# Profitability and Tax Avoidance

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May 2017

**ABSTRACT**

We ask whether tax savings generated by tax avoidance activities outweigh the associated agency costs. Using a decrease in tax avoidance following the adoption of IFRS, we find that tax aggressive firms' future operating profitability improved by 3.2 percent in our cross-country sample. This increase is driven by improved asset utilisation and operating liability management. Our results suggest that tax avoidance has a negative impact on operating profitability. These findings imply that tax authorities and outside shareholders share a common goal: decreasing managerial rent extraction.

Keywords: Tax Avoidance, Rent Extraction, Profitability, DuPont

JEL classification: G3, G30, H26

*We would like to thank our tutor Farzad Saidi for his comments and support during the process of writing this thesis.

# I. Introduction

In light of recent proposals to consolidate the corporate tax base in the EU, it is important to understand what implications a decrease in tax avoidance would have on stakeholders. In this study, we use the adoption of International Financial Reporting Standards (IFRS) in 2005 to investigate the association and direction of causality between tax avoidance by firms and their future profitability. In doing so, we examine whether tax avoidance affects future financial performance. Ultimately, we aim to fill a part of the void outlined by Graham et al. (2012), who call for more research examining the impact of tax avoidance on future profitability.

Related empirical literature in this field is predominantly based on association tests, which make distinct conclusions difficult due to the problem of reverse causality, as 'correlation does not imply causation'. We attempt to address the problem of endogeneity by using the adoption of IFRS as a transparency shock to tax avoidance to find the direction of causation. The introduction of IFRS imposed stricter disclosure requirements, facilitating detection of tax avoiding activities[1] by tax agencies, which led to a decrease in tax avoidance (Kerr, 2016)[2].

Our empirical findings are based on propensity-matched difference-in-difference tests. We classify firms as tax aggressive if their three-year cash effective tax rate spread is in the bottom decile for its industry. Previous research that relate to tax avoidance and profitability present mixed results that vary cross-sectionally. We investigate how tax avoidance affects future profitability and its constituents — financial leverage, operating leverage, operating asset turnover and profit margin. Our study provides new empirical evidence suggesting that a decrease in tax avoidance, on average, increases future operating profitability. This is mainly driven by poor balance sheet management. These results are in line with e.g. Katz et al. (2013), and Minrov (2013), but go against e.g. Blaylock (2016). Furthermore, the direction of causality between tax aggressiveness and future profitability is found to be negative.

We argue that tax avoidance has two opposing effects when it comes to firm profitability. By reducing tax liabilities to tax authorities, firms' after-tax cash flow increases. If the additional cash flow is invested in positive net present value projects, profitability is expected to be higher. However, if managers divert the additional cash flows to rent-extracting behaviour[3] and invest it in negative net present value projects, profitability is expected to be lower. To support this, we turn to the agency cost theory, and suggest that tax avoidance is strongly complementary to opacity, giving managers more room for

[1] Used interchangeably with tax aggressiveness and tax avoidance activities.

[2] Kerr provides empiric evidence that the increased transparency imposed by the adoption of IFRS had a negative and significant effect on tax avoidance for the 11 countries tested (which are the 11 countries we use when examining the impact of the IFRS shock).

[3] Rent extraction is defined as value-destroying activities pursued by inside shareholders at the expense of outside shareholders (Chen et al., 2010).

self-dealing activities. We find that the magnitude of agency costs is on average greater than the positive cash flow generated by tax avoidance for tax aggressive firms, as their future profitability increased following the adoption of IFRS.

This thesis relates to Katz et al. (2013) in the sense that they investigate the association of tax avoidance activities with future profitability in U.S. firms, by conducting association tests. Our study also relates to Kerr (2016), who tests whether transparency affects the level of firms' tax avoidance.

This study's contribution to the literature is hopefully threefold. First, by analysing a unique international dataset[4], including all countries that implemented IFRS in 2005, but did not allow it as the basis for statutory accounts, we add empirical evidence to the research field. This international setting is interesting as the level of corporate governance is likely to enjoy greater variation across countries. This mitigates some of the empirical limitations of previous studies, based on domestic data only, by leveraging cross-country variation. Second, we show that there is a negative average association between tax avoidance and future profitability. This reduced operating profitability is driven by ineffective management of operating liabilities and poor assets utilisation, not the profit margin. Third, this study suggests that the direction of causation between tax avoidance and firms' future profitability is negative, by using the IFRS implementation in 2005 as an exogenous shock to tax avoidance. We show that the average operating profitability increased for tax aggressive firms exposed to the shock, compared to control firms. These results also hold true when controlling for non-causal effects of IFRS, using FIN 48 as an exogenous shock to tax avoidance. Furthermore, the results are robust when ignoring time-series information to control for serial correlation.

However, whenever causality conclusions are drawn based on observational data that has not been randomly generated, it is the underlying assumptions that identify if any causal effects exists. Whether all the assumptions hold true, and all non-causal paths are blocked is not possible to test. This can result in uncontrolled-for biases that temper our conclusions.

# II. Previous Literature and Research Question Development

## A. *Previous Literature: Tax Avoidance*

Jensen and Meckling (1976) propose that asymmetric information gives rise to the problem of moral hazard and adverse selection. The authors argue that natural conflicts arise

[4]The countries included are: Austria, Belgium, Denmark, France, Germany, Hungary, Poland, Spain, Sweden, Switzerland and Australia.

between agents and principals when ownership is separated from control and lay out the theoretical framework behind the agency cost theory. The analysis is further extended by Bebchuk et al. (2002) who suggest that firms' CEOs do not operate within 'arms length' and can influence the structure of their compensation. Crocker and Slemrod (2004) show that tax avoidance increase the asymmetric information between agents and principals, making it interesting to investigate tax avoidance affect on firm profitability.

When looking at a sample of 44 firms using tax shelters, Graham and Tucker (2006) find that on average deductions amounting to 9 percent of total assets are generated. The notion that tax avoidance activities generate additional cash flow is further supported by more recent studies by e.g. Wilson (2009) and Lisowsky et al. (2013).

From a theoretical point of view, the result of tax aggressive behaviour is unclear as tax avoidance activities allocate money from the government to firms, but it does not come for free. Tax avoidance is associated with several costs, e.g. agency costs, due to the use of complex structures and implementation costs to set up the tax-effective vehicles (Graham and Tucker, 2006; Katz et al., 2013). There are thus two forces working in opposite directions when it comes to determine whether tax avoidance enhances firm profitability or not. Prior research reflects this complexity as mixed evidence is presented in the cross-section e.g. DeSimone and Stomberg (2012) and Desai and Dharmapala (2009).

Koester (2011) further documents that the quality of governance in firms plays an important role when investors value uncertain tax positions, as he finds that tax avoidance is only valued positively in firms that are considered to be well governed. Nonetheless, Blaylock (2016) finds that tax avoidance activities are valued positively, even for firms classified as poorly governed. However, Desai et al. (2007) propose that a higher degree of tax enforcement, *ceteris paribus*, can increase a firm's market value due to decreased agency costs e.g. rent extraction. Furthermore, they set the scene by illustrating the playing field as an interaction between three parties — the state, the inside and the outside shareholders, where bilateral actions between two of the parties always affect the third. Supporting this theory, Minrov (2013), studying Russian banking transactions, provides empirical evidence that increased tax enforcement in a country with weak investor protection has a positive association with firm value. Katz et al. (2013) extend this conclusion by analysing an environment with strong investor protection — the US, and find in accordance with the agency cost theory that tax-aggressive firms on average are associated with lower future profitability. However, Bankman (1999) claims that the positive gains from tax avoidance activities are positively associated with firm value due to the low risk of detection by tax authorities.

DeSimone and Stomberg (2012) provide evidence that investors value tax avoidance activities positively, and that the positive association is greater in income-mobile firms. However, this effect wears off as the sample is exposed to higher scrutiny following the introduction of FIN 48 in the US, effective 2007. Frischmann et al. (2008) on the other hand find evidence that average investor sentiment reacted positively to the imposed requirement of FIN 48, forcing firms to recognise tax positions that are more likely than not to be cleared by the IRS following an audit. Lisowsky et al. (2013) argue that the positive association is driven by the quality of firms' disclosure; poor disclosure is on average associated with greater market reactions.

Hanlon and Slemrod (2009) document that on average, news regarding tax shelters affect stock prices negatively due to reputational and political costs associated with being labelled as poorly governed. Conversely, the authors find evidence for cross-sectional variance. Firms in retail sectors are on average more adversely affected by press releases covering tax avoidance activities than non-retail sectors. The academic community's view on this matter can thus be summarised as polarised.

## *B. Previous Literature: Profitability Analysis*

Although there are numerous studies that scrutinise the effect of tax avoidance activities on firm value, the key drivers underlying the association and the direction of causation between firms' future profitability and tax avoidance have not yet been fully understood.

The analysis of tax aggressive activities' effect on current and future profitability is relevant since expectations regarding future profitability serve as key inputs in valuation (Abarbanell and Bushee, 1997). Barth et al. (1998) lay out the theoretical backbone between the association of firm value and earnings and suggests that current profitability and earnings have predictive powers when it comes to future earnings. Consistent with this idea, previous studies have examined the association between current earnings and future stock movements. Lev and Thiagarajan (1993) e.g. use key value drivers from accounting data to predict firms' 'future earnings momentum' and test the correlation between accounting data and future stock movements.

To decipher the drivers underlying the association and direction of causality between tax avoidance activities and future profitability, we conduct propensity-matched difference-in-difference test. We then proceed with a DuPont analysis. First we break down pre-tax return on equity (ROE) into two components: pre-tax return on net operating assets (RNOA) and financial leverage (FLEV). We then follow Nissim and Penman (2001) who present a way to dissect leverage into two components, separating leverage derived from financing activities and leverage derived from operating activities. By using their equations, RNOA can further be broken down to another three components, net operating profit margin, operating asset turnover, and operating leverage. The net operating profit margin serves as an indicator of firms' pricing power, where the variance can be explained by analysis of the product price and cost structure. Operating asset turnover provides insight to a firm's efficiency in using assets to generate revenue. Operating leverage showcases leverage generated from operating liabilities e.g. by decreasing days payable outstanding, a firm can decrease the working capital tied in the business.

## *C. Institutional Development*

As previous research is primarily based on association tests, it is subject to reverse causality problems. To address concerns associated with endogeneity investigators can leverage an exogenous shock to tax avoidance. A suitable shock would be one that is material and has no direct impact on the endogenous variable of interest. If this hold true, and the investigators observe a change that is statistically significant in profitability after the shock, a causal association is implied. In December 31, 2005, several countries in Europe mandated IFRS for consolidation purposes. The new standard imposed stricter disclosure requirements, increasing the level of reporting transparency within these countries. The increased level of transparency made it easier for government agencies to detect tax avoidance activities, e.g. Kerr (2016) shows that tax avoidance decreased in countries that adopted IFRS in 2005 relative to non-adopters.

A shock with similar effects on tax avoidance is the adoption of FIN 48 in the United States. Effective in 2007, firms are required to analyse all non-certain tax positions, and disclose the magnitude unrecognised tax benefits would affect the effective tax rate. Following this shift, aggressive tax positions subject too low risk of detection prior to FIN 48, were disclosed to a greater extent, increasing tax aggressive firms' tax liabilities following the adoption. Numerous previous studies e.g. Robinson and Schmidt (2013) and Gupta et al. (2009) find that tax avoidance decreased following the adoption in FIN 48.

## *D. Hypothesis Development*

All else being equal, we expect to find that tax aggressive firms become less operationally profitable when exposed to a shock to tax avoidance. However, this is under the restriction that tax aggressive firms invest the incremental increase in after tax cash flow from tax avoidance activities into positive net present value (NPV) projects. Conversely, if we relax this assumption and firms invest the extra cash flow into negative NPV projects or turn to rent extraction, we hypothesise the association between future return on net operating assets and key current value drivers to be less positive for tax aggressive firms compared to non-tax aggressive firms. Our theories thus suggest that managers' current decisions regarding the tax benefits generated from tax avoidance affect firm pretax future earnings. This motivates our reasoning to use future pre-tax profitability measures and drivers throughout all regressions in this study. Since previous empiric research differs in the cross-section, it is not clear how tax avoidance impacts the association between firms' current profitability drivers and future return. Hence our two null hypotheses are stated as below.

**Hypothesis 1.** *Tax aggressive firms' future profitability is not affected by the 2005 imposed disclosure requirements.*

**Hypothesis 2.** *Tax aggressive firms' future profitability components are not affected by the 2005 imposed disclosure requirements.*

# III. Data and Methodology

## *A. Data*

'Datastream' was used to collect our sample consisting of 14,732 firm-year observations over the period 1999-2009[5]. In line with Kerr (2016), the countries were selected on the basis that they adopt IFRS in 2005 but do not allow IFRS as the base for statutory tax accounts. Furthermore, we conducted a robustness test, by performing all tests on U.S. data to investigate how the analysis holds up using FIN 48 as an exogenous transparency shock to tax avoidance. Utilities and financial institutions were excluded by removing firms within the following SIC ranges: 4950>SIC>4899 and 5999>SIC<7000. Moreover, since tax avoidance is likely to play less importance for loss making firms, unprofitable firms were excluded. We also exclude firm-year observations with negative net operating assets and earnings before interest expense larger than sales.

## *B. Measuring Corporate Tax Avoidance*

We define firm $i$ as tax aggressive ($TAX_i = 1$) if its three-year cash effective tax rate spread ($CETR3\_SP_{i,t}$) is in the bottom decile for its industry. Companies are grouped in industries $j$ using Fama-French 12 industry classification. The usage of three-year cash effective tax rate is in line with e.g. Dyreng et al. (2008), Chen et al. (2010), Katz et al. (2013) and offers several advantages as it is based on statutory and not financial reporting rules. Since the statutory tax rate varies cross-country, we use the spread between $CETR_{i,t}$ and the corporate statutory tax rate ($CSTR_t$), in line with Kerr (2016).

[5]Our primary sample includes Austria, Belgium, Denmark, France, Germany, Hungary, Poland, Spain, Sweden, Switzerland and Australia. We further perform our test on a second sample consisting of U.S. firms using FIN 48 as a shock.

## *C. Identification Strategy*

We implement an identification strategy that uses the adoption of IFRS in 2005 as an exogenous shock to firms' tax avoidance. To empirically investigate the treatment effect associated with a lower degree of tax avoidance, we conduct propensity matched difference-in-difference tests. We let tax aggressive firms make up our treated subset. We choose non-tax aggressive firms domiciled in countries experiencing the exogenous shock, as control firms. Since we are conducting an observational study, our results are by definition subject to numerous sources of biases due to non-randomisation. To control for confounding bias, we attempt to design the study so that the variation of the 'design' is a source of variation in $\eta_i$, which convincingly is uncorrelated with the error term $\epsilon_i$. To do this, we conduct a two-step quasi-experiment, propensity score matching and difference-in-difference tests to eliminate any back-door paths that connects tax avoidance with future profitability.

## *D. Propensity Score Matching*

A fundamental challenge in non-experimental studies is selection bias, which could lead to fundamental differences between our control and treatment subsets. Ultimately, this could violate the strong underlying assumption regarding parallel paths. To mitigate this risk, we use propensity score matching (PSM). The reasons why we use PSM as a method to mitigate selection bias are threefold. First, p-scores decrease the required extrapolation and consequent reliance on how the model is specified, which is positive since the causal inference can change a lot depending on how the model is specified (Ho et al., 2007). Propensity score matching thus adds more robustness to inference tests if done correctly. Second, by estimating propensity scores, the selected range of observed variables is reduced to a single scalar summary, the propensity score, which facilitates balancing methods. Third, since the estimation of propensity scores is conducted without regard to the outcome variable, the 'specification' of the study is effectively separated from the examination, and thereby reducing potential sources of bias (Heller et al., 2010).

The propensity score is the conditional probability of exposure, given a set of observed covariates. The method, outlined by Rosenbaum and Rubin, facilitates the design and analysis of non-experimental studies as it mitigates some of the systematic differences between the treated group and the control group. The purpose of the matched sampling is to generate a control group that is as similar to the treated group as possible in terms of the chosen covariates and randomly different from one another with regards to the observed outcomes. One drawback with propensity score matching is that the propensity scores have to be estimated. Kang and Schafer (2008) address this problem and find that minor misspecifications of the propensity score model can result in a sizeable bias when estimating the treatment effect.

To derive a balanced sample prior to the matching process, a logistic propensity score model is estimated based on observed covariates of our sample, containing 412 IFRS (1,442 FIN 48) firm observations for the collapsed period 2002-2004 (2004-2006 US). When choosing which covariates to match on, we build on the model suggested by Katz et al. (2013). We then experiment with mixed combinations to investigate which design provides the best balance for our sample. The tested covariates excluding the ones used by Katz et al. (2013), include inventory, market-to-book ratio, RD and SGA as suggested by Lisowsky et al. (2013). However, the bias reduction does not improve when the previously stated covariates are included. Nonetheless, we diverge from the model proposed by Katz et al. (2013) as we do not include lagged three-year cash effective tax rate as an observed covariate. This is motivated by a low time variation in CETR spread, resulting in high autocorrelation. The lagged CETR spread is thus effectively very similar to the variable three-year cash effective tax rate spread, which is used to define the firms that are tax aggressive and considered to be too endogenous.

$$\begin{aligned} TAX_i = {} & \delta_1 ASSETS_i + \delta_2 ASSETS\_SQ_i + \delta_3 ROA_i + \delta_4 ROA\_SQ_i + \delta_5 TACC_i \\ & + \lambda_j + \gamma_c + \epsilon_i \end{aligned} \tag{1}$$

Where the indicator variable $TAX_i$ denotes whether firm $i$ is tax aggressive, $ASSETS_i$ is the natural log of firm $i$'s total assets[6], $ASSET\_SQ$ is firm $i$'s total assets raised to the power of two, ROA is firm $i$'s pre-tax return on total assets, $ROA\_SQ$ is firm $i$'s ROA raised to the power of two, $TACC_i$ equals total accruals for firm $i$, defined in line with Richardson et al. (2005), $\lambda_j$ and $\gamma_c$ denotes industry and country fixed effects, respectively. We do not include yearly fixed effects as matching is performed on collapsed baseline data. In our case the ex-ante period is the three years before the IFRS introduction in 2005 and the ex-post period is the three years after the introduction.

We run a logistic regression on the collapsed data and match at baseline using the 'Stata' command 'psmatch2'. Matching at baseline is the most commonly used method when estimating propensity scores on panel data followed by analysis using matched groups Kupzyk and Beal (2017a). Numerous previous studies match propensity scores at baseline when conducting difference-in-difference analyses on panel data (Plassman et al., 2010; Kohls et al., 2009). By matching at baseline, we assume that the variable $TAX_i$ is time-invariant. This means that no firm can enter the treatment or control group after baseline and that firms only can be included into one of the groups i.e. no switching. This can lead to potential biases if the assumption regarding time-invariance does not hold true. For example, firms can be tax aggressive at time $t$, but divert from

[6]To make sure that all model inputs are in common currencies, we have converted all firms' total assets to US dollars.

this behaviour at a later stage. However, by using the propensity score this bias is reduced as the misspecifications between the treatment conditions is accounted for Kupzyk and Beal (2017b).

To minimise the risk of violating Conditional Independence Assumption (CIA) i.e. that there are no unobserved covariates that influence the outcome variable, we conduct a double robustness test in line with Robins et al. (1994). To do this, we perform matched difference-in-difference regressions to add more robustness, taking advantage of the back-door criterion outlined by Pearl (2000). Consistent with Robins et al. (1994), Ho et al. (2007) find that regressions based on matched data are not as sensitive to imperfect models and therefore more robust than regressions based on the full data set. The backdoor criterion allows us to control for omitted variables that should have been controlled for in the propensity score matching to estimate the causal effect of tax aggressiveness on future profitability. Ultimately, this provides us with two chances to get things right: first, we use propensity score matching to exclude any association between observed covariates and the probability of being assigned as tax aggressive. Second, we conduct a matched difference-in-difference regression and block the back-door paths for other covariates that link tax avoidance with future profitability. The difference-in-difference technique will be discussed further in a separate section.

To examine if we have a balanced sample, we examine the covariate balance for matched treatment and control firms. If the balance is not acceptable, it would indicate that comparability is fundamentally not feasible and different evaluation methods should be used. The propensity scores for all covariates can be seen as fulfilling the balance assumption, as the mean bias of the IFRS matched sample is 4.6 percent and 6.0 percent for the matched FIN 48 sample which is less than the 10-percent threshold, suggested by Rosenbaum and Rubin (1985). We therefore conclude that we fulfil the assumption of balanced data set.

If the covariates are affected by the treatment, the treatment effect will not be correctly measured, as it will not solely include the differences induced by the treatment. All of the observed covariates fulfil the requirement of not being directly affected by the assigned treatment, which otherwise could create biases (Imbens, 2003).

In our model we match with replacement. This essentially means that once one of the control firms has been used to match with a treated firm, it is put back into the pool of control firms and can be used to match with other treated firms. The treated firms, are only used once, i.e. without replacement. By allowing control firms to be used with replacement, we eliminate the bias that would have appeared if we matched without replacement, as this approach minimises the distance between the two p-scores and the technique is considered best practise (Robins et al., 1994). Furthermore, by allowing replacement, the order in which the matching process occur does not affect the outcome. However, a potential problem associated with matching 'with replacement' is that control firms with abnormal values can receive a relatively high weight and consequently have a large effect on the difference-in-difference estimate.

We use nearest neighbour matching, which means that a treated firm is matched with a pre-specified number, $k$, of control firms. We match a treated firm with its five nearest neighbours outlined by Rubin (1973). Matching to multiple control firms rather than using one-to-one matching could increase the bias in our sample since the four additional matches are by definition further away than the first match with the lowest absolute difference to the treated firm. However, there are certain cases when matching to multiple neighbours can be beneficial e.g. when numerous covariates have the same propensity score i.e. the overall absolute difference between the treated and control firms does not increase while the number of observations increases, minimising the variance. This is the case for our sample, which is why we choose to match on a one-to-5 basis, consistent with Katz et al. (2013).

Rosenbaum and Rubin (1985) find that when caliper matching is implemented with propensity score matching, 0.25 standard deviations of the estimated propensity score can be seen as best practise. To ensure that the treated firms are matched with control firms that are within reasonable distance, we follow Rubin (2008) suggestion and restrict matches using a caliper of 0.25 standard deviations.

The result from the propensity score matching is presented in Appendix A, Table AII and AIII and Figure A1 for reference. The pseudo $R^2$ 13.8 percent (3.1 percent U.S.), can be viewed as reasonable as a propensity scores with high explanatory power suggests non-random matching.

Once the propensity score matching is done, the first step in the two-stage robustness stage is completed. The following section will provide more detail on the propensity-matched difference-in-difference test.

## *E. Difference-in-Difference with Matching*

By running a propensity-matched difference-in-difference analysis, we minimise the risk of adding bias to our analysis by using the back-door criterion outlined by Pearl (2000). The back-door path in our case would be a non-causal pathway from tax avoidance to firms' future profitability. The method thus allows us to control for variables that were unobserved in the propensity score matching process and also time-invariant characteristics. By performing the difference-in-difference test using matched pairs, we increase the comparability of the four groups. Furthermore, the propensity score matching also mitigates the assumption of no anticipation as the matching in theory matches treated firms with a control firm that is as similar as possible to the treated firm.

A potential area of concern is the appropriateness of IFRS as an exogenous shock to tax avoidance. IFRS could have had a direct effect on the endogenous variables through the change in presentation of accounting data i.e a potential back-door path. We attempt to mitigate this problem in two ways. First, the exogenous variable '$POST_{i,t+1}$' allows us to control for other influences on future profitability than changes due to decreased tax avoidance. However, this is only true if both subsets are equally affected by other influences. If e.g. treatment and control firms are affected differently by the change in presentation, we would not be able to determine if the estimated treatment effect is driven by changes in the way accounting data is presented or if it is driven by a decrease in tax avoidance. However, we are able to partially mitigate this by propensity score matching. Since we are performing the regressions using matched data, we ensure that the compared firms are as similar as possible. This increases the likelihood that they are similarly affected by the change in how accounting data is presented. Second, we test the robustness of our results by extending the analysis to a U.S. sample, leveraging the adoption of FIN 48, which does not impact the way accounting data is presented except for the presentation of undisclosed tax liabilities.

A key underlying assumption of the difference-in-difference test is the Common Trends Assumption (CTA). That is, control and treatment firms are assumed to follow parallel paths apart from the effect of the shock. If this does not hold true, the control firms would be poor counterfactuals for what would have happened in absence of a shock. We employ three strategies to mitigate the risk of violating the CTA. First, by matching treatment firms to similar control firms, we increase the likelihood that they follow the same path. Second, by performing placebo tests for both the IFRS shock and the FIN 48 shock, we can examine the prevalence of pre-treatment trends. Third, we examine graphically the shapes of the ex-ante trends.

Since we examine panel data, the independent and identically distributed random variables (i.i.d.) is not likely to hold. Due to autocorrelation, our estimated standard errors could significantly understate the standard deviation of the difference-in-difference estimate. To circumvent this problem, we relax the assumption of conditional heteroskedasticity and calculate standard errors that are heteroskedasticity-robust in line with Davidson et al. (1985). Bertrand et al. (2004) suggest that clustering should be done at the level of treatment status. In our study, treatment is done on firm-level, containing three-digit clusters. However, bias can still occur if the clusters are unbalanced. Furthermore, if the numbers of clusters are small, a t-test generated from 'Stata' would overstate the critical values due to the use of a t-distribution of G-1 degrees of freedom rather than N-k. However, this is not a problem in our case as we have three-digit clusters in all of our regressions and should thus not affect our results significantly.

Given the concern of inconsistent standard errors, due to serial correlation, we take a the conservative approach and add an additional robustness test where time-series information is ignored. In this test, we collapse the ex-ante and ex-post to one period each — 'pre' and 'post'. Bertrand et al. (2004) show that this method produces consistent standard errors. This test however comes with the disadvantage of lower power due to fewer observations.

An underlying assumption when estimating the treatment effect in our study is that the exogenous shocks only affects tax aggressive firms. However, although it is possible that this assumption does not fully hold true, it is not likely to have a material impact for two reasons. First, the effect on the control subset is likely to be small, since non-tax aggressive firms by definition have less undisclosed tax liabilities affected by imposed disclosure requirements. Second, the difference-in-difference approach is still applicable when the control is slightly affected although the estimated magnitude of the treatment effect would be somewhat contaminated.

The model designed to test our hypotheses is based on the time variation at the firm-level. We therefore need to choose fixed effects to ensure that the estimated treatment effect is not affected by any other shock than the IFRS introduction during our time window of interest. We expect firms' change in profitability to be correlated with industry-time trends since different industries are at different trajectories over time. In our sample, we e.g. have technology companies in the early 2000's and contrast them to construction companies, where the structure of competition, the production process and demand characteristics differ. To control for this, we follow the hybrid method outlined by Allison (2009) and generate two hybrid fixed effects. We interact time-invariant variables industry, $j$ and country, $c$, with a time variant variable 'year'. Since the industry composition differs across countries, the inclusion of country-year fixed effects captures different things than country-year fixed effects. Ultimately, by including hybrid fixed effects, we attempt to mitigate the risk of presenting an effect of changing a firms profitability within certain types of industries and countries without controlling for whether or not the firm's profitability changed because its profitability is endogenous to some movement that all firms in an industry or country have in common over time. Otherwise, the presented change might not only be related to the treatment but also to something on the industry/country level that we have not captured. By including industry, country and year as separate fixed effects, we would only capture things that are time-invariant at the time level while controlling for things that vary over time and affect everybody. We therefore include the interaction variables year-industry and year-country to mitigate this risk following Allison (2009) and firm fixed effects. However, there is a cost of including this many fixed effects, some of the signal in the data is thrown away.

## *F. Model Design*

To test whether the decrease in tax avoidance following the 2005 IFRS adoption impacted future profitability, we estimate the following specification:

$$ROE_{i,t+1} = \delta_1 TAX_i + \delta_2 POST_t + \delta_3 POST_t * TAX_i + \delta_4 X_{j,t} + \delta_5 X_{c,t} + \beta_i + \epsilon_{i,t} \quad (2)$$

Where the exogenous variable $ROE_{i,t+1}$ denotes firm $i$'s pre-tax return on equity in year $t+1$, $TAX_i$ is a dummy variable that equals 1 if firm $i$ is tax-aggressive, $POST_{i,t}$ is a dummy variable that equals 1 if the year is 2005 or after, $POST_t * TAX_i$ denotes the difference-in-difference estimator, $X_{j,t}$ denotes industry-year fixed effects and $X_{c,t}$ denotes country-year fixed effects, and $\beta_i$ denotes firm fixed effects.

We use the same regression specification when testing future operating profitability using $RNOA_{i,t+1}$ as the endogenous variable. Regressions performed on collapsed data are designed similarly to the equations shown in Appendix B except for the definition of the interaction variable 'year-industry'. This is due to the fact that we are collapsing the data and thus only have one period before and one period after the difference-in-difference test. The industry-year fixed effect is therefore defined as industry $j$ times '$POST_t$'. The definition of all variables can be found in Appendix A, Table AI.

To test whether the 2005 adoption of IFRS impacted the components of future profitability, we decompose pre-tax return on equity by following the method outlined by Nissim and Penman (2003):

$$ROE_{i,t+1} = RNOA_{i,t+1} * FLEV_{i,t+1} \quad (3)$$

Where the $ROE_{i,t+1}$ denotes pre-tax return on equity, $RNOA_{i,t+1}$ denotes pre-tax return on net operating assets and $FLEV_{i,t+1}$ denotes financial leverage. By following Nissim and Penman (2003) and Nissim and Penman (2001), we further break down $RNOA_{i,t+1}$ into three factors:

$$RNOA_{i,t+1} = PM_{i,t+1} * AT_{i,t+1} * OLLEV_{i,t+1} \quad (4)$$

Where $PM_{i,t+1}$ denotes the profit margin for firm $i$ in time $t+1$, $AT_{i,t+1}$ denotes operating asset turnover for firm $i$ in time $t+1$ and $OLLEV_{i,t+1}$ denotes the operating liability leverage for firm $i$ in time $t+1$. Using these relationships, we now have 4 components explaining firm $i$'s profitability in time $t+1$. We use each individual component as an endogenous variable in the regression specification outlined in equation (2)[7]. To quantify the relative contribution of each component to the increase in future profitability, we first decompose the change in pre-tax return on equity using the following equation:

[7] Regression specifications for each future profitability component can be found in Appendix B.

$$\Delta ROE_{i,t} = FLEV_{i,t}RNOA_{i,0} + RNOA_{i,t}FLEV_{i,0} + (FLEV_{i,t} - FLEV_{i,0})(RNOA_{i,t} - RNOA_{i,0}) \tag{5}$$

Where $\Delta ROE_{i,t}$ denotes future[8] pre-tax return on equity for firm $i$ in period $t$, $FLEV_{i,t} * RNOA_{i,0}$ denotes future financial leverage for firm $i$ in period $t$ while holding future return on net operating assets fixed, $RNOA_{i,t} * FLEV_{i,0}$ denotes future return on net operating assets in time $t+1$ for firm $i$ while holding financial leverage fixed. $(FLEV_{i,t} - FLEV_{i,0})(RNOA_{i,t-}RNOA_{i,0})$ denotes the interaction effect between changes in leverage and return on net operating assets. We estimate the contribution to pre-tax return on equity by using each of the three components in Equation (5) as endogenous variables in our regression specified in Equation (2). Since contribution analyses of this sort are limited to datasets where there is only one baseline period, we only perform this test on collapsed datasets. Note that we have defined period 0 as ex-ante and period 1 as ex-post.

To quantify the relative contribution of each component to the increase in future operating profitability, we decompose the change in pre-tax return on net operating assets using the following equation[9]:

$$\begin{aligned}\Delta RNOA_{i,t} = &(AT_{i,0} * OLLEV_{i,0} * \Delta PM_{i,t}) + (PM_{i,0} * OLLEV_{i,0} * \Delta AT_{i,t}) \\ &+ (PM_{i,0} * AT_{i,0} * \Delta OLLEV_{i,t}) + (PM_{i,0} * \Delta AT_{i,t} * \Delta OLLEV_{i,t}) \\ &+ (AT_{i,0} * \Delta PM_{i,t} * \Delta OLLEV_{i,t}) + (OLLEV_{i,0} * \Delta PM_{i,t} * \Delta AT_{i,t}) \\ &+ (\Delta OLLEV_{i,t} * \Delta PM_{i,t} * \Delta AT_{i,t})\end{aligned} \tag{6}$$

Where $\Delta RNOA_{i,t}$ denotes changes in future operating profitability for firm $i$ in period $t$. $AT_{i,0} * OLLEV_{i,0} * \Delta PM_{i,t}$ captures changes in future operating profitability attributable to changes in profit margin, while holding operating asset turnover and operating liability leverage fixed. $PM_{i,0} * OLLEV_{i,0} * \Delta AT_{i,t}$ captures changes in future operating profitability attributable to changes operating asset turnover, while holding profit margin and operating liability leverage fixed. $PM_{i,0} * AT_{i,0} * \Delta OLLEV_{i,t}$ captures changes in future operating profitability attributable to changes operating liability leverage, while holding profit margin and operating liability leverage fixed. The remaining components represent interaction terms. We estimate the contribution to pre-tax return on net operating assets by using each of these components in Equation (6) as endogenous

[8] Since we use collapsed data, the future does not refers to the period $t+1$. Instead, the future for period 0 is the average of the variable in $t+1$ in the non-collapsed data, where t represents years instead of periods. This is applicable for all variables defined as 'future' in the contribution analyses.

[9] A step-by-step derivation for the equation presented below is shown in Appendix B.

variables in our regression specified in Equation (2). Similar to the pre-tax return on equity contribution analysis, we perform the pre-tax return on net operating assets contribution analysis on collapsed data. This effectively means that we ignore the time-series information as we calculate standard errors. Bertrand et al. (2004) outline the prerequisites for implementing this method, which in our case can be considered to be fulfilled as the IFRS shock was introduced at the same point in time for all treated countries

# IV. Results

## Table I

## Descriptive Statistics

This table presents summary statistics for tax aggressive firms (TAX=1) and non-tax aggressive firms (TAX=0) for the two samples studied. Firms are classified as tax aggressive if their three year cash effective tax rate spread is in the bottom decile for its industry. The dataset is sampled using 'Datastream' and excludes utilities, financial institutions, observations with negative pre-tax income, negative operating asset turnover and observations with earnings before interest expense greater than sales. The data is winzorised at the 1st and 99th percentiles.

*IFRS:* The sample consists of firms with primary listing in European countries that 1) implemented IFRS in 2005 and 2) retained local GAAP for tax accounts following the adoption[10]. The sample is restricted to the three years ex-ante the adoption date (December 31, 2005) and three years ex-post, 2002-2007.

*FIN 48:* The sample includes firms with primary listing in the United States and includes observations three years ex-ante the adoption of FIN 48, effective 2007, and three years ex-post, i.e 2004-2009. Sources: Datastream OECD.

**IFRS (EU and Australia): 2002 - 2007**

| | | | *TAX = 1* | | | | | | *TAX = 0* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variable** | **N** | **Mean** | **SD** | **Q1** | **Median** | **Q3** | **N** | **Mean** | **SD** | **Q1** | **Median** | **Q3** | **t-stat** |
| *ROE* | 270 | 0.226 | 0.195 | 0.141 | 0.211 | 0.277 | 701 | 0.286 | 0.186 | 0.171 | 0.256 | 0.359 | -4.395 |
| *FLEV* | 259 | 1.322 | 0.683 | 0.776 | 1.274 | 1.657 | 691 | 1.385 | 0.691 | 0.983 | 1.287 | 1.665 | -1.255 |
| *RNOA* | 259 | 0.190 | 0.141 | 0.093 | 0.149 | 0.271 | 691 | 0.214 | 0.131 | 0.121 | 0.191 | 0.291 | -2.438 |
| *PM* | 273 | 0.149 | 0.285 | 0.062 | 0.126 | 0.211 | 703 | 0.122 | 0.130 | 0.047 | 0.083 | 0.146 | 2.062 |
| *AT* | 259 | 1.795 | 1.404 | 0.739 | 1.423 | 2.379 | 691 | 3.337 | 3.464 | 1.276 | 2.215 | 4.414 | -6.950 |
| *OLLEV* | 259 | 0.462 | 0.420 | 0.201 | 0.349 | 0.639 | 691 | 0.731 | 1.050 | 0.286 | 0.458 | 0.845 | -4.005 |
| *SIZE* | 278 | 13.857 | 1.894 | 12.716 | 14.116 | 14.870 | 725 | 13.667 | 2.092 | 12.082 | 13.581 | 15.065 | 1.320 |
| *ROA* | 262 | 0.111 | 0.081 | 0.062 | 0.099 | 0.132 | 686 | 0.130 | 0.086 | 0.074 | 0.111 | 0.162 | -3.093 |
| *TACC* | 268 | 140,916 | 627,555 | -430 | 21,591 | 95,987 | 719 | 202,160 | 1,020,793 | -2,416 | 9,311 | 78,562 | -0.919 |
| *CETR3_SP* | 234 | -0.138 | 0.086 | -0.198 | -0.142 | -0.083 | 631 | 0.045 | 0.208 | -0.045 | 0.012 | 0.085 | -13.067 |

**FIN 48 (United States): 2004 - 2009**

| | | | *TAX = 1* | | | | | | *TAX = 0* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variable** | **N** | **Mean** | **SD** | **Q1** | **Median** | **Q3** | **N** | **Mean** | **SD** | **Q1** | **Median** | **Q3** | **t-stat** |
| *ROE* | 706 | 0.196 | 0.492 | 0.194 | 0.194 | 0.307 | 1,914 | 0.206 | 0.455 | 0.115 | 0.197 | 0.290 | -0.486 |
| *FLEV* | 641 | 1.416 | 1.659 | 1.262 | 1.262 | 1.865 | 1,853 | 1.287 | 1.516 | 0.780 | 1.100 | 1.494 | 1.804 |
| *RNOA* | 619 | 0.190 | 0.192 | 0.150 | 0.150 | 0.251 | 1,822 | 0.199 | 0.188 | 0.105 | 0.166 | 0.282 | -1.008 |
| *PM* | 720 | 0.128 | 0.131 | 0.111 | 0.111 | 0.181 | 1,920 | 0.101 | 0.130 | 0.052 | 0.094 | 0.156 | 4.675 |
| *AT* | 641 | 2.013 | 2.294 | 1.677 | 1.677 | 2.655 | 1,853 | 2.665 | 2.921 | 1.203 | 1.877 | 3.114 | -5.126 |
| *OLLEV* | 641 | 0.478 | 0.938 | 0.342 | 0.342 | 0.557 | 1,853 | 0.558 | 0.844 | 0.262 | 0.398 | 0.637 | -2.009 |
| *SIZE* | 768 | 13.513 | 1.865 | 13.593 | 13.593 | 14.608 | 2,067 | 13.502 | 1.749 | 12.480 | 13.390 | 14.555 | 0.150 |
| *ROA* | 686 | 0.120 | 0.072 | 0.103 | 0.103 | 0.149 | 1,777 | 0.129 | 0.081 | 0.079 | 0.113 | 0.159 | -2.475 |
| *TACC* | 736 | 216,447 | 6,222,404 | 29,288 | 29,288 | 137,845 | 2,060 | 209,131 | 2,134,243 | 11 | 23,338 | 106,028 | 0.046 |
| *CETR3_SP* | 681 | -0.274 | 0.143 | -0.298 | -0.298 | -0.222 | 1873 | -0.097 | 0.148 | -0.180 | -0.099 | -0.038 | -27.111 |

[10] The countries included in the EU-Australia sample are; Australia, Austria, Belgium, Denmark, France, Germany, Hungary, Poland, Spain, Sweden and Switzerland.

Table I presents descriptive statistics for both samples examined and is segmented on tax aggressive firms ($TAX_i = 1$) and firms that are not tax aggressive ($TAX_i = 0$). By construct, the three-year cash effective tax rate spread ($CETR3\_SP_{i,t}$) is significantly lower for tax aggressive firms compared to non-tax aggressive firms.

Return on equity is lower for tax aggressive firms in our main sample exposed to the 2005 adoption of IFRS and the primary driver appears to be lower return on net operating assets and lower financial leverage. These results however, are not consistent with sample exposed to FIN 48. When contrasting the summary statistics for the two samples, tax aggressive firms in EU-Australia have significantly higher financial leverage compared to non-tax aggressive firms whilst they have lower leverage in the US. Regardless of region, we find significant results that firms' operating asset turnover and operating liability leverage are lower for tax aggressive firms, whilst the profit margin is higher.

## *A. Tax Avoidance and Future Profitability*

Table II presents Ordinary Least Squares (OLS) estimates for the matched difference-in-difference tests using $ROE_{i,t+1}$ as the dependent variable. Our main regression model (1) is based on time-series of three years ex-ante and three years ex-post the adoption of IFRS. Standard errors are clustered on a firm-level and we include industry-year fixed effects, country-year fixed effects and firm fixed effects. These fixed effects and firm-level clustering are used for all tables discussed in this section. The results in (1) show that we can not reject the null hypothesis that a reduction in tax avoidance had no effect $ROE_{i,t+1}$. This difference-in-difference estimate remains insignificant when using FIN 48 as an exogenous shock instead of IFRS and also when ignoring time-series information in (2) and (5).

Table III presents OLS estimates for the matched difference-in-difference test using $RNOA_{i,t+1}$ as the endogenous variable. We find a positive difference-in-difference estimate of 3.2 percent that is statistically significant at the 10-percent level (8.9 percent) (1), suggesting that a reduction in tax avoidance resulted in higher operating profitability.

As we rely on panel data, we are subject to the problem of serial correlation, i.e $RNOA_{i,t+1}$ is positively associated with $RNOA_{i,t+2}$. This could cause the standard errors to be underestimated, which potentially could lead us to falsely reject our first null-hypothesis. Column (2) depicts collapsed data, and by collapsing, we ignore time-series data when calculating standard errors. The estimated interaction coefficient is positive, but only significant at the 14-percent level. However, it is difficult to rule out if the increased p-value is a result of less observations (1,446 vs. 521) or due to more accurately estimated standard errors (Bertrand et al., 2004).

## Table II

## Tax Avoidance and Future Pre-tax Return on Equity

This table presents OLS regression estimates for future return on equity, defined as t+1. To control for confounding bias, propensity score matching is performed, matching on observed baseline covariates, outlined in Appendix B (B1). Tax aggressive firms (TAX=1) are matched to their five nearest non-tax aggressive neighbours using propensity scores. A firm is defined as tax aggressive if its cash effective tax rate spread is in the bottom decile of its industry. Difference-in-difference tests are then conducted on matched data using the IFRS as an exogenous transparency shock to tax avoidance. The model design is based on the time variation at the firm-level. To ensure that the estimated treatment effect is not affected by other shocks than the IFRS introduction during our event window of interest, we include industry-year, country-year and firm fixed effects. Standard errors are clustered at the firm-level. Future profitability is defined as year t+1. The underlying regressions are presented in Appendix B. The dummy variable 'POST' represents the time range 2005-2007. Sources: Datastream and OECD.

| | Pre-tax Return on Equity ($ROE_{i,t+1}$) | | | | | |
|---|---|---|---|---|---|---|
| | IFRS | | | FIN 48 | | |
| | Main Test | Collapsed | Placebo (2002) | Main Test | Collapsed | Placebo (2004) |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **TAX × POST** | **-0.021** | **-0.018** | **0.030** | **-0.039** | **-0.023** | **0.034** |
| | (0.020) | (0.023) | (0.036) | (0.061) | (0.067) | (0.032) |
| TAX | 0.0868*** | -0.003 | 0.130*** | 0.399*** | 0.083 | 0.100 |
| | (0.029) | (0.038) | (0.035) | (0.140) | (0.056) | (0.092) |
| POST | -0.316*** | 0.053 | -0.504*** | -0.107* | -0.0823* | 0.030 |
| | (0.075) | (0.039) | (0.070) | (0.065) | (0.046) | (0.067) |
| Country-year FE | Y | Y | Y | Y | Y | Y |
| Industry-year FE | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y |
| N | 1,467 | 525 | 1,460 | 3,376 | 1,323 | 3,776 |

As previously mentioned, IFRS did not only impact tax avoidance but also the way firms report their earnings, assets, liabilities and equity. Hence, there is a risk that the positive difference-in-difference estimates in (1) and (2) are affected by changes in reporting standards that affect treated and control firms differently. To control for this, we perform a robustness test using the adoption of FIN 48 as an exogenous shock to tax avoidance on U.S. data (4). This has an advantage since the imposed requirements of FIN 48 only affects the way firms report taxes. The results are consistent with our main test and the positive $RNOA_{i,t+1}$ difference-in-difference estimate is significant at a 5-percent level. This result is robust when conducting the test on collapsed data (5), where serial correlation has been controlled for.

Another concern with our main regression in column (1) is that the exogenous variable 'POST' has a large negative coefficient in relation to the sample standard deviation. This suggest that control firms experienced a significant negative secular trend apart from the reduction in tax avoidance following the adoption of IFRS. This gives rise the fundamental questions, what is driving the results? Could it be the case that a few control firms experience a significant reduction in profitability during the treatment, or is it perhaps the basis by which control firms have been selected that is problematic?

**Table III**

**Tax Avoidance and Future Pre-tax Return on Net Operating Assets**

This table presents OLS regression estimates for future return on assets turnover, defined as t+1. To control for confounding bias propensity score matching is performed, matching on observed baseline covariates, outlined in Appendix B (B1). Tax aggressive firms (TAX=1) are matched to its five nearest non-tax aggressive firms using propensity scores. A firm is defined as tax aggressive if its cash effective tax rate spread is in the bottom decile of its industry. Difference-in-difference tests are then conducted on matched data using the IFRS as an exogenous transparency shock to tax avoidance. The model design is based on the time variation at the firm-level. To ensure that the estimated treatment effect is not affected by other shocks than the IFRS introduction during our event window of interest, we include industry-year, country-year and firm fixed effects. Standard errors are clustered at the firm-level. Future profitability is defined as year t+1. The underlying regressions are presented in Appendix B. The dummy variable 'POST' represents the time range 2005-2007 for the IFRS and 2007-2009 for Fin 48. Sources: Datastream and OECD.

| | **Pre-tax Return on Net Operating Assets (*RNOA* $_{i,t+1}$)** | | | | | |
|---|---|---|---|---|---|---|
| | IFRS | | | FIN 48 | | |
| | Main Test | Collapsed | Placebo (2002) | Main Test | Collapsed | Placebo (2004) |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **TAX × POST** | **0.0322*** | **0.034** | **0.013** | **0.0449**** | **0.0525*** | **-0.001** |
| | (0.019) | (0.023) | (0.019) | (0.020) | (0.028) | (0.015) |
| TAX | -0.009 | -0.033 | 0.0514* | -0.061 | -0.007 | -0.213*** |
| | (0.023) | (0.023) | (0.028) | (0.053) | (0.031) | (0.044) |
| POST | -0.311*** | 0.019 | -0.434*** | -0.031 | -0.0637** | -0.044 |
| | (0.075) | (0.032) | (0.054) | (0.038) | (0.032) | (0.037) |
| Country-year FE | Y | Y | Y | Y | Y | Y |
| Industry-year FE | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y |
| N | 1,446 | 521 | 1,376 | 3,167 | 1,283 | 3,571 |

To mitigate these sources of error, we leverage FIN 48 as a robustness check by comparing results in (1) with (4). When contrasting the results, it becomes clear that our results have not been significantly affected by previously stated issues. To further investigate the robustness of our results, we investigate the pre-treatment trends in Figure 1 to make sure that the common trends assumption is not violated (CTA). By looking at Figure 1 it seems like CTA holds for $RNOA_{i,t+1}$, giving further credence to our results.

In summary, we find no significant impact on $ROE_{i,t+1}$ following a reduction in tax avoidance but find a positive and significant difference-in-difference estimate for $RNOA_{i,t+1}$. This suggests that a decrease in tax avoidance led to increased future profitability for treated tax aggressive firms.

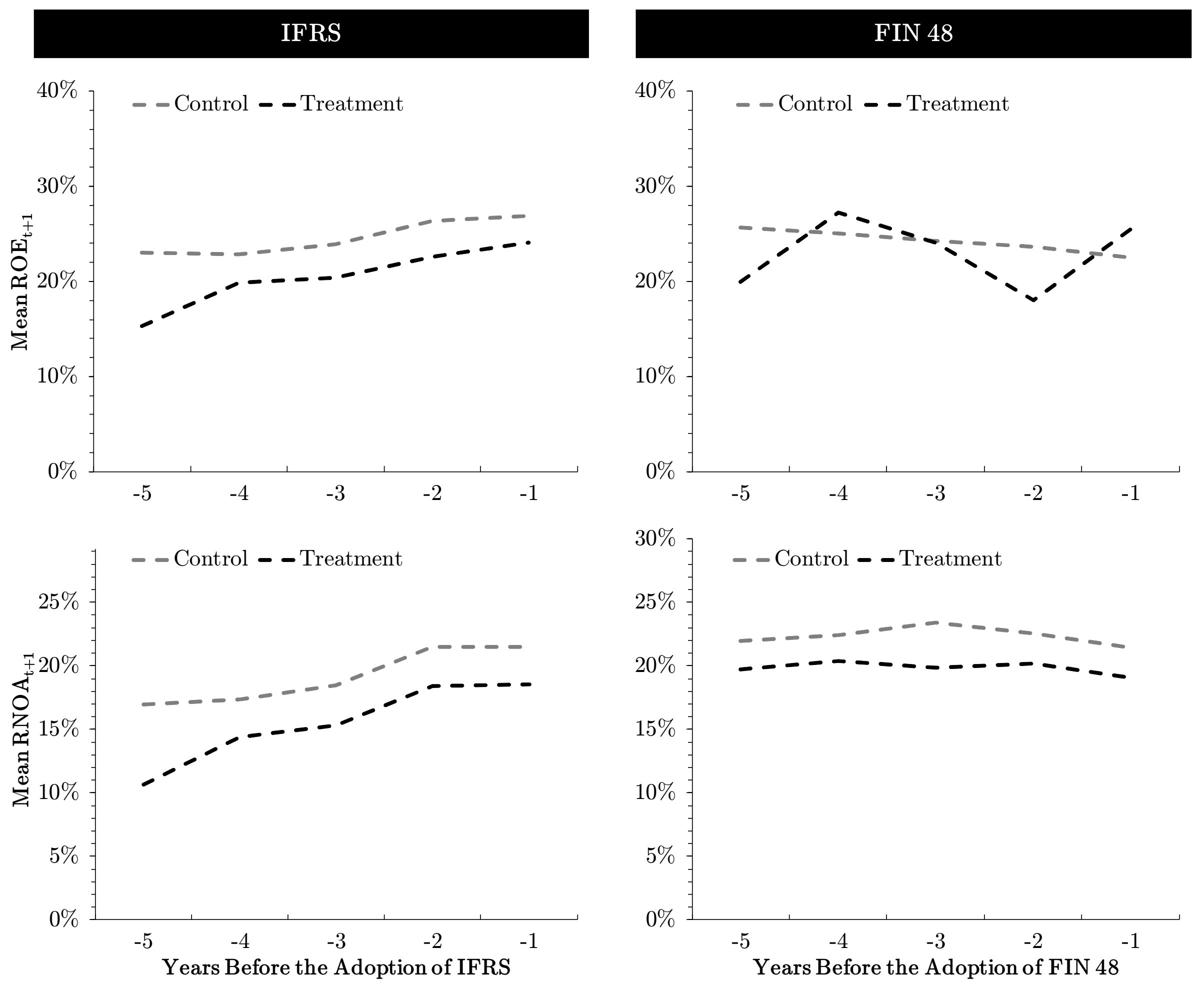


**Figure 1: Pre-treatment Trends – Future Profitability** Depicts graphs outlining the pre-treatment trends for our treated (tax aggressive) and control subsets (non-tax aggressive). The graphs plot the mean of $ROE_{t+1}$ and $RNOA_{t+1}$ for both treated and control firms, segmented by the use of IFRS (EU-Australia) and FIN 48 (US) as exogenous shocks. Sources: Datastream and OECD.

## *B. Tax Avoidance and Future Profitability Components*

In this section, we show that the increase in operating profitability following the IFRS adoption is primarily driven by more effective balance sheet management. We find that operating asset turnover and operating leverage improve for tax-aggressive firms relative to control following the 2005 IFRS adoption, and that the results are statistically significant.

This is achieved by decomposing profitability into its components and testing each of these factors as endogenous variables in our matched difference-in-difference regressions. Industry-year, country-year, and firm fixed effects are included. We also cluster at the firm-level. These fixed effects and firm-level clustering are used for all tables discussed in this section.

Table IV presents the difference-in-difference estimates for $FLEV_{i,t+1}$. The coefficient is negative and significant (1), indicating that tax aggressive firms decreased their financial leverage relative to control firms following the reduction in tax avoidance. These results are robust when controlling for serial correlation in (2) but with slightly less significance (1 percent vs. 5 percent), respectively.

**Table IV**

**Tax Avoidance and Future Financial Leverage**

This table presents OLS regression estimates for future financial leverage, defined as t+1. To control for confounding bias propensity score matching is performed, matching on observed baseline covariates, outlined in Appendix B (B1). Tax aggressive firms (TAX=1) are matched to its five nearest non-tax aggressive firms using propensity scores. A firm is defined as tax aggressive if its cash effective tax rate spread is in the bottom decile of its industry. Difference-in-difference tests are then conducted on matched data using the IFRS as an exogenous transparency shock to tax avoidance. The model design is based on the time variation at the firm-level. To ensure that the estimated treatment effect is not affected by other shocks than the IFRS introduction during our event window of interest, we include industry-year, country-year and firm fixed effects. Standard errors are clustered at the firm-level. Future profitability is defined as year t+1. The underlying regressions are presented in Appendix B. The dummy variable 'POST' represent the time range 2005-2007 for the IFRS and 2007-2009 for Fin 48. Sources: Datastream and OECD.

| | Financial Leverage ($FLEV_{i,t+1}$) | | | | | |
|---|---|---|---|---|---|---|
| | IFRS | | | FIN 48 | | |
| | Main Test | Collapsed | Placebo (2002) | Main Test | Collapsed | Placebo (2004) |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **TAX × POST** | **-0.225*****| **-0.221**** | **-0.181*** | **-0.057** | **0.003** | **0.196*** |
| | (0.073) | (0.086) | (0.096) | (0.183) | (0.192) | (0.107) |
| TAX | 0.515*** | 0.464*** | 0.615*** | 0.644 | 0.472*** | 0.099 |
| | (0.124) | (0.094) | (0.093) | (0.493) | (0.132) | (0.239) |
| POST | 0.017 | 0.183 | -0.016 | -0.077 | 0.063 | 0.115 |
| | (0.075) | (0.165) | (0.185) | (0.171) | (0.117) | (0.169) |
| Country-year FE | Y | Y | Y | Y | Y | Y |
| Industry-year FE | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y |
| N | 1,446 | 521 | 1,376 | 3,192 | 1,288 | 3,608 |

However, the results are not robust when comparing (1) and (2) with (4), where we use FIN 48 as a shock to the U.S. sample. These contradicting findings make clean interpretations problematic as we cannot rule out that the findings in (1) and (2) were contaminated by something else than the decrease in tax avoidance. The results in (1) and (2) could e.g. have been due to a non-causal pathway from tax avoidance to financial leverage, such as different impact on book income for treatment and control firms due to the new accounting standard.

When examining the pre-treatment trends in Figure 2 the treatment and control subsets, treated with the IFRS shock, appear to follow similar trends. However, a closer look at the U.S. sample, exposed to FIN 48, suggests that something is happening one year prior to the shock. This gives rise to the question whether CTA is violated for the U.S. sample. If a restrictive view is applied, and the assumption is considered to be violated, the robustness of the estimates of $FLEV_{i,t+1}$ from the U.S. data can be questioned. Moreover, our placebo tests performed prior to the adoption of FIN 48 and IFRS are statistically significant. This points to additional concerns regarding the estimated treatment effects, since CTA might be violated for both shocks. Clear-cut conclusions are therefore problematic.

In Table V, we use future profit margin as a dependent variable in our regressions. The estimated difference-in-difference estimate in column (I) is -2.4 percent, but it is not statistically significant (p-value = 0.61). Furthermore, when estimating the U.S. difference-in-difference coefficient, we receive no statistical significance, and the coefficient is very low (-0.008). The magnitude of the coefficient, relative to the sample standard deviation (0.13), implies that profit margin did not drive the change in $(RNOA_{i,t})$ for U.S. firms. This relationship remains when looking at the collapsed data.

**Table V**

**Tax Avoidance and Future Profit Margin**

This table presents OLS regression estimates for future profit margin, defined as t+1. To control for confounding bias propensity score matching is performed, matching on observed baseline covariates, outlined in Appendix B (B1). Tax aggressive firms (TAX=1) are matched to its five nearest non-tax aggressive firms using propensity scores. A firm is defined as tax aggressive if its cash effective tax rate spread is in the bottom decile of its industry. Difference-in-difference tests are then conducted on matched data using the IFRS as an exogenous transparency shock to tax avoidance. The model design is based on the time variation at the firm-level. To to ensure that the estimated treatment effect is not affected by other shocks than the IFRS introduction during our event window of interest, we include industry-year, country-year and firm fixed effects. Standard errors are clustered at the firm-level. Future profitability is defined as year t+1. The underlying regressions are presented in Appendix B. The dummy variable 'POST' represents the time range 2005-2007 for the IFRS and 2007-2009 for Fin 48. Sources: Datastream and OECD.

| | **Profit Margin ($PM_{i,t+1}$)** | | | | | |
|---|---|---|---|---|---|---|
| | IFRS | | | FIN 48 | | |
| | Main Test | Collapsed | Placebo (2002) | Main Test | Collapsed | Placebo (2004) |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **TAX × POST** | **-0.024** | **-0.025** | **0.017** | **-0.008** | **-0.004** | **0.002** |
| | (0.046) | (0.061) | (0.018) | (0.014) | (0.022) | (0.007) |
| TAX | 0.174*** | 0.115*** | 0.155*** | -0.020 | -0.006 | -0.0844** |
| | (0.029) | (0.032) | (0.017) | (0.024) | (0.030) | (0.035) |
| POST | -0.592*** | 0.0616* | -0.643*** | -0.010 | -0.0349** | -0.026 |
| | (0.075) | (0.032) | (0.070) | (0.023) | (0.017) | (0.021) |
| Country-year FE | Y | Y | Y | Y | Y | Y |
| Industry-year FE | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y |
| N | 1,473 | 525 | 1,507 | 3,396 | 1,328 | 3,872 |

We analyse the impact of reduced tax avoidance on future operating asset turnover in Table VI (1), and find a positive and significant difference-in-difference estimate at the 1-percent level. This suggests that tax aggressive firms improved their capital efficiency relative to control firms following a reduction in tax avoidance due to the IFRS shock. These results remain significant at the 5-percent level, when testing on the collapsed data to control for inconsistent standard errors (2). The results are also robust when using FIN 48 as a shock in column (4) and when controlling for serial correlation in the FIN 48 sample in column (5), yet with lower significance (1-percent vs. 5-percent).

To further examine the robustness of these results, we analyse the pre-treatment trends presented in Figure 2. For the IFRS sample, the treated and control firms appear to follow similar paths initially, but diverge slightly from each other the year leading up to the shock. This gives rise to the concern of CTA violation. However, a small deviation from parallel paths prior to the shock does not directly imply violation of the CTA. For the FIN 48 sample, pre-treatment trends are parallel, providing further robustness to the FIN 48 findings. Furthermore, the we find no significant placebo treatment effect for both the IFRS and FIN 48 sample (column (3) and (6)).

**Table VI**

**Tax Avoidance and Future Operating Asset Turnover**

This table presents OLS regression estimates for operating asset turnover, defined as t+1. To control for confounding bias propensity score matching is performed, matching on observed baseline covariates, outlined in Appendix B (B1). Tax aggressive firms (TAX=1) are matched to its five nearest non-tax aggressive firms using propensity scores. A firm is defined as tax aggressive if its cash effective tax rate spread is in the bottom decile of its industry. Difference-in-difference tests are then conducted on matched data using the IFRS as an exogenous transparency shock to tax avoidance. The model design is based on the time variation at the firm-level. To ensure that the estimated treatment effect is not affected by other shocks than the IFRS introduction during our event window of interest, we include industry-year, country-year and firm fixed effects. Standard errors are clustered at the firm-level. Future profitability is defined as year t+1. The underlying regressions are presented in Appendix B. The dummy variable 'POST' represent the time range 2005-2007 for the IFRS and 2007-2009 for Fin 48. Sources: Datastream and OECD.

| | Asset Turnover ($AT_{i,t+1}$) | | | | | |
|---|---|---|---|---|---|---|
| | IFRS | | | FIN 48 | | |
| | Main Test | Collapsed | Placebo (2002) | Main Test | Collapsed | Placebo (2004) |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **TAX × POST** | **0.614*** ** | **0.511** ** | **0.140** | **0.631*** ** | **0.561** ** | **-0.320** |
| | (0.189) | (0.198) | (0.135) | (0.214) | (0.230) | (0.265) |
| TAX | -1.270*** | -1.117*** | -1.443*** | -0.142 | -0.067 | -0.629 |
| | (0.419) | (0.249) | (0.215) | (0.245) | (0.179) | (0.470) |
| POST | 1.365** | 0.232 | 0.725 | -0.319 | -0.291 | -1.370 |
| | (0.075) | (0.506) | (0.784) | (0.631) | (0.392) | (1.249) |
| Country-year FE | Y | Y | Y | Y | Y | Y |
| Industry-year FE | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y |
| N | 1,473 | 525 | 1,376 | 3,396 | 1,328 | 3,608 |

In Table VII we present OLS estimates from our difference-in-difference test using future operating liability leverage as the endogenous variable. The treatment effect is positive following the IFRS shock, and estimated to be 16.6 percent (1). These results are significant at the 5-percent level and are consistent when controlling for serial correlation, using collapsed data for both IFRS and FIN 48 (2 and 5) and when contrasting the results with U.S. time-series data (4).

To test the robustness of these findings, we examine the pre-treatment trends presented in Figure 2. For the sample exposed to the IFRS shock, the pre-treatment trends are parallel for almost all years except the year prior to the shock. This leads to the concern that CTA might be violated. Pre-treatment trends for the sample experiencing the FIN 48 shock appear more similar, providing further robustness for our findings stemming from this sample. However, we find no significant treatment effect for our placebo test, which serves as a test for differences in pre-treatment trends. In summary, we find evidence supporting that the difference-in-difference estimated treatment effect is positive and statistically significant. Although the parallel paths assumption from an ocular analysis can be questioned, the placebo test shows no significance, strengthening our findings.

The investigation of tax avoidance and its effect on future profitability suggests that the positive change in $RNOA_{i,t+1}$ is driven by improved balance sheet management through more effective use of assets and operating liabilities. However, previous analyses do not educate us on the profitability components' relative contribution to the change in future profitability. This is investigated in the following section.

**Table VII**

**Tax Avoidance and Future Operating Liability Leverage**

This table presents OLS regression estimates for future operating liability leverage, defined as t+1. To control for confounding bias propensity score matching is performed, matching on observed baseline covariates, outlined in Appendix B (B1). Tax aggressive firms (TAX=1) are matched to its five nearest non-tax aggressive firms using propensity scores. A firm is defined as tax aggressive if its cash effective tax rate spread is in the bottom decile of its industry. Difference-in-difference tests are then conducted on matched data using the IFRS as an exogenous transparency shock to tax avoidance. The model design is based on the time variation at the firm-level. To ensure that the estimated treatment effect is not affected by other shocks than the IFRS introduction during our event window of interest, we include industry-year, country-year and firm fixed effects. Standard errors are clustered at the firm-level. Future profitability is defined as year t+1. The underlying regressions are presented in Appendix B. The dummy variable 'POST' represent the time range 2005-2007 for the IFRS and 2007-2009 for Fin 48. Sources: Datastream and OECD.

| | **Operating Liability Leverage (*$OLLEV_{i,t+1}$*)** | | | | | |
|---|---|---|---|---|---|---|
| | IFRS | | | FIN 48 | | |
| | Main Test | Collapsed | Placebo (2002) | Main Test | Collapsed | Placebo (2004) |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **TAX × POST** | **0.166**** | **0.155**** | **0.060** | **0.217**** | **0.178**** | **-0.118** |
| | (0.066) | (0.065) | (0.044) | (0.088) | (0.091) | (0.106) |
| TAX | -0.580*** | -0.280*** | -0.649*** | -0.392*** | -0.279*** | -0.762*** |
| | (0.212) | (0.076) | (0.065) | (0.064) | (0.067) | (0.233) |
| POST | 0.527*** | 0.088 | 0.430** | -0.047 | -0.035 | -0.500 |
| | (0.075) | (0.187) | (0.197) | (0.325) | (0.094) | (0.510) |
| Country-year FE | Y | Y | Y | Y | Y | Y |
| Industry-year FE | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y |
| N | 1,473 | 525 | 1,376 | 3,396 | 1,328 | 3,608 |

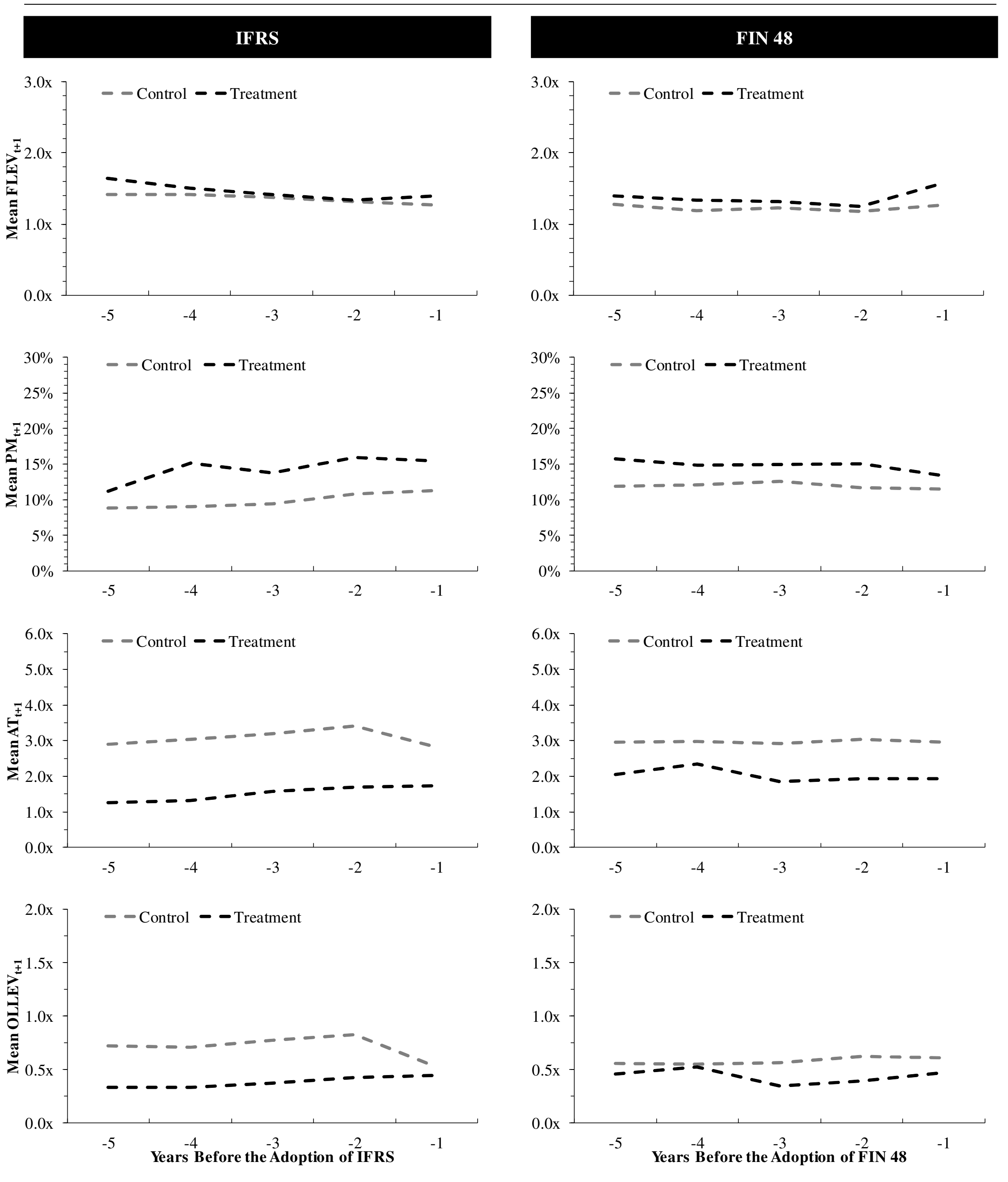


**Figure 2: Pre-treatment Trends – Future Profitability Components** Depicts graphs outlining the pre-treatment trends for our treated (tax aggressive) and control subsets (non-tax aggressive). The graphs plot the mean of $FLEV_{t+1}$, $PM_{t+1}$, $AT_{t+1}$ and $OLLEV_{t+1}$ for both treated and control firms, segmented by the use of IFRS (EU-Australia) and FIN 48 (US) as exogenous shocks. Sources: Datastream and OECD.

### *C. Contribution Analysis*[11]

This analysis investigates the contribution of each profitability component to changes in $ROE_{i,t+1}$ and $RNOA_{i,t+1}$. For reference, Appendix A, Table AIV, presents OLS estimates that make up the change in $ROE_{i,t+1}$. We find that decreased future financial leverage contributed negatively to future return on equity by 5.1 percent, significant at the 1-percent level. Future pre-tax return on net operating assets on the other hand contributed positively with 4.9 percent. This effect is however only significant at the 13-percent level. This suggests that the underlying drivers of future return on equity work in opposite directions.

For reference, Appendix A, Table AV and AVI, presents the breakdown of $RNOA_{i,t+1}$ into future pre-tax profit margin, future asset turnover and future operating leverage. Our results suggest that changes in asset turnover and operating leverage drive the increase in RNOA. The contribution from operating leverage marginally outweigh the contribution from operating asset turnover. Although not statistically significant at the 10-percent level, we can reject the second null hypothesis with 86 and 85 percent certainty for operating asset turnover and operating liability leverage respectively. The profit margin is not statistically significant (p-value of 52.5 percent). The same pattern is found for the U.S. data, where the increase in operating asset turnover is statically significant at the 10-percent level, while the increase in operating leverage is significant at the 13.7-percent level. The profit margin is not statistically significant (p-value of 85.5). The lack of robustness test of these findings limit our ability to use these results for inference.

## V. Discussion

Our empirical results suggest that a decrease in tax avoidance due to imposed transparency regulations increases firms' future operating performance. Two natural questions from our study arise, why do the future operating profitability, $RNOA_{i,t+1}$, and the two components $AT_{i,t+1}$ and $OLLEV_{i,t+1}$ increase following a decrease in tax avoidance? How can firms mitigate the risk of rent extraction?

A possible answer to the first question is that the direct and indirect costs of tax avoidance activities are on average greater than the increase of after-tax cash flow due to reduced tax liabilities. Tax avoidance activities impose both direct costs, associated with the set-up of tax-efficient vehicles and indirect agency costs, the result of a more opaque environment that facilitates rent-extraction. Firms' actions, taken to decrease the effective cash tax rate have to be hidden from tax authorities. This is problematic from the perspective of the agency cost theory. The need to camouflage potential 'risky' actions

[11] The sum of the factors do not add up to the collapsed coefficient of ROE presented in the table due to winzorising at the 1st and 99th percentiles and varying number of observations across the variables.

implies that more complex company structures are required. Such machinations provide managers with extra degrees of freedom, which more easily can be used for self-dealing projects without detection. When relating this to our findings, the results suggest that tax avoidance activities do not transfer wealth from the state to outside shareholders. Tax avoidance is rather a transfer from the state and outside shareholders to inside shareholders such as management. Our findings indicate that it is not the quality in earnings that separate tax aggressive firms from non-tax aggressive firms; the difference in operating profitability is rather driven by ineffective balance sheet management. Perhaps the mismanagement of assets and operating leverage is linked to the incentive structure. Although not tested in this thesis, it would be interesting for future research to investigate if the necessity of masking the prevailing agency costs associated with tax avoidance affects the compensation structure.

To mitigate the risk of managers turning to tax avoidance activities that decrease operating profitability, we take a step back and analyse the problem from a holistic perspective. The agents in tax aggressive firms in our sample, are not on average aligned with the principals. Since tax avoidance activities are associated with complexity and opacity, managers are able to divert to negative net present value decisions. To align incentives between the two stakeholders, firms could introduce a greater degree of performance-based compensation.

The structuring of executive compensation can be broken down into two contrasting lines of thought. Under the 'optimal contracting theory', the board of directors structure the payment arrangement to maximise firm value. However, the 'management power approach' outlined by Bebchuk et al. (2002) argues that the board and senior management do not operate within 'arm's length', when it comes to aligning interests between the agents and principals.

When adding the dimension of management power approach to our analysis, the suggestion of increased incentivised compensation, based on after tax earnings is concluded to provide CEOs with the opportunity to influence their rewards even more. An example being aggressive accounting to extract more rent. A potential way to mitigate increased rent extraction due to tax aggressiveness would be to measure the performance on a pre-tax basis. Managers become more prone to not divert money on rent extraction.

However, the effectiveness of performance-based measures is likely to depend on the extent that tax avoidance is associated with diversion. Ultimately, it comes down to the degree of opacity that is induced when firms engage in tax avoidance activities. Our findings suggest that rent extraction and tax avoidance are strongly complementary, as the cost of tax avoidance on average decreases operating future profitability.

In terms of claims on cash flows, the state can be seen as the largest minority shareholder in many corporations. Our findings are interesting for policy makers in two ways. By imposing stricter disclosure requirements, governments are able to untangle parts of the revenue hidden in complex tax efficient structures, while reducing agency costs in tax aggressive firms.

One important thing to note is that our sample only includes listed companies, and thus the interpretations do not apply to private companies. Private companies might not suffer as much by the agency cost problem due to less separation between management and owners.

# VI. Conclusion

In this study, we focus on the imposed disclosure requirements that decreased firms' level of tax avoidance using a cross-country sample. Our results suggest that tax authorities and equity shareholders share a common goal: decreasing managerial rent extraction. We provide evidence that the 2005 introduction of IFRS improved the operating profitability for tax aggressive firms, driven by improved asset utilisation and operating liabilities management.

Previous research has found mixed results that vary cross-sectionally. Our results are in accordance with e.g. Desai et al. (2007) who document that tax avoidance is negatively associated with firm profitability. We find that the positive effect of enhanced balance sheet management outweighs the negative effects of increased cash tax liabilities. An area of interest for future research could be to investigate whether the need to mask agency costs associated with tax avoidance affects firms' compensation structure.

Given recent proposals of consolidating corporate taxes in the EU (CCCTB), our findings suggest that current tax aggressive firms may become more operationally profitable if implemented, driven by improved asset utilisation and operating liabilities management.

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# Appendix A.

## Table AI

## Variable Definitions

This table presents definitions of variables used in our matched difference-in-difference model. "Avg." denotes the average of opening and closing balance. Datastream item tickers are presented in parenthesis (e.g. WC02999). Source: Datastream and OECD.org.

| Variable | Definition |
|---|---|
| ***Propensity Score Matching*** | |
| $ASSETS_{i,t}$ | **Natural Log of Total Assets** = Ln(Total Assets (WC02999)) |
| $ASSETS\_SQ_{i,t}$ | **Squared Assets** = ASSETS^2 |
| $ROA_{i,t}$ | **Pre-tax Return on Assets** = (Pre-tax Income (WC01401) + Financial Expenses (WC01251)) / Avg. TA |
| $ROA\_SQ_{i,t}$ | **Squared Return on Assets** = ROA^2 |
| $NWC_{i,t}$ | **Net Working Capital** = Current Assets (WC01251) - Cash and Cash Equivalent (WC02001) - Current Liabilities (WC03101) + Short-term Debt (WC03051) |
| $NCO_{i,t}$ | **Non-current Operating Assets =** Total Assets (WC02999) - Current Assets (WC01251) - Other Investments (WC02250) |
| $FIN_{i,t}$ | **Net Financial Assets** = Cash and Cash Equivalents (WC02001) + Other Investments (WC02250) - (Short-term Debt (WC03051) + Long-term Debt (WC03251) + Preferred Stock (WC03451)) |
| $TACC_{i,t}$ | **Total Accruals** = ΔNWC + ΔNCO + ΔFIN |
| ***Main Models*** | |
| $CETR3_{i,t}$ | **Cash Effective Tax Rate =** Sum of last three-year Pre-tax Income (WC01401) / Sum of the last three-year Cash Taxes Paid (WC04150) |
| $CSTRP_{t}$ | **Corporate Statutory Tax Rate =** Consists of central and applicable sub-central government tax rates (as reported by OECD) |
| $CETR3\_SP_{i,t}$ | **Three-year Cash Effective Tax Rate Spread** = CETR3 - CSTRP |
| $TAX_{i}$ | **Tax Aggressive Indicator =** Indicator variable that equals 1 if a firm's CETR3_SP is in the bottom decile for its industry-year in 2004 (2006) for the IFRS (FIN 48) shock |
| $POST_{t}$ | **Post-treatment Indicator =** Indicator variable that equals 1 if the year is 2005 (2007) or after for the IFRS (FIN 48) shock |
| $EBIE_{i,t}$ | **Earnings Before Interest Expense =** (Pre-tax Income (WC01401) + Financial Expenses (WC01251) |
| $TA_{i,t}$ | **Total Assets** (WC02999) |
| $FA_{i,t}$ | **Financial Assets** = Cash and Cash Equivalents (WC02001) + Other Investments (WC02250) |
| $E_{i,t}$ | **Equity =** Common Equity (WC03501) **+** Minority Interest (WC03426) |
| $FO_{i,t}$ | **Financial Obligations =** Short-term Debt (WC03051) + Long-term Debt (WC03251) + Preferred Stock (WC03451) |
| $OA_{i,t}$ | **Operating Assets** = FO + E |
| $NOA_{i,t}$ | **Net Operating Assets** = FO + E - FA |
| $ROE_{i,t}$ | **Pre-tax Return on Equity** = (Pre-tax Income (WC01401) + Financial Expenses (WC01251)) / Avg. E |
| $ROA_{i,t}$ | **Pre-tax Return on Assets** = (Pre-tax Income (WC01401) + Financial Expenses (WC01251)) / Avg. TA |
| $RNOA_{i,t}$ | **Pre-tax Return on Net Operating Assets** = (Pre-tax Income (WC01401) + Financial Expenses |
| $FLEV_{i,t}$ | **Financial Leverage** = Avg. NOA / Avg. E |
| $PM_{i,t}$ | **Profit Margin** = (Pre-tax Income (WC01401) + Financial Expenses (WC01251)) / Sales (WC01001) |
| $AT_{i,t}$ | **Operating Asset Turnover** = Sales (WC01001) / Avg. OA |
| $OLLEV_{i,t}$ | **Operating Liability Leverage =** Avg. OA / Avg. NOA |

## Table AII

## Propensity Score Model and Covariate Balance: IFRS

This table presents regression estimates for the logistic model outlined in Equation (1) for the IFRS sample. The regression has been estimated using collapsed ex-ante data (2002-2004). Industry and country fixed effects have been included. The table also shows covariate balance before and after matching as well as the level of bias reduction achieved.

**Logistic Propensity Score Model**

| | SIZE | SIZE_SQ | PTROA | PTROA_SQ | TACC | Pseudo $R^2$ |
|---|---|---|---|---|---|---|
| Coef. | 1.285 | -0.043 | -20.57*** | 33.29*** | 3.51E-07 | 13.760% |
| Std. Err | 1.061 | 0.039 | 7.61 | 15.47 | 6.33E-07 | |

**Covariate Balance and Bias Reduction**

| Variable | Unmatched Matched | Mean Treated | Mean Control | %Bias | %Bias Reduction | t-stat |
|---|---|---|---|---|---|---|
| SIZE | U | 13.53 | 12.805 | 36.90 | | -1.03 |
| | M | 13.40 | 13.38 | 1.00 | 97.4 | -0.17 |
| SIZE_SQ | U | 186.61 | 167.960 | 35.90 | | -1.01 |
| | M | 183.01 | 182.500 | 1.00 | 97.3 | -0.14 |
| PTROA | U | 0.0978 | 0.125 | -41.20 | | -3.00 |
| | M | 0.1007 | 0.107 | -8.70 | 78.8 | 0.33 |
| PTROA_SQ | U | 0.0147 | 0.0229 | -27.00 | | -1.85 |
| | M | 0.0153 | 0.0181 | -9.50 | 64.9 | -0.03 |
| TACC | U | 7.7E+04 | 5.55E+04 | 6.30 | | 1.77 |
| | M | 7.1E+04 | 6.04E+04 | 3.00 | 51.9 | 0.21 |
| OVERALL | U | | | 29.5 | | |
| | M | | | 4.60 | 84.4 | |

## Table AIII

## Propensity Score Model and Covariate Balance: FIN 48

This table presents regression estimates for the logistic model outlined in Equation (1) for the FIN 48 sample. The regression has been estimated using collapsed ex-ante data (2004-2006). Industry and country fixed effects have been included. The table also shows covariate balance before and after matching as well as the level of bias reduction achieved.

**Logistic Propensity Score Model**

| | SIZE | SIZE_SQ | PTROA | PTROA_SQ | TACC | Pseudo $R^2$ |
|---|---|---|---|---|---|---|
| Coef. | 0.333 | -0.018 | -7.76*** | 5.57 | 7.95E-08** | 3.130% |
| Std. Err | 0.673 | 0.025 | 2.58 | 4.50 | 4.12E-08 | |

**Covariate Balance and Bias Reduction**

| Variable | Unmatched Matched | Mean Treated | Mean Control | %Bias | %Bias Reduction | t-stat |
|---|---|---|---|---|---|---|
| SIZE | U | 13.45 | 13.66 | -11.4 | | -1.21 |
| | M | 13.45 | 13.286 | 9.3 | 19.0 | 0.75 |
| SIZE_SQ | U | 184.28 | 189.85 | -11.2 | | -1.18 |
| | M | 184.28 | 179.4 | 9.8 | 12.5 | 0.79 |
| PTROA | U | 0.1192 | .14478 | -33.0 | | -3.15 |
| | M | 0.1192 | .12381 | -6.0 | 81.8 | -0.51 |
| PTROA_SQ | U | 0.0195 | .02978 | -22.5 | | -1.93 |
| | M | 0.0195 | .02194 | -5.3 | 76.4 | -0.52 |
| TACC | U | 6.0e+05 | 2.9e+05 | 9.4 | | 1.75 |
| | M | 6.0e+05 | 4.9e+05 | 3.4 | 63.6 | 0.23 |
| OVERALL | U | | | 17.5 | | |
| | M | | | 6.0 | 65.7 | |

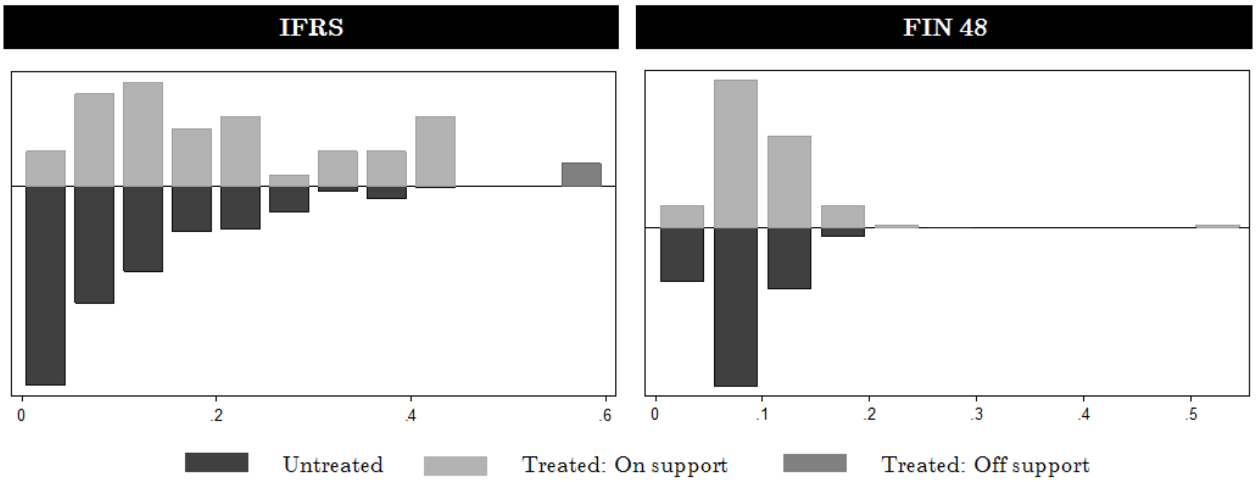


**Figure A1: Common support** Depicts distribution of propensity scores for treatment and control firms. The calculation of propensity scores are based on collapsed ex-ante data.

## Table AIV

## Tax Avoidance and Future ROE Contribution Analysis

Table VIII presents OLS estimates for the two samples examined. The first sample consists of eleven countries[12], that were exposed to the IFRS adoption in 2005. The second sample is made up by US firms exposed to FIN 48 in 2007. The table shows the relative contribution of the pre-tax return on net operating assets (RNOA) and financial leverage (FLEV) to the change in pre-tax return on equity (ROE). To estimate the value of each variable, difference-in-difference tests are performed on all variables listed in the regression separately. The equation is depicted in Appendix B and based on collapsed data since the ex-ante and ex-post period are three years each. By definition, the time-series information is thus disregarded when calculated standard errors. However, the introduction of the IFRS shock was effective the same date in all countries, mitigating some of the potential bias. To ensure that the estimated treatment effect is not affected by other shocks than the IFRS introduction during our event window of interest, we include industry-year, country-year and firm fixed effects. Standard errors are clustered at the firm-level. The sum of the factors do not add up to the collapsed coefficient of ROE presented in table due to winorising at the 1st and 99th percentiles and varying number of observations across the variables. Sources: Datastream and OECD.

| | IFRS | | | FIN 48 | | |
|---|---|---|---|---|---|---|
| | | | Interaction Term | | | Interaction Term |
| | $\mathbf{FLEV_{i,t}}\times RNOA_{i,0}$ | $\mathbf{RNOA_{i,t}}\times FLEV_{i,0}$ | $\Delta RNOA_{i,t}\times\Delta FLEV_{i,t}$ | $\mathbf{FLEV_{i,t}}\times RNOA_{i,0}$ | $\mathbf{RNOA_{i,t}}\times FLEV_{i,0}$ | $\Delta RNOA_{i,t}\times\Delta FLEV_{i,t}$ |
| **TAX × POST** | **-0.0511*** ** | **0.049** | **-0.010** | **-0.029** | **0.040** | **-0.006** |
| | (0.016) | (0.032) | (0.009) | (0.052) | (0.040) | (0.027) |
| TAX | 0.0513*** | -0.031 | 0.011 | -0.017 | 0.053 | -0.016 |
| | (0.017) | (0.039) | (0.009) | (0.040) | (0.048) | (0.028) |
| POST | 0.028 | 0.027 | -0.0268** | 0.003 | -0.051 | -0.020 |
| | (0.034) | (0.040) | (0.013) | (0.030) | (0.039) | (0.022) |
| Country-year FE | Y | Y | Y | Y | Y | Y |
| Industry-year FE | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y |
| N | 520 | 520 | 520 | 1,276 | 1,274 | 1,273 |
| R-square | 90.90% | 86.40% | 57.40% | 58.80% | 77.90% | 53.00% |

[12]The countries included are Australia, Austria, Belgium, Denmark, France, Germany, Hungary, Poland, Spain, Sweden and Switzerland.

## Table AV

### Tax Avoidance and Future RNOA Contribution Analysis (IFRS)

Table AV presents OLS estimates for a sample consisting of eleven countries[13]exposed to the adoption of IFRS in 2005. The countries are selected on the basis that they do not allow IFRS as the basis for statutory accounts. The table shows the relative contribution of pre-tax profit margin (PM), operating asset turnover (AT) and operating liability leverage (OLLEV) to the change in return on net operating assets (RNOA). The underlying equations for the factor contributions are presented in Appendix B. To attain the value of each variable, difference-in-difference tests are performed on all variables listed in the regression separately, using IFRS as an exogenous shock. Since our ex-ante and ex-post period are three years each, the regressions are based on collapsed data for the factor contribution analysis. To ensure that the estimated treatment effect is not effected by other shocks than the IFRS introduction during our event window of interest, we include industry-year, country-year and firm fixed effects. Standard errors are clustered at the firm-level. The sum of the factors do not add up to the collapsed coefficient of RNOA presented in table due to winzorising at the 1st and 99th percentiles and varying number of observations across the variables. Sources: Datastream and OECD.

| | | | | Interaction Term 1 | Interaction Term 2 | Interaction Term 3 | Interaction Term 4 |
|---|---|---|---|---|---|---|---|
| | $\boldsymbol{\Delta PM_{i,t}}\times AT_{i,0}\times OLLEV_{i,0}$ | $\boldsymbol{\Delta AT_{i,t}}\times PM_{i,0}\times OLLEV_{i,0}$ | $\boldsymbol{\Delta OLLEV_{i,t}}\times PM_{i,0}\times AT_{i,0}$ | $\Delta PM_{i,t}\times\Delta AT_{i,t}\times OLLEV_{i,0}$ | $\Delta PM_{i,t}\times\Delta AT_{i,1}\times\Delta OLLEV_{i,t}$ | $PM_{i,0}*\Delta AT_{i,t}*\Delta OLLEV_{i,t}$ | $\Delta PM_{i,t}*\Delta AT_{i,t}*\Delta OLLEV_{i,t}$ |
| **TAX × POST** | **0.024** | **0.071** | **0.090** | **0.015** | **-0.007** | **-0.045** | **-0.019** |
| | (0.037) | (0.048) | (0.063) | (0.019) | (0.012) | (0.036) | (0.018) |
| TAX | -0.044 | -0.051 | -0.060 | -0.024 | 0.001 | -0.007 | -0.016 |
| | (0.031) | (0.038) | (0.055) | (0.021) | (0.012) | (0.039) | (0.024) |
| POST | 0.064 | 0.050 | 0.056 | 0.062 | 0.017 | 0.075 | 0.056 |
| | (0.052) | (0.063) | (0.131) | (0.060) | (0.022) | (0.119) | (0.081) |
| Country-year FE | Y | Y | Y | Y | Y | Y | Y |
| Industry-year FE | Y | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y | Y |
| N | 520 | 520 | 520 | 520 | 520 | 523 | 523 |
| R-square | 55.40% | 65.90% | 51.40% | 51.40% | 55.50% | 53.80% | 51.30% |



[13]The countries include Australia, Austria, Belgium, Denmark, France, Germany, Hungary, Poland, Spain, Sweden and Switzerland.

## Table AVI

## Tax Avoidance and Future RNOA Contribution Analysis (FIN 48)

Table AV presents OLS estimates, based on U.S. firms, for the relative contribution of pre-tax profit margin (PM), operating asset turnover (AT) and operating liability leverage (OLLEV) to the change in return on net operating assets (RNOA). The underlying equations for the factor contributions are presented in Appendix B. To attain the value of each variable, difference-in-difference tests are performed on all variables listed in the regression separately, using the adoption of FIN 48 as an exogenous shock to tax avoidance. Since our ex-ante and ex-post period are three years each, the regressions are based on collapsed data for the factor contribution analysis. To ensure that the estimated treatment effect is not effected by other shocks than the IFRS introduction during our event window of interest, we include industry-year, country-year and firm fixed effects. Standard errors are clustered at the firm-level. The sum of the factors do not add up to the collapsed coefficient of RNOA presented in table due to winzorising at the 1st and 99th percentiles and varying number of observations across the variables. Sources: Datastream and OECD.

| | | | | Interaction Term 1 | Interaction Term 2 | Interaction Term 3 | Interaction Term 4 |
|---|---|---|---|---|---|---|---|
| | $\mathbf{\Delta PM_{i,t}}\times AT_{i,0}\times OLLEV_{i,0}$ | $\mathbf{\Delta AT_{i,t}}\times PM_{i,0}\times OLLEV_{i,0}$ | $\mathbf{\Delta OLLEV_{i,t}}\times PM_{i,0}\times AT_{i,0}$ | $\Delta PM_{i,t}\times\Delta AT_{i,t}\times OLLEV_{i,0}$ | $\Delta PM_{i,t}\times\Delta AT_{i,1}\times\Delta OLLEV_{i,t}$ | $PM_{i,0}*\Delta AT_{i,t}*\Delta OLLEV_{i,t}$ | $\Delta PM_{i,t}*\Delta AT_{i,t}*\Delta OLLEV_{i,t}$ |
| **TAX × POST** | **0.076** | **0.0985*** | **0.110** | **-0.055** | **-0.033** | **0.065** | **-0.001** |
| | (0.050) | (0.055) | (0.074) | (0.051) | (0.033) | (0.135) | (0.071) |
| TAX | 0.137*** | -0.004 | 0.0822* | -0.023 | -0.012 | 0.014 | 0.030 |
| | (0.037) | (0.031) | (0.045) | (0.028) | (0.018) | (0.076) | (0.036) |
| POST | -0.053 | 0.004 | 0.010 | -0.017 | -0.027 | 0.047 | -0.014 |
| | (0.055) | (0.046) | (0.050) | (0.040) | (0.039) | (0.056) | (0.044) |
| Country-year FE | Y | Y | Y | Y | Y | Y | Y |
| Industry-year FE | Y | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y | Y |
| N | 1,289 | 1,276 | 1,276 | 1,275 | 1,275 | 1,298 | 1,300 |
| R-square | 53.40% | 51.60% | 51.20% | 51.60% | 51.80% | 51.70% | 51.50% |

# Appendix B.

### Propensity Score Logistic Model

$$
\begin{aligned}
TAX_i = {} & \delta_1 ASSETS_i + \delta_2 ASSETS\_SQ_i + \delta_3 ROA_i + \delta_4 ROA\_SQ_i + \delta_5 TACC_i \\
& + \lambda_j + \gamma_c + \epsilon_i
\end{aligned} \tag{B1}
$$

### Future Profitability and DuPont

$$ROE_{i,t+1} = FLEV_{i,t+1} * RNOA_{i,t+1} \tag{B2}$$

Where $RNOA_{i,t+1}$ can be decomposed into:

$$RNOA_{i,t+1} = PM_{i,t+1} * AT_{i,t+1} * OLLEV_{i,t+1} \tag{B3}$$

Which can be re-written into:

$$RNOA_{i,t+1} = \frac{EBIE_{i,t+1}}{SALES_{i,t+1}} * \frac{SALES_{i,t+1}}{OA_{i,t+1}} * \frac{OA_{i,t+1}}{NOA_{i,t+1}} \tag{B4}$$

### Model Design

$$
\begin{aligned}
ROE_{i,t+1} = {} & \delta_1 TAX_i + \delta_2 POST_t + \delta_3 POST_t * TAX_i + \ \delta_{4j,t} \\
& + \ \delta_5 X_{c,t} + \beta 6_i + \epsilon_{i,t}
\end{aligned} \tag{B5}
$$

$$
\begin{aligned}
RNOA_{i,t+1} = {} & \delta_1 TAX_i + \delta_2 POST_t + \delta_3 POST_t * TAX_i + \ \delta_{4j,t} \\
& + \ \delta_5 X_{c,t} + \beta 6_i + \epsilon_{i,t}
\end{aligned} \tag{B6}
$$

$$
\begin{aligned}
FLEV_{i,t+1} = {} & \delta_1 TAX_i + \delta_2 POST_t + \delta_3 POST_t * TAX_i + \ \delta_{4j,t} \\
& + \ \delta_5 X_{c,t} + \beta 6_i + \epsilon_{i,t}
\end{aligned} \tag{B7}
$$

$$
\begin{aligned}
PM_{i,t+1} = {} & \delta_1 TAX_i + \delta_2 POST_t + \delta_3 POST_t * TAX_i + \ \delta_{4j,t} \\
& + \ \delta_5 X_{c,t} + \beta 6_i + \epsilon_{i,t}
\end{aligned} \tag{B8}
$$

$$AT_{i,t+1} = \delta_1 TAX_i + \delta_2 POST_t + \delta_3 POST_t * TAX_i + \ \delta_{4j,t} \\ + \ \delta_5 X_{c,t} + \beta 6_i + \epsilon_{i,t} \tag{B9}$$

$$OLLEV_{i,t+1} = \delta_1 TAX_i + \delta_2 POST_t + \delta_3 POST_t * TAX_i + \ \delta_{4j,t} \\ + \ \delta_5 X_{c,t} + \beta 6_i + \epsilon_{i,t} \tag{B10}$$

**Pre-tax Return on Equity Contribution Analysis**

$$ROE_{i,t\,+1} = FLEV_{i,t} {*} RNOA_{i,t} \tag{B11}$$

$$\Delta ROE_{i,t} = FLEV_{i,t} RNOA_{i,0} + RNOA_{i,t} FLEV_{i,0} \\ + (FLEV_{i,t} - FLEV_{i,0})(RNOA_{i,t} - RNOA_{i,0}) \tag{B12}$$

**Pre-tax Return on Net Operating Asset Contribution Analysis**

$$RNOA_{i,t} = PM_{i,t} * AT_{i,t} * OLLEV_{i,t} \tag{B13}$$

$$RNOA_{i,0} + \Delta RNOA_{i,t} = (PM_{i,0} + \Delta PM_{i,t} * (AT_{i,0} + \Delta AT_{i,1} t * (OLLEV_{i,0} + \Delta OLLEV_{i,t} \tag{B14}$$

$$RNOA_{i,0} + \Delta RNOA_{i,t} = (PM_{i,0} * AT_{i,0} * OLLEV_{i,0}) + (AT_{i,0} * OLLEV_{i,0} * \Delta PM_{i,t}) \\ + (PM_{i,0} * OLLEV_{i,0} * \Delta AT_{i,t}) + (PM_{i,0} * AT_{i,0} * \Delta OLLEV_{i,t}) \\ + (PM_{i,0} * \Delta AT_{i,t} * \Delta OLLEV_{i,t}) + (AT_{i,0} * \Delta PM_{i,t} * \Delta OLLEV_{i,t}) \\ + (OLLEV_{i,0} * \Delta PM_{i,t} * \Delta AT_{i,t}) + (\Delta OLLEV_{i,t} * \Delta PM_{i,t} * \Delta AT_{i,t}) \tag{B15}$$

$$
\begin{aligned}
\Delta RNOA_{i,t} = {} & (AT_{i,0} * OLLEV_{i,0} * \Delta PM_{i,t}) + (PM_{i,0} * OLLEV_{i,0} * \Delta AT_{i,t}) \\
& + (PM_{i,0} * AT_{i,0} * \Delta OLLEV_{i,t}) + (PM_{i,0} * \Delta AT_{i,t} * \Delta OLLEV_{i,t} \\
& + AT_{i,0} * \Delta PM_{i,t} * \Delta OLLEV_{i,t} + OLLEV_{i,0} * \Delta PM_{i,t} * \Delta AT_{i,t} \\
& + \Delta OLLEV_{i,t} * \Delta PM_{i,t} * \Delta AT_{i,t})
\end{aligned}
\tag{B16}
$$