation (6) represents the new relative tax planning measure ($RTPM$). If the value is greater than the mean, tax planning is indicated for a company. Values lower than the mean indicate that the company is paying more taxes than expected based on the regression from Equation (3).

¹⁰ Chen et al. (2018) suggest to normalize residuals with the dependent variable to avoid a bias in later regressions.

3.3 Sample and Descriptive Statistics

The sample is drawn from Compustat North America providing consolidated firm-year observations for active US companies. To enable a long-term perspective and replicate the findings on tax planning for domestic firms versus multinational firms from Dyreng et al. (2017) we need the analysis to start in 1988 and range until 2016 since data for 2017 provides insufficient information. For setting up the new measure, 3 lagged and one lead period are necessary resulting in a total (applicable) sample period from 1985 to 2016 (1988 to 2015). The unbalanced sample yields 211,329 firm-year observations in total. As done in prior studies we exclude firms from the finance and assurance sector (less 53,758 observations). For setting up the new tax planning measure, we lose years 1985-1987 and 2016 with 21,303 firm-year observations. Also, five consecutive firm-year observations are necessary (less 32,997 observations) along with information on the control variables (less 10,074 observations). The final number of firm-year observations therefore is 93,197. The aim of this paper is to present the relative tax planning measure. Therefore, a comparison with established tax planning measures should validate the new measure. Table (1) provides a summary of descriptive statistics for the new relative tax planning measure, a set of tax planning measures and the variables used for setting up *RTPM*.

<Please insert Table (1) about here>

The first row reports the descriptive statistics for *RTPM*. In total 93,197 firm-year observations provide information on *RTPM*. The mean value of *RTPM* is 0.4587 with a standard variation of 1.8 ranging from -8.5 to 8.4. $RTPM^{firm}$ and $RTPM^{time}$ are the two components summing up to the relative tax planning measure. While $RTPM^{firm}$ has a similar mean as *RTPM*, it is not surprising that the firm-fixed component is characterized by a lower standard deviation only ranging from -3.8 to 3.6. In contrast, $RTPM^{time}$ has a mean of approximately 0 with a high standard variation ranging from -7.5 to 7.2. Turning to the effective tax rates yields a consistent picture compared to prior literature. The single-year and long-run ETRs are truncated at 0 and 1 and

therefore limit the number of observations. While the structural loss of data is not as severe for the *GAAP ETR* the *long-run Cash ETR* shows 74,114 observations only. The mean effective tax rate ranges from 26.47% for the *Cash ETR* to 33.76% for the *GAAP ETR*. Book-tax differences are available for 138,521 observations while providing a mean of 18.989 with a high standard deviation of 737. Information on cash taxes paid is available for 144,171 firm-year observations with a mean of 45.037. $TXPD^{DOM}$ is calculated as total cash taxes paid minus foreign cash taxes paid resulting in the same number of observations as *TXPD* but a lower mean of 32.4. $TXPD^{FO}$ is equal to zero if a firm does not report any foreign cash taxes paid. The number of observations therefore equals the sample size and the mean value becomes very small with 5.8. A similar picture occurs for pre-tax income and the separation into a domestic and a foreign portion. While information on PI is available for 199,270 firm-year observations the mean for total pre-tax income is 136.85 and for domestic pre-tax income 106.74. foreign pre-tax income is calculated in analogy to foreign cash taxes paid resulting in 216,541 observations with a mean of 16.52. Since unprofitable firms are excluded for any analyses employing various ETR measures the final variable *LOSS* is an indicator variable equal to 1 in case of negative pre-tax income and zero otherwise. The mean of 0.319 indicates that nearly one third of all firm-year observations are loss-firms which are structurally excluded if working with single-year ETRs.

<Please insert Table (2) about here>

In Table (2), the Spearman and Pearson correlations are presented. The Spearman correlations are reported below the diagonal and the Pearson correlations are reported above the diagonal. *RTPM* shows a high correlation with $RTPM^{firm}$ and $RTPM^{time}$ what is not surprising since it is the sum of both. If comparing *RTPM* with the different effective tax rates, one would expect a higher association with *Cash ETR* than with *GAAP ETR*, since taxes paid is a component of both, *RTPM* and *Cash ETR*. The association with book-tax differences is very low but with the

predicted sign. The correlation matrix underlines the statement by Hanlon and Heitzman (2010): Although the measures of tax planning are supposed to measure the same, they vary in terms of assumptions and informative content.

3.4 Results of Constructing RTPM

Table (3) presents the regression results applying an ordinary least squares estimation model. Robust standard errors are applied for the fixed effects (FE) model. Column (1) reports the coefficients from regressing Equation (3) while Column (2) reports the t-statistics. Column (3) shows the regression without control variables and Column (4) presents the corresponding t-statistics.

<Please insert Table (3) about here>

For the main regression, 93,197 firm-year observations are available resulting in an adjusted R^2 of 72.27%. 72% of the variation in $TXPD^{DOM}$ can be explained by the domestic and foreign pre-tax income from the current, prior three and next year as well as the loss indicator with the interaction term and the control variables. The regression coefficients and their signs for the current, lagged and leading pre-tax income are consistent with intuition. Both, domestic and foreign pre-tax income seem to increase domestic cash taxes paid. Looking at domestic pre-tax income first, most impact stems from current year's pre-tax income with yearly decreasing impacts through t-3 and lowest coefficient in t+1. Current year's domestic cash taxes paid comprises 8.1% of current year's domestic pre-tax income, 6.6% of last year's domestic income, approximately 2% of domestic pre-tax income in t-2 and t-3 and 1.5% of next year's domestic income. All coefficients are statistically significant on a level of 1%.

Since the United States are characterized by a worldwide taxation system, foreign pre-tax earnings also affect domestic cash taxes paid. In contrast to domestic pre-tax income, domestic cash

taxes paid is associated with current year's and prior years' foreign pre-tax income while pre-tax income in t+1 do not seem to be associated with $TXPD^{DOM}$. Current year's domestic cash taxes paid further comprises 7.6% of current year's foreign pre-tax income (1% significance interval), 8.8% of last year's domestic income (1% significance interval) and approximately 3.5% of domestic pre-tax income in t-2 (1% significance interval) and t-3 (5% significance interval). Again, all coefficients show positive signs indicating that foreign pre-tax income increases the tax burden at home. When applying foreign pre-tax earnings in the equation, foreign cash taxes paid need to be considered as well. Foreign tax credits may reduce the tax liability at home and therefore a negative sign is predicted for an association of foreign cash taxes paid with domestic cash taxes paid. Indeed, the coefficient is negative with statistical significance on a level of 1%. The coefficient needs to be interpreted as follows: Current year's domestic cash taxes paid are reduced by 75.2% of foreign cash taxes paid. The coefficient seems to make sense. This may be a hint towards double taxation for multinational companies which are not able to fully deduct foreign tax expense. This may also be an indicator for higher tax rates for multinational firms. Domestic firms do not run into double taxation for domestic pre-tax income.

The loss indicator variable does not provide any statistical significance. However, the interaction term with domestic pre-tax income provides a negative coefficient on a significance level of 1%. A company's loss in the current period seems to be associated with an increase in cash taxes paid by 10% of the loss.¹¹ The negative sign indicates the special role of loss firms if it comes to taxation. Not allowing for a different treatment via another coefficient would lead to

¹¹ The negative coefficient is necessary to offset the implied tax refund by $\beta_4 (PI^{DOM}$ in t) and prior years' induced effect on cash taxes paid.

identical coefficients for profitable firm-year observations as for non-profitable ones. Therefore, the positive coefficient would indicate negative cash taxes paid similar in magnitude to profitable firms in the presence of a loss year resulting in a corresponding tax refund.

For the control variables, only *SIZE*, *CASH*, *GROWTH* and *NOL* provide significant coefficients indicating that domestic cash taxes paid increases with firm size and the growth rate while decreases with the amount of cash held by the company and net operating losses.

As a robustness test, the variation of Equation (3) provides the same regression without incorporating control variables. According to our theory, control variables should not explain our results and the associations of pre-tax income with domestic cash taxes paid. Although *SIZE*, *CASH*, *GROWTH* and *NOL* are statistically significant on a level of at least 5%, the results from a regression without control variables underline the findings from column (1). A comparison of the respective coefficients yields the same statistical power with similar statistical and economic significance. The adjusted R^2 slightly decreases by 0.73 percentage points. As indicated by the comparison, the control variables do not explain much variation in the dependent variable or drive the significance or magnitude of the coefficients of interest. Due to the explanatory power provided by *SIZE*, *CASH*, *GROWTH* and *NOL* we proceed with the model definition as shown in Equation (3) containing the set of control variables.

<Please insert Figure (1) about here>

Figure (1) presents the development of *RTPM* over time by plotting yearly mean values. The illustration provides a first impression for a slightly rising time-varying tax planning component which constantly jumps around zero. Characteristic-varying tax planning seems to be constant over time while the combination of both slightly increases over time.

The model specification with firm-fixed effects does not allow for industry specific adjustments or industry-fixed effects. Structural differences across industries may be possible and should be

controlled for. Therefore, Figure (2) provides a graphical illustration of $RTPM$, $RTPM^{firm}$ and $RTPM^{time}$ for each industry separately.

<Please insert Figure (2) about here>

While some industries are characterized by high volatility (Agriculture and Public Administration) others show extremely low variation over time (Trade and Services). In addition, the development over time seems to be different across industries. While for example Transportation and Communication seem to increase the tax planning activity over time, Trade seems to lower tax planning while Mining and Construction or Services seem to hold a constant level. The graphical analysis provides some evidence that a difference tax planning behavior may exist across industries. To address this finding, we modify our estimation of domestic cash taxes paid in the regression model following Equation (3) by running the model per industry.

<Please insert Table (4) about here>

Table (4) presents the regression coefficients after running Equation (3) within each industry. The number of observations within each industry varies between 425 (Agriculture, Forestry and Fishing) and 41,874 (Manufacturing). The adjusted R^2 also varies between 92.1% (Agriculture, Forestry and Fishing) and 56.8% (Public Administration). Overall, less coefficients seem to be statistically significant while still providing good adjusted R^2 . Taken together, the coefficients on domestic pre-tax income confirm prior findings across all industries. Nevertheless, foreign pre-tax earnings seem to be especially relevant for Manufacturing. The findings on the loss interaction term still hold and foreign tax credits seem to be relevant for all industries but Transportation and Communication. The regression results hint towards a different composition of domestic cash taxes paid. Therefore, running the regression to estimate $RTPM$ should be done per industry to allow for other coefficients and industry-specific specialties. Running the main model per industry yields a similar picture as provided in Figure (1).

<Please insert Figure (3) about here>

Figure (3) presents yearly mean tax planning after having estimated domestic cash taxes paid per industry. Although time-varying tax planning shows a similar movement around zero as shown in Figure (1), the amplitude seems to be bigger. Consequently, the volatility of *RTPM* is higher if running the model per industry.

4 Appropriateness of *RTPM*: Seeding Artificial Tax Planning

4.1 Idea of Artificially Seeding Tax Planning Behavior

A major problem evaluating the quality of a tax planning measure is verification. Since the “real” tax planning strategy or an intrinsic tax planning behavior of a firm is not known, the classification of one measure as superior is difficult. However, De Simone et al. (2016) present the idea of artificially “seeding” additional tax planning into a given sample. Randomly treating some observations with additional tax planning enables a comparison of how different measures identify the treated firms. Having seeded additional tax planning for a known treatment group enables to check for better detection of these treated firms.

De Simone et al. (2016) combine an allocation of additional tax planning following a permanent avoidance strategy, a temporary avoidance strategy which reverses in the next year and a combination of both. In analogy to their approach, we employ three different seeding methods to mimic diverse strategies for reducing a firm’s tax position. We seed artificial tax planning following (1) a single-year reduction of taxes, (2) a reversal strategy, which reduces the tax position in the year of the treatment but increases the tax position in the next year, and (3) a permanent reduction of taxes, which equals a reduction of the tax position in every year following the treatment.

Randomly, numbers following a normal distribution with an expectation value of -1 and a standard deviation of 1 are allocated to each firm-year. Each positive value identifies the treatment

(approximately 15% of the sample). All firm-years allocated to the treatment group receive a reduction of their tax position. Not changing the pre-tax income, cash taxes paid, current tax expense and total tax expense are reduced to mimic an additional tax planning activity. The amount of the reduction equals 3% of the pre-tax earnings the firm faces in the year of the treatment. In case of a single-year reduction the tax position is reduced in the year of treatment only. When applying the reverting reduction, the treated firms receive a reduction (as calculated above) in the year of the treatment while receiving an increase in the tax position by the same amount one year after the treatment. The permanent reduction decreases the firms' tax position not only in the year of the treatment but also for all following years (by the previously calculated amount).

A logistic regression should provide possible associations between the treatment (having receiving artificial tax planning) and the respective measure for identifying tax planning. The measures should detect tax planning activities. Knowing which observations received such an additional reduction of the tax position we can evaluate the detection of the various tax planning measures.

$$\begin{aligned}
 treatment_{i,t} = & \beta_0 + \beta_1 TPM_{i,t} + \beta_2 SIZE_{i,t} + \\
 & \beta_3 ROA_{i,t} + \beta_4 LEV_{i,t} + \beta_5 PPE_{i,t} + \beta_6 INTAN_{i,t} + \beta_7 CASH_{i,t} + \beta_8 GROWTH_{i,t} + \varepsilon_{i,t}
 \end{aligned} \tag{7}$$

If the respective measure adequately identifies tax planning, statistically significant results should document such ability. Receiving the treatment is explained by the respective tax planning measure (TPM) and a set of control variables as shown in the logistic regression in Equation (9).

4.2 Regression Results on Seeding Artificial Tax Planning

Table (5) presents the logistic regression results for explaining the probability of having received the treatment of additional tax planning as the dependent variable. To address concerns of multicollinearity the logit model regresses the treatment indicator on each tax planning measure separately.

<Please insert Table (5) about here>

The first column estimates the logit model with the *Cash ETR* as the independent variable along with a set of control variables. Column (2) presents the regression with the *long-run Cash ETR* as the independent variable while Column (3)/ (4)/ (5) and (6) explain the indicator variable for having received the treatment via the *GAAP ETR/ long-run GAAP ETR/ BTD* and *RTPM*.

The logistic regression provides statistically significant (1% confidence interval) coefficients for all six tax planning measures indicating an association of the various measures with additionally seeded tax planning. The first row provides the marginal effects of the respective tax planning measure. Again, all coefficients are significant on a level of 1%. The marginal effect needs to be interpreted as follows: An increase of the *Cash ETR* by 1% is associated with a decrease in probability of having received the treatment of 0.03%. The margins are estimated at means and therefore not as easy to interpret for the whole sample. The important notion here is that statistical significance is indicated for all tax planning measures.

To get an impression for the suitability of the different tax planning measures we apply the various measures and mark those firm-years for which the measure detects tax planning. In a second step, we look at all firm-year observations, which have received the treatment and compare the number of detections by the various measure. Table (6) only reports firm-years, with a treatment.

<Please insert Table (6) about here>

RTPM classifies over 27,000 observations which received an additional tax planning treatment as “tax planner” and therefore shows a detection-rate of over 80%. The *long-run Cash ETR* is only able to identify approximately 7,000 observations.¹² The detection-rate for the *long-run Cash ETR* is approximately 53%, which is even lower than the detection rate of the single-year *Cash ETR* of nearly 57%. This finding is not surprising since the long-run measure averages the single year effects. The *GAAP ETR (long-run GAAP ETR)* provides a detection-rate of only 44% (43%) which is even lower. *BTD* can slightly improve that rate to 50% but still provides unacceptable results.

The picture drawn from the descriptive table indicate that *RTPM* actually might be able to identify tax planning behavior. The unsatisfactory result for the effective tax rates can be explained by the nature of the measure and the handling of rates below 0. Since observations with a negative ETR are typically excluded from the analysis, the measure fails to show these firms as tax planning companies. Additionally, this finding underlines the importance of adequately handling loss-firms and confirms the finding of DeSimone et al. (2016) and Henry and Sansing (2014) regarding the consequences of truncating ETRs.

The seeding process just presented is designed in a way to mimic single-year tax planning without consequences for future periods. This assumption is quite naïve and therefore the second seeding strategy implies a reverting effect of the tax deduction in the following year. Since no measure applies forward tax information, the results are not expected to significantly change.

<Please insert Table (7) about here>

Indeed, the results are similar to those of the single-year reduction provided in Table (5). All tax planning measures provide statistically significant associations with the predicted sign. The marginal effects are also statistically significant on a level of 1%. As previously supposed the

¹² A firm is identified as a tax planner if its ETR is below the mean ETR.

seeding of additional tax planning for just one year yields consistent results compared to a seeding strategy with a reverting increase in the tax position one year after the reduction. We therefore assume similar detection rates for the reverting seeding process as for the single year seeding. Since allocation of the treatment follows a random assignment, the control variables should not be associated with the indicator variable. In contrast to the tax planning measure, which are calculated containing the seeding information, the set of control variables miss such a relation.

<Please insert Table (8) about here>

Table (8) provides similar results as Table (6) regarding the number of correct classifications as having received additional tax planning. Looking at those firms having received the treatment, *RTPM* shows a detection rate of 82% while the best effective tax rate measure is the single-year *Cash ETR* with a rate of only 56.8%. *BTD* provides an even lower rate of 50%.

Next to single-year reductions of taxes paid due to tax planning behavior and single-year reductions followed by increases one year after the reduction, some tax planning strategies are characterized by permanent changes of tax positions. Since tax planning can be seen as a continuum as described by Hanlon and Heitzman (2010), these strategies might be located at the more aggressive end compared to reverting strategies or single-year reductions. The third seeding strategy intends to mimic such a strategy by permanently adding artificial tax planning via a permanent reduction of taxes paid following each year after the treatment. The magnitude of the reduction is calculated in analogy to the prior seeding strategies resulting in the regression results presented in Table (9).

<Please insert Table (9) about here>

The logistic regression provides consistent results and supports the findings derived from the prior seeding strategies. It seems that throughout all seeding variations, the logistic regression

model identifies a significant association between the tax planning measures and the probability of having received the treatment.

<Please insert Table (10) about here>

Looking at the numbers indicating the detection of firm-year observations as high tax planning in Table (10) provides a consistent view. Throughout all variations of seeding additional tax planning behavior into the dataset, *RTPM* identifies on average 82% of all treated firms correctly while the (*long-run*) *Cash ETR* on average detects 54%. Similarly, (*long-run*) *GAAP ETR* on average identifies 45% while *BTD* identifies 51%. Taken together, the research design of seeding artificial tax planning into a real dataset hints towards a superiority of *RTPM* in identifying tax planning behavior in the form of reduced tax payments.

The active manipulation of data needs to be developed further and verified in several repetitions. Applying a randomized design makes it difficult to reproduce exactly the same output. This disadvantage might not be severe if applying big samples following the law of large numbers. Furthermore, a severe problem occurs with the artificial seeding of tax planning. The different measures are constructed in a way to identify tax planning in general and not artificially seeded tax planning. That means, that the purpose of a measure is not to identify those firms treated with additional reductions in taxes paid but identify those firms, which are characterized by tax planning after the seeding. Although identifying the treated firms is a good indicator for identifying tax planning, the measures might detect tax planning for firms, which are engaged in such strategies but are not treated with the seeding. Such a finding would be judged as a false detection in the model although it is not.

5 Tax Planning by multinationals and domestic firms

5.1 Separation in multinationals and domestic firms

Regardless of the statistical measure chosen to identify tax planning activities, conforming tax planning may be performed via various channels. Tax planning may be executed via income shifting from one period into another, from one jurisdiction into another or by converting income from one type into another. While non-multinational firms may be able to convert income from one type into another or postpone earnings into future periods, they may not be able to shift income from one jurisdiction into another. The lack of presence in several countries may be a disadvantage since typical trans-jurisdictional shifting instruments like internal debt financing, transfer price determination or internal license arrangements are not available. Therefore, one might expect less income shifting potential for domestic firms in comparison to multinational firms. The more astonishing is the finding by Dyreng et al. (2017) who find lower effective tax rates for domestic firms compared to multinational firms. The authors interpret their finding as evidence for more tax planning associated with domestic firms. Figure (1) shows mean *Cash ETRs* for multinational and domestic firms over the sample period from 1988 to 2016.

<Please insert Figure (4) about here>

Throughout the whole sample period, multinational firms show higher *Cash ETRs* than those firms lacking international presence. In accordance to Dyreng et al. (2017), we imply international presence if foreign pretax earnings or foreign cash taxes paid is not zero or missing. Although no explanation solves this puzzle, the difference in effective tax rates between multinationals and domestics seems to be statistically significant. Edwards, Kubata and Shevlin (2017) provide a detailed analysis on why the effective tax rate is correlated with pre-tax income. They show that declining ETRs might not indicate tax planning but can be the mechanical result of the definition. This finding along with Dyreng et al. (2017) call for an alternative measure to identify tax planning in order so unravel the puzzle of tax planning differences between multinationals and domestics.

5.2 Explaining the differences by employing RTPM

In order to analyze potential differences in tax planning behavior between multinational and domestic firms, we follow the approach by Dyreng et al. (2017) and plot the year-mean values of $RTPM$, $RTPM^{firm}$ and $RTPM^{time}$ for multinationals and domestics. Figure (5) shows the development of RTPM for multinationals in black and for domestics in grey. Triangles and the dash-dot line indicate time-varying tax planning. The rhombus with the dash line indicates characteristic varying tax planning. Circles and the solid line mark the combination of both resulting in the final tax planning score.

<Please insert Figure (5) about here>

The time-varying component is characterized by sinusoidal course around zero for both, multinational and domestic firms. For the chosen sample period, an increase of time-varying tax planning is indicated by comparing the value of negative 0.2 (0.1) in 1988 and positive 0.1 in 2015. However, if the sample period had been chosen to last from 2006 to 2015, a negative slope would have indicated a decrease in time-varying tax planning. On the other hand, characteristic-varying tax planning seems to be slightly higher for domestic firms although the difference is not high and reverts from 2011. Taken together, $RTPM$ starts to be higher for domestic firms from 1988 to 1997, higher for multinationals from 1998 to 2004 and higher for domestic firms from 2005 to 2009. For the period after 2009, the levels are similar. The graphical illustration provides a first intuition for similar tax planning behaviors when comparing domestic and multinational firms. However, why is the result different compared to a picture drawn by ETRs? The answer lies in the mechanical construction of ETRs. Mixing domestic and foreign pre-tax income and taxes may result in a distortion. If we would run our model without a separation into domestic and foreign pre-tax income (cash taxes paid) but regressing global

cash taxes paid on the current and lagged global pre-tax income, the picture resembles the one drawn by employing ETRs.

<Please insert Figure (6) about here>

Figure (6) presents the graphical illustration of *RTPM* following the divergent definition without the separation into domestic and foreign pre-tax income and taxes. While the time-varying component provides a similar course, the characteristic-varying component does not. Characteristic-varying tax planning seems to be much higher for domestic firms compared to multinational firms. This conclusion is similar to the one derived by looking at the ETR plot provided in Figure (1). Not differentiating between multinational and domestic income ignores problems with double taxation when income may be taxed by the foreign jurisdiction and the home state. The regression results from Table (3) suggest that domestic cash taxes paid is associated with 20.02% of domestic pre-tax income while 22.02% of foreign pre-tax income. Since statutory tax rates in the United States are one of the highest in the world, higher foreign statutory tax rates do not explain the higher effective taxation.

Following the idea of a worldwide taxation system, where domestic taxes are raised on global pre-tax income, foreign tax credits play an important role. As noted above, the high statutory tax rate in the US should enable a large foreign tax credits (up to 35%). Since most statutory rates are below 35%, the regression's coefficient should be similar to negative one. However, the coefficient equals negative 0.678. This indicates that only 68% of foreign cash taxes paid reduce the amount of domestic cash taxes paid. The reasoning may be found in problems following double taxation. It seems that one third of foreign taxes is not credited and subject to double taxation. Therefore, multinational firms face higher cash taxes paid in comparison to domestic firms, which do not face double taxation and a structural increase of cash taxes paid. Not addressing differences in foreign and domestic pre-tax income leads to higher effective tax rates by default. Therefore, the finding of Dyreng et al. (2017) does not seem surprising but

results from the special role of foreign pre-tax income and foreign cash taxes paid in the light of double taxation.

In addition to the graphical illustration, we evaluate the difference between multinational and domestic firms regarding statistical significance. To get a first impression on the time-trend and potential differences, an OLS regression estimates $RTPM$ as the dependent variable via the independent variables $TIME$ (a consecutively running variable over years), $MULTI$ (an indicator variable with 1 for multinational firms) and the interaction term of both. To not only analyze the sum of time-varying and characteristic-varying tax planning together, we expand the model by estimating $RTPM^{firm}$ and $RTPM^{time}$ via the independent variables just presented as presented in Equation (8).

$$RTPM_{i,t}/RTPM_{i,t}^{firm}/RTPM_{i,t}^{time} = \beta_0 + \beta_1 TIME_{i,t} + \beta_2 MULTI_{i,t} + \beta_3 TIME_{i,t} * MULTI_{i,t} + \varepsilon_{i,t} \quad (8)$$

The coefficient of interest for identifying a significant difference between multinational and domestic firms is β_2 . The coefficient β_1 may identify a time-trend for tax planning. Increasing (decreasing) tax planning may be indicated by a positive (negative) coefficient, which would (not) be in line with decreasing ETRs as shown by Dyreng et al. (2017). Furthermore, the coefficient β_3 indicates a different time-trend for tax planning by multinationals over the past decades whereas no significance may be a hint towards a similar development for both groups of companies.

<Please insert Table (11) about here>

The regression provides a very low R^2 of 0.1%. The low R^2 is not surprising since the regression does not aim to explain $RTPM$ but provide an indication for an association with the variables of interest. Column (1) provides the regression coefficients for estimating the sum of time- and

characteristic-varying tax planning. The coefficient on *TIME* is positive and statistically significant on a level of 1% indicating slightly increasing tax planning over time. However, the coefficient on *MULTI* does not provide any significance, not even on a level of 10%. This hints towards no major difference between multinational and domestic firms regarding tax planning. In addition, the coefficient for the interaction term does not provide any significant results, too. This indicates not only missing statistical significance regarding different levels of tax planning for multinationals and domestics but also missing statistical significance regarding a different development of tax planning over time.

Column (2) presents the regression estimation for characteristic-varying tax planning. Since firm-fixed effects constitute the measure, the coefficient for *TIME* and for the interaction term yield no statistical results. However, the coefficient for *MULTI* does not provide any statistical significance at all indicating no major difference for characteristic-varying tax planning between multinationals and domestics.

Column (3) presents the regression estimation for time-varying tax planning. Similar to column (1), a positive time trend indicates slightly increasing tax planning over the past decades with statistical significance on a level of 1%. While the interaction term provides no statistical significance, the coefficient for *MULTI* is positive on a significance level of 10%. Regarding time-varying tax planning, multinational firms are associated with higher tax planning behavior than domestic firms. However, the association is so small, that any differences disappear statistically when aggregating both tax planning components.

To support the intuition derived from the graphical illustration and the regression, a t-test should serve as an additional robustness check. The two-sided t-test evaluates whether $RTPM$, $RTPM^{firm}$ and $RTPM^{time}$ significantly differ for multinational and domestic firms. The sample period is quite long and differences may be stronger in some sub periods than in others. Therefore, the t-

test is performed per year. Figure (7) provides a plot with the t-test significance level for $RTPM$, $RTPM^{firm}$ and $RTPM^{time}$ per year.

<Please insert Figure (7) about here>

The three horizontal lines mark the levels of 1%-/5%- and 10%-significance. Circles mark the significance for $RTPM$, triangles mark the significance for $RTPM^{time}$ while rhombuses mark the significance for $RTPM^{firm}$. While most t-tests provide no statistical significance, the results are in line with no differences in tax planning behavior between multinational and domestic firms. However, for some years the t-test identifies significant differences, for $RTPM$ and its two components. Throughout the whole sample period, the t-test provides a strongly significant difference for $RTPM$ just for one year. Only in 2008 during the financial crisis, $RTPM$ differs for multinational and domestic firms. However, the difference may not be induced by different tax planning behavior but may be the result of a different impact on earnings for multinational and domestic firms. A significant difference on a level of 5% is indicated for 2001 with the burst of the Tech-Bubble. Differences for characteristic-varying tax planning are not statistically significant on a level of 1% throughout the whole sample period. However, differences for time-varying tax planning seem to be significant on a level of 1% for the years 1999 to 2002 (during the Tech-Bubble) and in 2008 (financial crisis) and 2011 (flash crash). The t-test hints towards differences in tax planning behavior for multinational and domestic firms in times of external shocks for the financial markets. These differences do not necessarily mean that tax planning behavior differs but may rather indicate short-term anomalies in the financial reporting behavior. The selective differences may be interpreted as indicators for different reactions on external shocks rather than structural tax planning differences between multinational and domestic firms.

6 Conclusion and Perspectives

The aim of this paper is to introduce a new measure for identifying tax planning activities. We show that our measure combines advantages of interpretation with the possibility of not losing observations due to the limitations of the ETR. Especially the bias generated by dropping ETRs below zero and the handling of loss-firms is crucial in practice. The separation into a firm-specific idiosyncratic tax planning component which represents a long-term firm characteristic and a characteristic-varying tax planning component which captures any single-year deviations is a big advantage for further research. Depending on the research question, it is possible to think about tax planning as a firm induced characteristic which is desired to hold a certain level but simultaneously allowing for single-year effects which are natural and realistic since firms face different circumstances every year.

Besides the presentation of the new measure, a validation of the ability to detect tax planning suggests that *RTPM* may be able to identify tax planning activity. The seeding test with the artificial manipulation of actual firm-year observations suggests that *RTPM* is able to capture the additional tax planning strategy. Employing three different seeding variations should increase the informative value and reduce the sensitivity to a favorable research design. Single-year deductions, reverting deductions and permanent deductions of a firm's tax position is indicated by *RTPM* while other tax planning measures partly fail to indicate the treatment and partly provide weak evidence for the additional tax planning.

After introducing and verifying the new measure, we provide an analysis resulting in a possible explanation for differences in ETRs for domestic and multinational firms. Our results suggest that both groups of firms do not structurally differ regarding their tax planning behavior. Double taxation effects on foreign pre-tax income may explain differences appearing in the light of ETRs. Furthermore, foreign tax credits may not reduce domestic cash taxes paid on a one by one basis. These effects call for a separation into foreign and domestic pre-tax income as well

as a separation into foreign and domestic cash taxes paid. Following this approach may not result in a structural overestimation of taxes paid by multinationals and a corresponding higher ETR compared to domestic firms. However, in times of external shocks on the capital market, impacts differ for multinational and domestic firms resulting in a different *RTPM* score.

As prior literature points out there is not the one measure to capture tax planning perfectly. Only looking at several measures identifying different facets enables the big picture. This paper contributes to the literature in at least three major ways. First, it introduces another tax planning measure, which might be favorable to add another facet to the big picture. Second, a validation test with artificially seeding additional tax planning into the data suggests that the new measure identifies tax planning. Third, we provide a possible answer to the question on why ETRs differ between multinational and domestic firms.

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Tables and Figures:

Table (1): Descriptive statistics for major variables used

Variable	Obs.	Mean	Std. Dev.	Min	Max
<i>RTPM</i>	93,197	0.4587	1.8151	-8.5135	8.3648
<i>RTPM^{firm}</i>	93,197	0.4579	0.8895	-3.7740	3.6029
<i>RTPM^{time}</i>	93,197	0.0027	1.5520	-7.5431	7.2458
<i>Cash ETR</i>	88,489	0.2647	0.1847	0.0000	1.0000
<i>long-run Cash ETR</i>	74,114	0.2854	0.1732	0.0000	1.0000
<i>GAAP ETR</i>	116,493	0.3376	0.1364	0.0000	1.0000
<i>long-run GAAP ETR</i>	96,239	0.3427	0.1337	0.0000	1.0000
<i>BTD</i>	138,521	18.989	737.06	-96,060	101,395
<i>TXPD</i>	144,171	45.037	151.97	-19.770	1,109.0
<i>TXPD^{DOM}</i>	144,171	32.396	111.20	-41.900	789.72
<i>TXPD^{FO}</i>	216,541	5.8129	26.153	-0.0960	195.93
<i>PI</i>	199,270	136.85	529.94	-480.92	3,845.0
<i>PI^{DOM}</i>	199,270	106.74	426.44	-485.76	3,044.0
<i>PI^{FO}</i>	216,541	16.520	80.090	-24.249	594.00
<i>LOSS</i>	216,541	0.3194	0.4662	0.0000	1.0000

Table (2): Correlation between *RTPM* and established tax planning measures

Variable	1	2	3	4	5	6	7	8
1 <i>RTPM</i>	1.0000	0.5472	0.7808	-0.2830	-0.2288	-0.1099	-0.1209	0.0088
2 <i>RTPM^{firm}</i>	0.6748	1.0000	-0.0166	-0.1551	-0.1853	-0.1122	-0.1211	-0.0426
3 <i>RTPM^{time}</i>	0.6538	0.0010	1.0000	-0.2412	-0.1531	-0.0575	-0.0669	0.0393
4 <i>Cash ETR</i>	-0.4518	-0.2224	-0.4175	1.0000	0.6487	0.3678	0.3060	-0.1195
5 <i>long-run Cash ETR</i>	-0.3493	-0.2427	-0.2520	0.7127	1.0000	0.3493	0.4765	-0.0884
6 <i>GAAP ETR</i>	-0.1445	-0.1073	-0.1000	0.3182	0.3339	1.0000	0.7107	-0.1085
7 <i>long-run GAAP ETR</i>	-0.1582	-0.1283	-0.1008	0.2968	0.4224	0.7897	1.0000	-0.0754
8 <i>BTD</i>	0.1753	0.0222	0.2219	-0.5369	-0.4595	-0.4041	-0.3438	1.0000

The Spearman (Person) correlations are shown below (above) the diagonal.

Table (3): Estimating the “Fair Amount of Taxes” according to Equation (3)

Variables	Estim. Sign	(1) $TXPD^{DOM}_t$	(2) $TXPD^{DOM}_t$
PI^{DOM}_{t-3}	[+]	0.0194*** (5.62)	0.0192*** (5.86)
PI^{DOM}_{t-2}	[+]	0.0210*** (6.59)	0.0214*** (6.75)
PI^{DOM}_{t-1}	[+]	0.0662*** (18.94)	0.0624*** (17.85)
PI^{DOM}_t	[+]	0.0814*** (17.00)	0.0818*** (18.33)
PI^{DOM}_{t+1}	[+]	0.0151*** (5.11)	0.0154*** (5.38)
PI^{FO}_{t-3}	[+]	0.0338** (2.45)	0.0318** (2.34)
PI^{FO}_{t-2}	[+]	0.0377*** (2.93)	0.0294** (2.33)
PI^{FO}_{t-1}	[+]	0.0875*** (7.05)	0.0913*** (7.34)
PI^{FO}_t	[+]	0.0759*** (4.69)	0.0618*** (4.01)
PI^{FO}_{t+1}	[+]	-0.000741 (-0.06)	0.00589 (0.47)
$PI^{DOM}_t * LOSS_t$	[-]	-0.101*** (-9.17)	-0.119*** (-12.45)
$LOSS_t$	[-]	0.601 (1.19)	-0.449 (-1.04)
$TXPD^{FO}_t$	[-]	-0.752*** (-9.33)	-0.678*** (-8.70)
<i>SIZE</i>		2.898*** (4.22)	
<i>LEV</i>		-2.836 (-1.48)	
<i>PPE</i>		-6.074 (-1.33)	
<i>INTAN</i>		-4.171 (-1.00)	
<i>CASH</i>		-5.433** (-2.10)	
<i>GROWTH</i>		0.0989** (2.17)	
<i>NOL</i>		-0.00529** (-2.24)	
<i>Constant</i>		-4.417 (-0.99)	10.12*** (10.79)
N		93,197	103,271
R ²		0.7227	0.7145

t-statistics in parentheses,
 */**/** denote significance at the 10%/5%/1% level

Table (4): Estimating the “Fair Amount of Taxes” within each industry

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Mining and Construc- tion	Manufac- turing	Agricul- ture	Transport. and Com.	Trade	Public Admin.	Services
	$TXPD^{DOM}_t$	$TXPD^{DOM}_t$	$TXPD^{DOM}_t$	$TXPD^{DOM}_t$	$TXPD^{DOM}_t$	$TXPD^{DOM}_t$	$TXPD^{DOM}_t$
PI^{DOM}_{t-3}	0.0151 (1.23)	0.0280*** (5.93)	-0.0105 (-1.28)	0.00321 (0.51)	-0.0108 (-1.20)	-0.033 (-0.93)	0.0189 (1.48)
PI^{DOM}_{t-2}	0.0368*** (3.72)	0.0172*** (3.67)	-0.0796*** (-3.81)	0.0164*** (3.18)	0.0441*** (3.13)	0.031 (1.33)	0.00607 (0.58)
PI^{DOM}_{t-1}	0.0505*** (5.66)	0.0665*** (12.48)	0.170*** (4.1)	0.0609*** (9.16)	0.0780*** (7.13)	0.0574*** (2.62)	0.0700*** (5.54)
PI^{DOM}_t	0.0955*** (6.68)	0.0874*** (11.97)	0.190*** (10.75)	0.0598*** (7.32)	0.122*** (8.64)	0.0480*** (4.24)	0.101*** (4.93)
PI^{DOM}_{t+1}	-0.00516 (-0.83)	0.00666 (1.38)	-0.00196 (-0.24)	0.0271*** (4.99)	0.0396*** (5.22)	0.0350** (2.15)	0.0210*** (3.97)
PI^{FO}_{t-3}	0.0504 (1.00)	0.00776 (0.49)	-0.128 (-1.52)	0.0823 (1.55)	0.0549 (1.19)	0.0618 (1.17)	0.126*** (2.68)
PI^{FO}_{t-2}	-0.0158 (-0.30)	0.0435*** (2.91)	0.0574* (1.94)	0.0196 (0.45)	0.0278 (0.56)	0.0666 (0.3)	0.0498* (1.65)
PI^{FO}_{t-1}	0.132*** (2.83)	0.0869*** (5.86)	0.0562* (1.7)	0.0613 (1.32)	0.0413 (0.83)	0.112 (0.77)	0.0194 (0.65)
PI^{FO}_t	0.1 (1.36)	0.0929*** (5.00)	0.180*** (4.71)	0.0413 (0.74)	-0.0223 (-0.47)	0.0721 (1.02)	0.0559 (1.56)
PI^{FO}_{t+1}	-0.00659 (-0.13)	0.00118 (0.08)	0.0000131 (0.00)	-0.00908 (-0.23)	0.0463 (0.91)	-0.0962 (-0.90)	-0.0208 (-0.57)
$PI^{DOM}_t * LOSS_t$	-0.0616** (-2.33)	-0.101*** (-5.49)	-0.305*** (-7.00)	-0.098*** (-4.78)	-0.106*** (-4.57)	-0.0396 (-0.79)	-0.0765* (-1.79)
$LOSS_t$	3.736** (2.13)	-0.531 (-0.62)	1.277 (0.7)	2.652 (1.39)	1.035 (1.26)	3.001 (1.31)	2.090*** (3.87)
$TXPD^{FO}_t$	-0.796*** (-3.49)	-0.868*** (-8.52)	-1.125*** (-7.24)	-0.172 (-0.88)	-0.646** (-2.47)	-1.250*** (-7.95)	-0.622** (-2.26)
$SIZE$	4.004* (1.87)	5.862*** (6.2)	3.107** (2.38)	-12.49*** (-5.94)	5.464*** (3.88)	2.729 (1.35)	3.312*** (2.99)
LEV	-3.911 (-0.52)	-5.110** (-2.07)	10.95 (1.01)	-4.578 (-0.51)	1.194 (0.35)	1.331 (0.15)	-2.04 (-0.88)
PPE	4.062 (0.35)	5.901 (0.88)	-10.54 (-1.36)	-45.44*** (-3.23)	-29.32** (-2.36)	-15.1 (-1.04)	-5.579 (-1.21)
$INTAN$	-15.13 (-0.48)	-8.81 (-1.43)	-13.63** (-2.01)	-0.271 (-0.02)	-19.14* (-1.88)	5.68 (0.31)	-2.717 (-0.55)
$CASH$	-4.663 (-0.39)	-4.558 (-1.42)	10.22 (1.18)	-34.98** (-2.20)	-21.37** (-2.23)	-11.92 (-0.97)	0.795 (-0.24)
$GROWTH$	0.319** (1.98)	0.0132 (0.24)	-0.228 (-0.78)	0.666*** (2.60)	-0.0336 (-0.40)	-0.0893 (-0.49)	0.0446 (0.61)
NOL	-0.0187*** (-2.90)	-0.011*** (-2.65)	0.0469*** (5.76)	0.000476 (0.39)	-0.0185* (-1.90)	0.000162 (0.06)	-0.0265** (-2.53)
$Constant$	-21.25 (-1.43)	-21.43*** (-3.90)	-14.40** (-2.01)	139.9*** (-7.42)	-14.78* (-1.88)	2.082 (0.31)	-13.05** (-2.48)
N	8,157	41,874	425	14,992	11,203	798	15,748
R ²	0.5949	0.7512	0.9214	0.6356	0.8814	0.5681	0.6665

t-statistics in parentheses,

*/**/** denote significance at the 10%/5%/1% level

Table (5): Logistic regression for **Single-year reduction**

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	<i>treatment</i>	<i>treatment</i>	<i>treatment</i>	<i>treatment</i>	<i>treatment</i>	<i>treatment</i>
Marginal Effects	-0.0329***	-0.0569***	-0.0680***	-0.0634***	0.00374***	0.0098***
<i>Cash ETR</i>	-0.172*** (-3.36)					
<i>Long-run Cash ETR</i>		-0.266*** (-4.64)				
<i>GAAP ETR</i>			-0.305*** (-6.07)			
<i>Long-run GAAP ETR</i>				-0.272*** (-5.03)		
<i>BTD</i>					0.000186*** (6.82)	
<i>RTPM</i>						0.0251*** (4.75)
<i>SIZE</i>	0.0116** (2.3)	-0.0052 (-0.94)	0.0060 (1.43)	-0.0040 (-0.89)	-0.0098** (-2.06)	-0.0004 (-0.07)
<i>ROA</i>	-1.072*** (-21.95)	-0.613*** (-10.05)	-0.194*** (-5.06)	-0.0332 (-0.76)	0.0762** (2.00)	0.105* (1.85)
<i>LEV</i>	-0.0203 (-0.40)	0.0341 (0.59)	-0.0009 (-0.02)	0.0002 (0.00)	0.108*** (2.64)	0.065 (1.30)
<i>PPE</i>	-0.318*** (-6.94)	-0.159*** (-3.10)	-0.154*** (-4.30)	-0.0877** (-2.26)	-0.0862** (-2.28)	-0.0429 (-0.94)
<i>INTAN</i>	-0.0337 (-0.54)	-0.0056 (-0.08)	0.0325 (0.62)	-0.0118 (-0.21)	-0.0476 (-0.88)	0.0097 (0.15)
<i>CASH</i>	-0.129* (-1.70)	0.0483 (0.55)	-0.123** (-2.10)	-0.0523 (-0.79)	-0.0239 (-0.40)	-0.0606 (-0.74)
<i>GROWTH</i>	-0.0063** (-2.45)	0.0009 (0.28)	-0.0012 (-0.59)	-0.0029 (-1.20)	-0.0005 (-0.22)	-0.0017 (-0.68)
<i>Constant</i>	-1.526*** (-41.67)	-1.472*** (-34.62)	-1.562*** (-50.24)	-1.521*** (-44.10)	-1.615*** (-52.51)	-1.679*** (-46.45)
N	89,847	75,258	129,287	112,090	116,813	93,197
pseudo R ²	0.008	0.003	0.001	0.000	0.001	0.000

t-statistics in parentheses,
*/**/** denote significance at the 10%/5%/1% level

Table (6): Identified tax planning within treated firms for **Single-year reduction**

	Tax Planning indicated	Tax Planning not indicated	correctly specified
<i>Cash ETR</i>	9,629	7,320	56.8%
<i>long-run Cash ETR</i>	7,064	6,386	52.5%
<i>GAAP ETR</i>	11,680	15,063	43.7%
<i>long-run GAAP ETR</i>	8,798	11,721	42.9%
<i>BTB</i>	17,099	17,111	50.0%
<i>RTPM</i>	27,837	6,373	81.4%

Table (7): Logistic regression for **Reverting reduction**

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	<i>treatment</i>	<i>treatment</i>	<i>treatment</i>	<i>treatment</i>	<i>treatment</i>	<i>treatment</i>
Marginal Effects	-0.0611***	-0.0735***	-0.1095***	-0.0790***	0.0035***	0.0092***
<i>Cash ETR</i>	-0.311*** (-6.09)					
<i>Long-run Cash ETR</i>		-0.334*** (-5.83)				
<i>GAAP ETR</i>			-0.475*** (-9.95)			
<i>Long-run GAAP ETR</i>				-0.331*** (-6.44)		
<i>BTD</i>					0.000193*** (7.00)	
<i>RTPM</i>						0.0237*** (4.49)
<i>SIZE</i>	0.0020 (0.41)	-0.0101* (-1.87)	0.0010 (0.24)	-0.0069 (-1.60)	-0.0080* (-1.74)	0.0004 (0.08)
<i>ROA</i>	-0.684*** (-16.73)	-0.612*** (-11.95)	-0.0849*** (-3.98)	-0.0434** (-2.05)	0.042 (1.60)	0.0456 (1.20)
<i>LEV</i>	0.0319 (0.72)	0.0777 (1.55)	0.0211 (0.67)	-0.0003 (-0.01)	0.0484* (1.80)	0.0503 (1.24)
<i>PPE</i>	-0.284*** (-6.23)	-0.167*** (-3.27)	-0.153*** (-4.31)	-0.0913** (-2.38)	-0.0740** (-2.00)	-0.0431 (-0.96)
<i>INTAN</i>	-0.0181 (-0.29)	-0.0113 (-0.17)	0.0259 (0.51)	0.0006 (0.01)	-0.0296 (-0.56)	0.0087 (0.14)
<i>CASH</i>	-0.0834 (-1.10)	0.159* (1.79)	-0.0776 (-1.35)	-0.0049 (-0.07)	-0.0411 (-0.71)	-0.0727 (-0.91)
<i>GROWTH</i>	0.00008 (0.92)	0.00004 (0.26)	-0.00004 (-1.08)	-0.00007 (-1.26)	0.00003 (0.17)	0.00012 (1.30)
<i>Constant</i>	-1.473*** (-40.14)	-1.429*** (-33.18)	-1.482*** (-48.39)	-1.482*** (-43.64)	-1.618*** (-53.10)	-1.677*** (-46.74)
N	88,774	73,976	126,613	109,927	116,813	93,197
pseudo R ²	0.006	0.004	0.002	0.001	0.001	0.000

t-statistics in parentheses,
*/**/** denote significance at the 10%/5%/1% level

Table (8): Number of identified tax planning within treated firms for **Reverting reduction**

	Tax Planning indicated	Tax Planning not indicated	correctly specified
<i>Cash ETR</i>	9,548	7,257	56.8%
<i>long-run Cash ETR</i>	7,017	6,264	52.8%
<i>GAAP ETR</i>	11,638	14,762	44.1%
<i>long-run GAAP ETR</i>	8,705	11,543	43.0%
<i>BTD</i>	17,257	16,953	50.4%
<i>RTPM</i>	27,821	6,389	81.3%

Table (9): Logistic regression for **Permanent reduction**

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	<i>treatment</i>	<i>treatment</i>	<i>treatment</i>	<i>treatment</i>	<i>treatment</i>	<i>treatment</i>
Marginal Effects	-0.0484***	-0.0332***	-0.0881***	-0.0465***	0.0057***	0.0089***
<i>Cash ETR</i>	-0.265*** (-4.83)					
<i>Long-run Cash ETR</i>		-0.169*** (-2.80)				
<i>GAAP ETR</i>			-0.410*** (-8.14)			
<i>Long-run GAAP ETR</i>				-0.211*** (-3.94)		
<i>BTD</i>					0.00014*** (6.01)	
<i>RTPM</i>						0.0211*** (5.58)
<i>SIZE</i>	-0.0014 (-0.28)	-0.0045 (-0.83)	0.0033 (0.80)	-0.0009 (-0.22)	-0.0084* (-1.75)	0.0013 (0.27)
<i>ROA</i>	-0.215*** (-6.00)	-0.237*** (-5.15)	-0.0049 (-0.24)	0.0028 (0.12)	0.0529* (1.91)	0.0505 (1.27)
<i>LEV</i>	-0.0026 (-0.07)	0.0042 (0.10)	-0.0053 (-0.17)	-0.0191 (-0.59)	0.0477* (1.73)	0.043 (1.03)
<i>PPE</i>	-0.196*** (-4.17)	-0.0783 (-1.52)	-0.0959*** (-2.63)	-0.064 (-1.64)	-0.0758** (-2.00)	-0.0506 (-1.11)
<i>INTAN</i>	-0.0157 (-0.25)	0.0119 (0.18)	0.0467 (0.89)	-0.0106 (-0.19)	-0.0287 (-0.53)	-0.0073 (-0.12)
<i>CASH</i>	-0.149* (-1.92)	0.0054 (-0.06)	-0.115* (-1.95)	-0.063 (-0.96)	-0.0514 (-0.85)	-0.0948 (-1.16)
<i>GROWTH</i>	0.00012 (1.36)	0.00022 (1.35)	-0.00004 (-1.15)	-0.00004 (-1.05)	0.00008 (0.42)	0.00013 (1.36)
<i>Constant</i>	-1.525*** (-39.82)	-1.557*** (-36.05)	-1.551*** (-48.85)	-1.573*** (-45.40)	-1.619*** (-51.38)	-1.677*** (-46.57)
N	84,334	72,781	121,965	108,262	111,651	90,958
pseudo R ²	0.001	0.001	0.001	0.000	0.000	0.000

t-statistics in parentheses,
*/**/** denote significance at the 10%/5%/1% level

Table (10): Number of identified tax planning within treated firms for **Permanent reduction**

	Tax Planning indicated	Tax Planning not indicated	correctly specified
<i>Cash ETR</i>	9,134	6,542	58.3%
<i>long-run Cash ETR</i>	7,148	5,716	55.6%
<i>GAAP ETR</i>	12,154	12,921	48.5%
<i>long-run GAAP ETR</i>	9,211	10,456	46.8%
<i>BTB</i>	17,512	16,698	51.2%
<i>RTPM</i>	28,077	6,133	82.1%

Table (11): Relative Tax Planning Over Time

	(1)	(2)	(3)
	$RTPM$	$RTPM^{firm}$	$RTPM^{time}$
<i>TIME</i>	0.0101*** (4.79)	0.00 (0.00)	0.00765*** (5.45)
<i>MULTI</i>	0.0409 (0.73)	0.00 (0.00)	0.0720* (1.93)
<i>TIME*MULTI</i>	-0.00241 (-0.89)	0.00 (0.00)	-0.00279 (-1.47)
<i>Constant</i>	0.352*** (8.3)	0.00 (0.00)	-0.146*** (-5.63)
<i>N</i>	93,197	93,197	93,197
<i>R</i> ²	0.001	0.000	0.001

t-statistics in parentheses,
 */**/** denote significance at the 10%/5%/1% level

Figure (1): Development of Mean Cash ETR – referring to Dyreng et al. (2017)

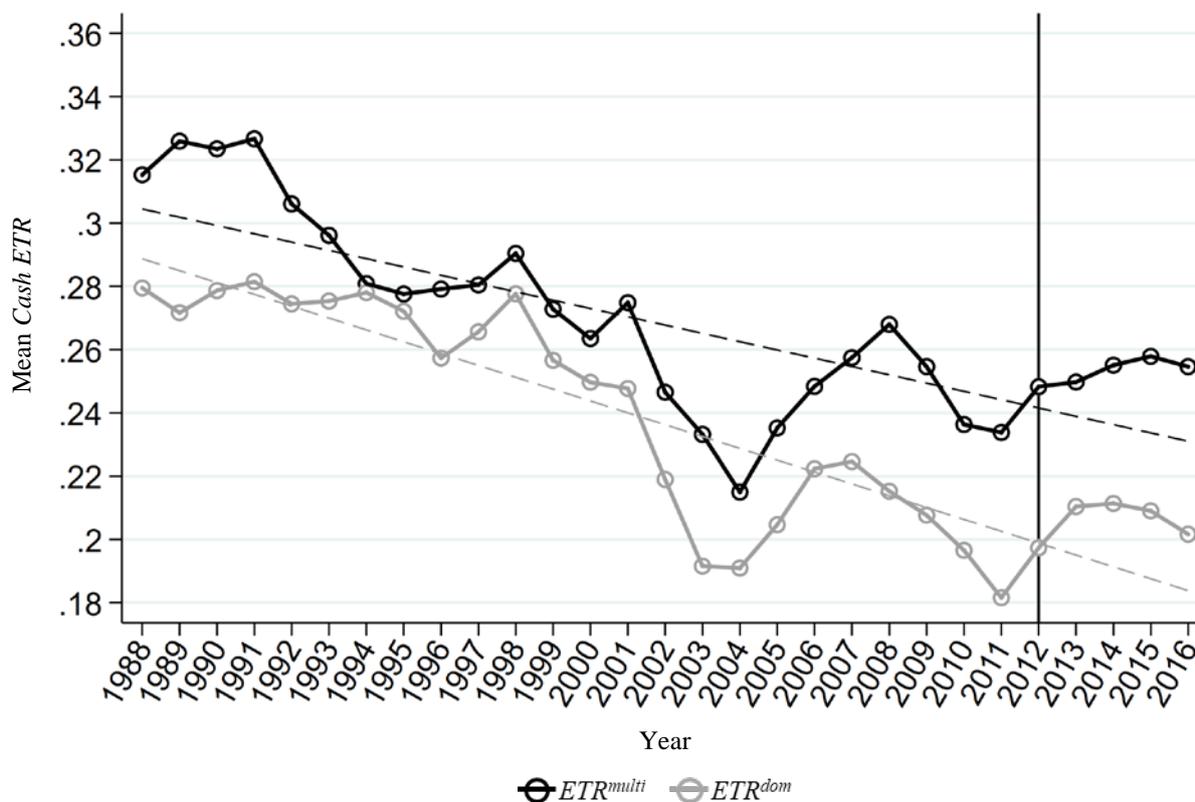


Figure (2): Development of Relative Tax Planning over all Industries

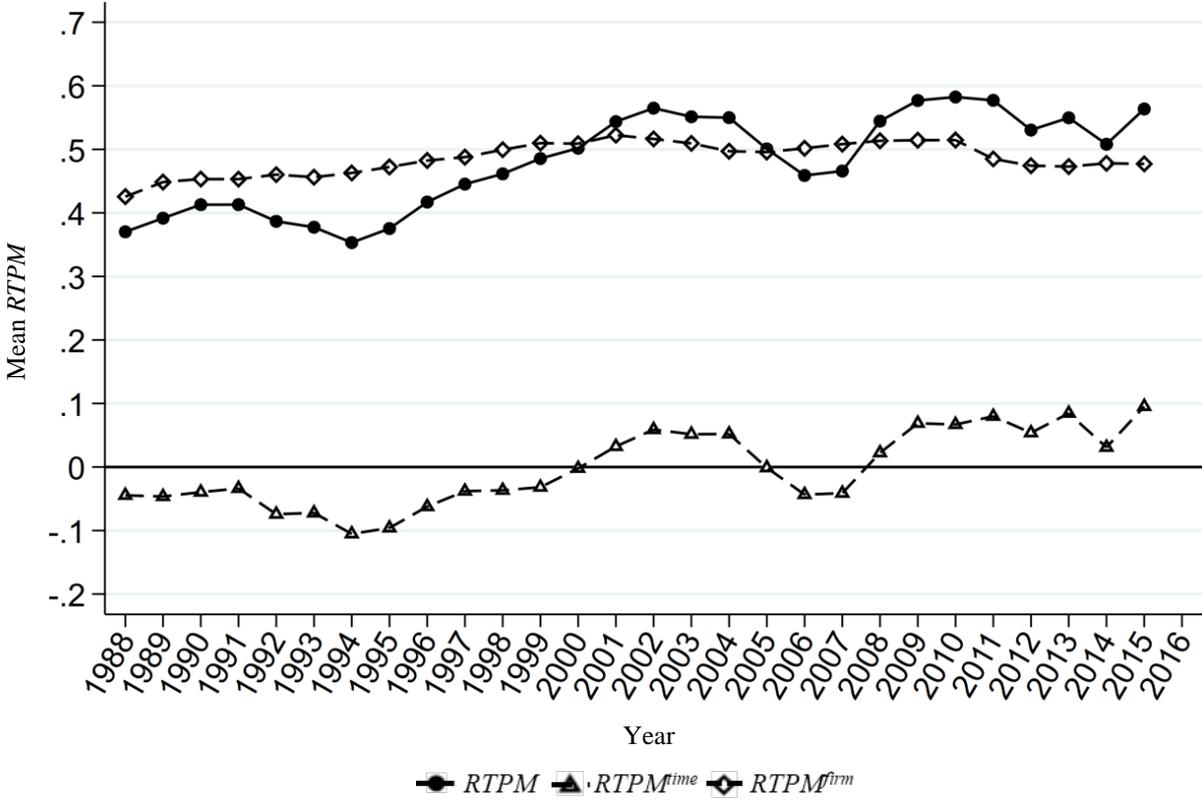


Figure (3): Development of Relative Tax Planning **Printed per Industry**

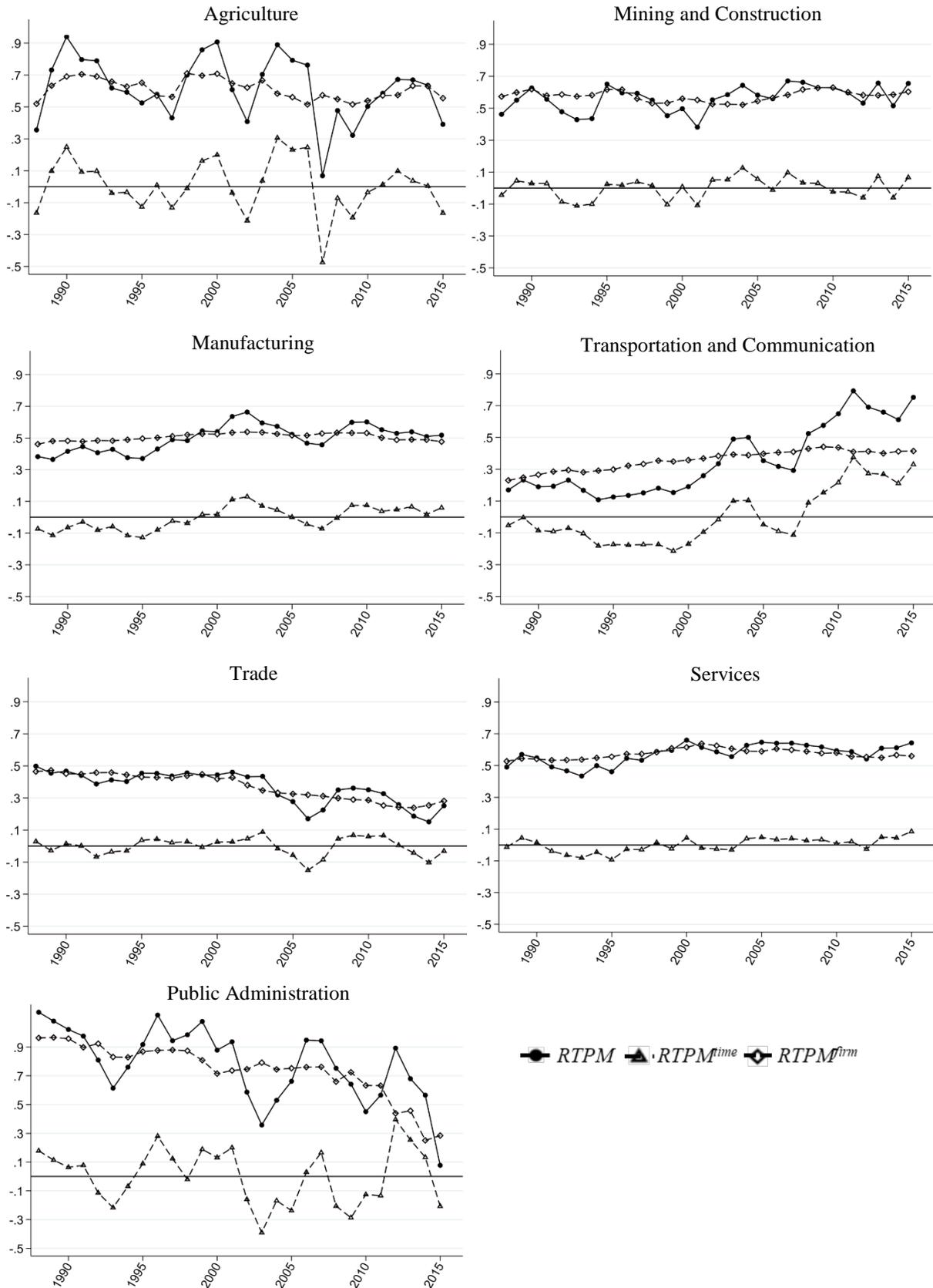


Figure (4): Development of Relative Tax Planning Estimated per Industry

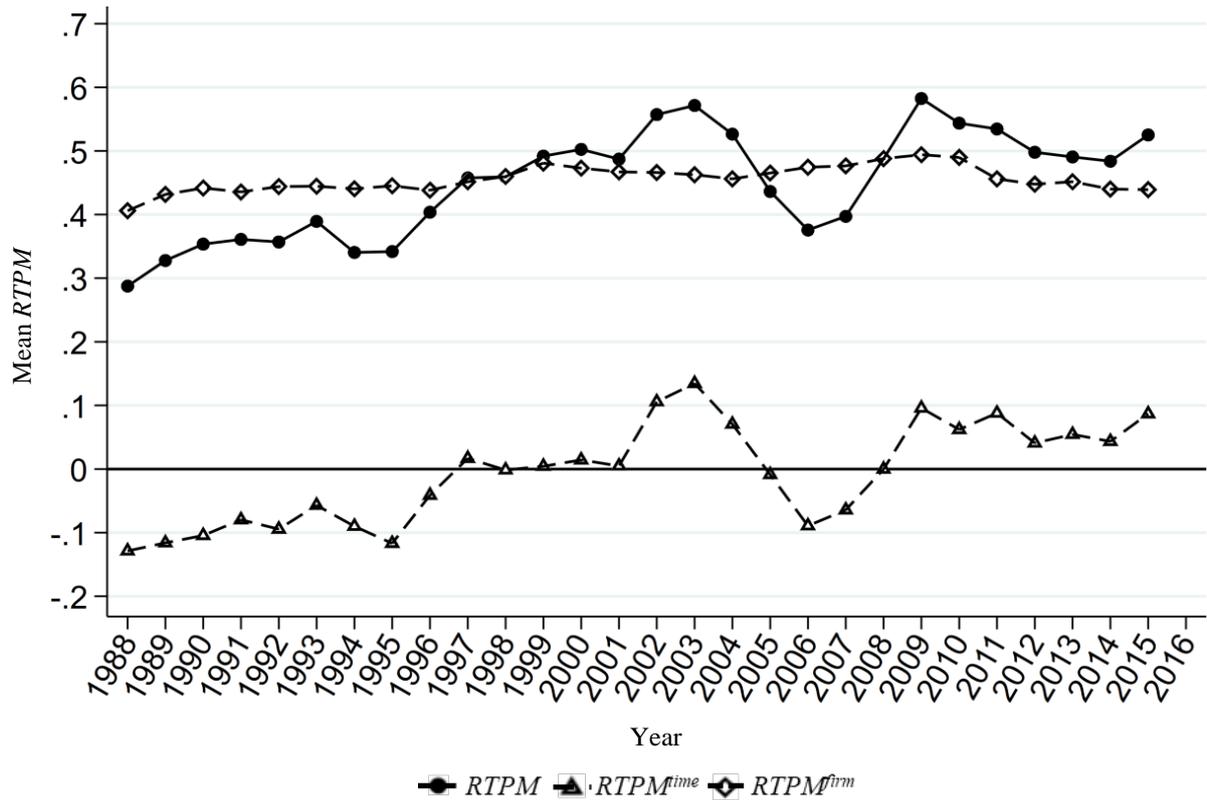


Figure (5): Development of Tax Planning for Multinationals vs. Domestics

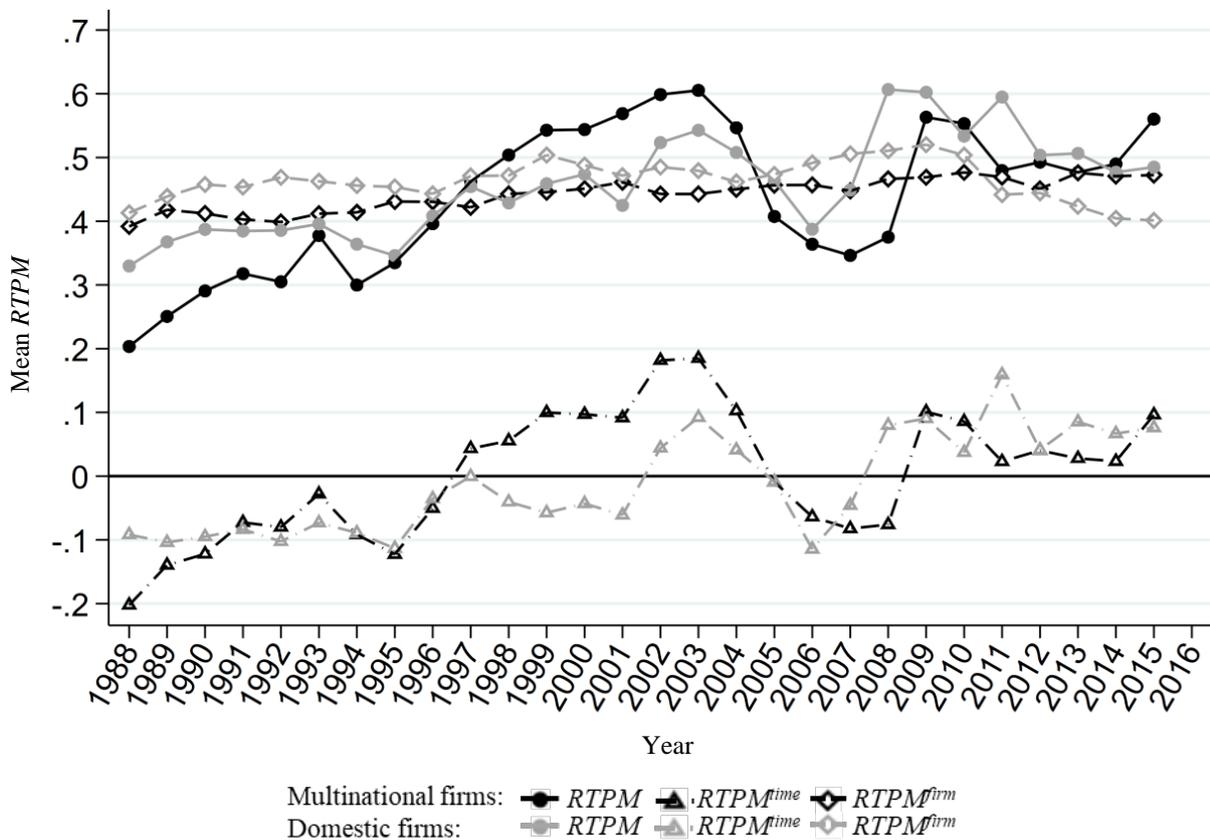


Figure (6): Development of Tax Planning without separating dom./foreign PI/XPD

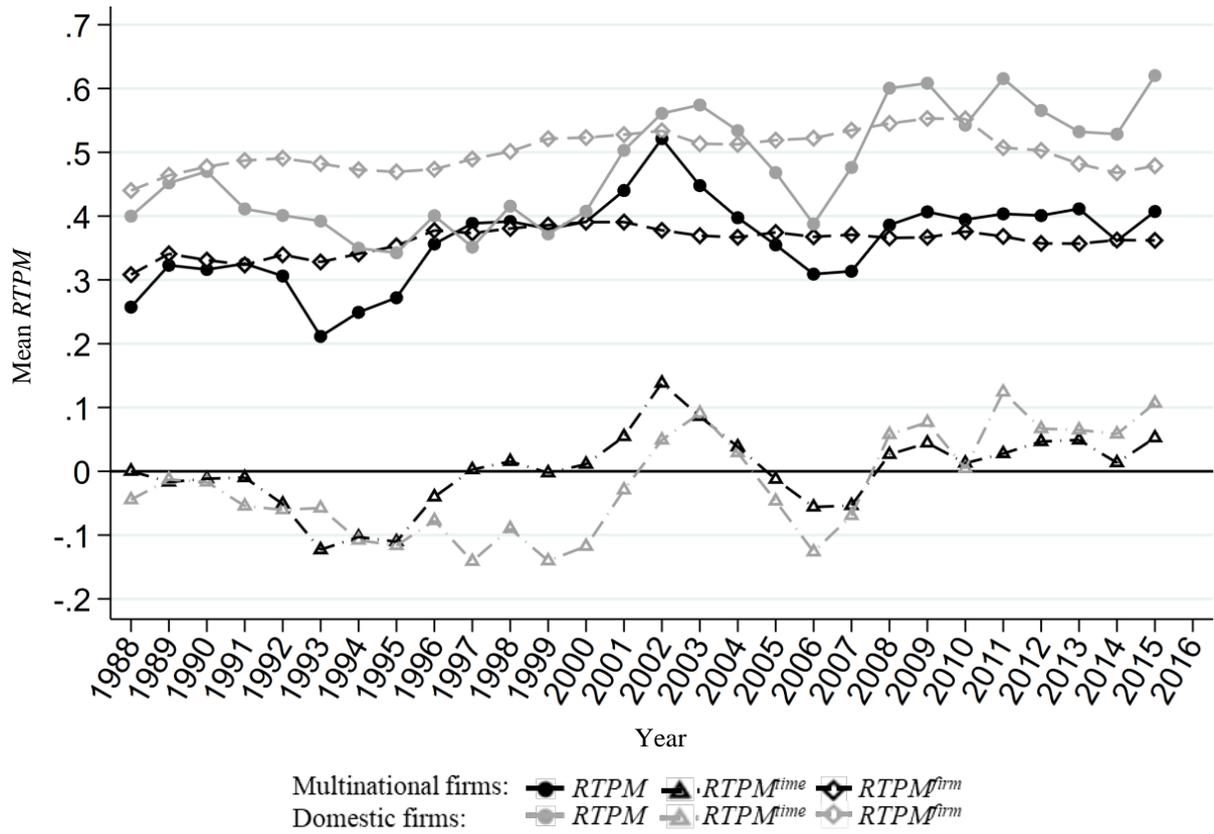
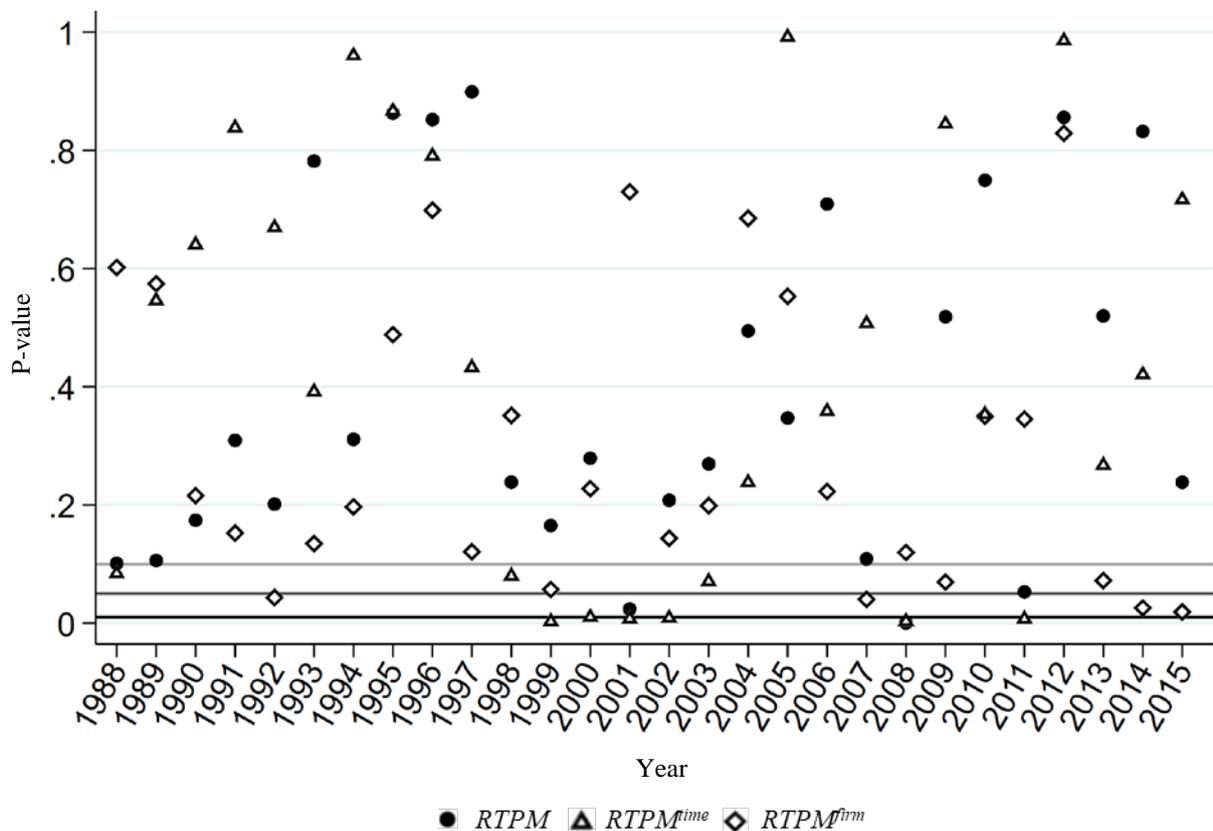


Figure (7): T-Test significance levels for $RTPM$ Multinationals vs. Domestics



Appendix: Variable Definition

Variable	Definition and Source (if applicable)
<i>a</i>	Tax Planning Adjustment Term
<i>AT</i>	Assets – Total (drawn from Compustat)
<i>BTD</i>	Book-Tax Differences; calculated as $PI - \left(\frac{TXC}{\tau} - \Delta NOL\right)$
<i>CASH</i>	Cash and Cash Equivalents; scaled with <i>AT</i> (variables drawn from Compustat)
<i>Cash ETR</i>	Cash Effective Tax Rate; calculated as $\frac{TXPD}{PI}$ truncated at 0 and 1
<i>FirmFE</i>	Firm-Fixed Effects; received from regressing Equation (3)
<i>GAAP ETR</i>	GAAP Effective Tax Rate; calculated as $\frac{TXT}{PI}$ truncated at 0 and 1
<i>GROWTH</i>	Company's Growth; calculated as $\frac{PI_t - PI_{t-1}}{PI_t}$
<i>INTAN</i>	Intangible fixed assets; scaled with <i>AT</i> (variables drawn from Compustat)
<i>LEV</i>	Leverage; scaled with <i>AT</i> (variables drawn from Compustat)
<i>Long-run Cash ETR</i>	Long-run Cash Effective Tax Rate; calculated as $\frac{\sum_{t-2}^t TXPD_t}{\sum_{t-2}^t PI_t}$ truncated at 0 and 1
<i>Long-run GAAP ETR</i>	Long-run GAAP Effective Tax Rate; calculated as $\frac{\sum_{t-2}^t TXT_t}{\sum_{t-2}^t PI_t}$ truncated at 0 and 1
<i>LOSS</i>	Indicator Variable; 1 if $PI > 0$; 0 otherwise
<i>MULITI</i>	Indicator Variable: 1 if PI^{FO} or $TXPD^{FO} \neq 0$; 0 otherwise
<i>NOL</i>	Net Operating Loss
<i>PI</i>	Pre-tax income – winsorized at 1% (drawn from Compustat)
PI^{DOM}	Domestic Pre-tax income – winsorized at 1%; calculated as $PI - PI^{FO}$
PI^{FO}	Foreign Pre-tax income – winsorized at 1% (drawn from Compustat)
<i>PPE</i>	Property, Plant and Equipment; scaled with <i>AT</i> (variables drawn from Compustat)
<i>ROA</i>	Return on Assets; calculated as $\frac{PI}{AT}$ (variables drawn from Compustat)
<i>RTPM</i>	Relative Tax Planning Measure; calculated as the sum of $RTPM^{firm}$ and $RTPM^{time}$
$RTPM^{firm}$	Time-invariant Tax Planning component; calculated as $\frac{FirmFE_i}{TXPD_{i,t}^{DOM}} * (-1)$
$RTPM^{time}$	Characteristic-varying Tax Planning component; calculated as $\frac{\varepsilon_{i,t}}{TXPD_{i,t}^{DOM}} * (-1)$
<i>SIZE</i>	Firm's Size; calculated as the nat. logarithm of <i>AT</i>
<i>TIME</i>	Running Time Variable; calculated as fiscal year - 1984
<i>TIME</i>	Continuous Variable: [1;2;...;33] for years [1983;1984;...;2016]
<i>TPM</i>	Tax Planning Measure [<i>Cash ETR</i> ; <i>Long-run Cash ETR</i> ; <i>GAAP ETR</i> ; <i>Long-run GAAP ETR</i> ; <i>BTD</i> ; <i>RTPM</i>]
<i>TXC</i>	Income Taxes – Current; winsorized at 1% (drawn from Compustat)
<i>TXDI</i>	Income Taxes – Deferred; winsorized at 1% (drawn from Compustat)
<i>TXPD</i>	Income Taxes Paid – winsorized at 1% (drawn from Compustat)
\widehat{TXPD}	Estimated Income Taxes Paid; estimated with coefficients received from Equation (3)
$TXPD^{DOM}$	Domestic Income Taxes Paid; winsorized at 1%; calculated as $TXPD - TXPD^{FO}$
$TXPD^{FO}$	Foreign Income Taxes Paid; winsorized at 1% (drawn from Compustat)
<i>TXT</i>	Income Taxes – Total; winsorized at 1% (drawn from Compustat)

Variable	Definition and Source <i>(if applicable)</i>
α	Regression Coefficient
β	Regression Coefficient
γ	Regression Coefficient
δ	Regression Coefficient
μ	Regression Coefficient
ν	Regression Coefficient
ε	Residuals; received form regressing Equation (3)
τ	Statutory Tax Rate