Firm Reactions around a Corporate Tax Cut: Four Empirical Essays

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Intertemporal Profit Shifting around a Large Tax Cut: The Case of Depreciations
Der Beitrag wurde gemeinsam mit Prof. Dr. Sebastian Eichfelder (Otto-von-Guericke-Universität Magdeburg), Prof. Dr. Frank Hechtner (Freie Universität Berlin) und Prof. Dr. Jochen Hundsdoerfer (Freie Universität Berlin) erstellt. Jeder Autor hat zu einem Viertel zu dem Projekt beigetragen.

Does International Profit Shifting Substitute Intertemporal Profit Shifting?
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Chapter 1

Introduction

A corporate tax cut in a country requires a thorough trade-off between expected costs and positive firm reactions. Comparing policymakers' goals for tax reforms (e.g., in Germany, the United States, the United Kingdom, or Sweden[1]) shows that international tax competition for firms in a globalized market is the crucial factor. Making the location more attractive for investments and retaining more taxable profits in the country are expected to help compensate for the lower tax rate.

This thesis analyzes firm reactions to a corporate tax rate cut in four empirical studies: I look at firms' efforts to reduce their tax burden by shifting taxable profits to favorable tax environments either in another country, or in another period, and at corporate investment behavior around the tax rate reduction. The thesis focuses particularly on the role of multinational firms and the effect of globalization on reform reactions. I find that incentives for international profit shifting persist even after a tax rate change, and a possible adjustment effect is not visible until about three years later. The tax cut also triggers tax avoidance through intertemporal profit shifting. Moreover, I find that slipping away from local taxation through international profit shifting mitigates the tax sensitivity of multinational firms. They perceive the tax rate cut as smaller than domestic firms do. Consequently, I find that multinational firms increase their investment less than domestic firms after a

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[1] See the draft legislation of the German tax reform act 2008, dip21.bundestag.de/dip21/btd/16/048/1604841.pdf, last accessed April 11, 2016, The President's Framework for Business Tax Reform: An Update, A Joint Report by The White House and the Department of Treasury, https://www.treasury.gov/resource-center/tax-policy/Documents/The-Presidents-Framework-for-Business-Tax-Reform-An-Update-04-04-2016.pdf, last accessed April 22, 2016, the Budget Statement from the Budget Bill 2013 in Sweden, http://www.government.se/contentassets/24e79b514b5b4474aa3d6f5eadb738a4/from-the-budget-bill-for-2013-budget-statement, last accessed April 11, 2016, and the policy paper on 2010 to 2015 tax policy: business tax reform in the United Kingdom, https://www.gov.uk/government/publications/2010-to-2015-government-policy-business-tax-reform/2010-to-2015-government-policy-business-tax-reform, last accessed April 11, 2016.

corporate tax cut. They also engage less in intertemporal profit shifting around the reform.

My thesis contributes to the public finance and the tax accounting research. It helps understand effects of tax policy on firm behavior, especially on investment and profit shifting. It also sheds light on incentives and opportunities for the management of taxable earnings. On the one hand, my research adds to prior literature on international profit shifting. While there is wide evidence for cross-border profit shifting (e.g., Weichenrieder, 2009; Dharmapala and Riedel, 2013), studies that explore an exogenous policy shock are rare (e.g., Harris, 1993; Klassen, Lang, and Wolfson, 1993). Moreover, a controversial discussion about profit shifting effects has evolved more recently suggesting that the tax elasticity of firms' taxable earnings has decreased and that a corporate tax cut might not lead to clear and immediate adjustments as suggested in earlier research (e.g., Klassen and Laplante, 2012a; Riedel, Zinn, and Hofmann, 2015; Alexander, De Vito, and Jacob, 2016). On the other hand, my thesis contributes to research on tax effects on firm investment (e.g., Auerbach, 1983; Djankov et al., 2010; Dwenger, 2014), and applies an identification strategy based on heterogeneous investment responses of domestic and multinational firms. Another paper extends the literature on management of taxable earnings around a tax rate change (e.g., Scholes, Wilson, and Wolfson, 1992; Guenther, 1994; Lin, Mills, and Zang, 2014), and studies the role of opportunities for intertemporal profit shifting. Eventually, I analyze interdependencies between international and intertemporal profit shifting, thus connecting two aspects of my research, and provide insight into the field of substitution effects between profit shifting channels, which has previously only explicitly been accessed by Saunders-Scott (2015).

Understanding firm behavior around a corporate tax cut is important in many dimensions. Analyzing the trade-off between costs and positive firm reactions provides an evaluation of past reforms, and, more importantly, helps policymakers develop future tax reforms. The role of multinational firms, and the consequences of an international company structure on responses to a tax cut, becomes crucial information with a growing number of globally operating firms. Especially in economies with a high number of multinational firms, and less domestic firms, firm responses to a tax rate change may be weaker than expected. Also, bringing together different reaction channels of companies, and analyzing potential interdependencies, is the key for an unbiased integrated and comprehensive understanding of the consequences of a tax rate change. Results on the extent of taxable earnings management, and on the influence of firm ownership, allow a better interpretation of financial statement positions for stakeholders. Overall, my thesis provides a distinct analysis of corporate tax cut effects on firm behavior with a focus on multinational

firms.

All four papers in this thesis exploit a corporate tax rate cut in Germany as part of the 2008 Business Tax Reform Act. The corporate tax rate, consisting of the corporation tax, the trade tax, and the solidarity surcharge, was reduced by about 10 percentage points from around 39% to 29%. The reform plans were published in July 2007, which provided plenty of time for respective tax planning before the reform came into effect in January 2008. The reform also contained several provisions to broaden the corporate tax base, like stricter transfer pricing rules, or the interest barrier rule, mainly to prevent profit shifting to low-tax countries. However, considering that the tax rate was reduced considerably, the tax cut was effectively still prevalent, even despite other counteracting provisions. The 2008 Business Tax Reform Act offers an attractive setting to analyze firm behavior. Sufficient time has passed to ensure data availability even for research on long-term effects.

The financial crisis, coinciding with the post-reform period, affected the global economy severely between 2007 and 2010. Disentangling crisis effects and tax effects imposed one of the main challenges to the empirical analyses of this thesis. However, the special economic circumstances of the crisis also provided a suitable framework to learn about the relevance of opportunities for intertemporal profit shifting.

The empirical analyses in this dissertation are mainly based on German firm-level data around the 2008 tax reform, with observation periods ranging from eight years (2005–2012) to a cross-section analysis for 2007, depending on the research question. The studies use several data sources. *dafne* and *amadeus*, both databases from Bureau van Dijk, offer company data for Germany and other European countries that we use to analyze investment effects after the tax cut. Additional robustness tests for this study are based on *Compustat* and *Datastream*. The studies on international profit shifting and on substitution effects between shifting channels are also based on *dafne*. We use the special dataset *Amtliche Firmendaten für Deutschland (AFiD)* to identify opportunities for intertemporal profit shifting, which provides the rare opportunity to use actual tax information for firms.

My dissertation consists of four separate studies, which are embedded in the following chapters. Despite being closely connected with regard to their content, the projects are to be seen as independent and individually complete. Therefore, they may also exhibit minor stylistic or formal differences, depending on the participating authors.

Do Corporate Tax Cuts Increase Investments? (with Prof. Dr. Martin Jacob)
Our study analyzes the effect of corporate taxes on firm investment. We expect that a corporate tax cut leads to an increase in investments, but that the effect

is heterogeneous across domestic and multinational firms. Multinational firms can reduce their effective tax rates, and therefore their tax-induced investment costs, by shifting taxable profits to low-tax countries. Domestic firms, in contrast, are less engaged in cross-border profit shifting, and consequently exhibit a higher effective tax rate than multinational firms. We argue that a corporate tax rate cut for all firms has thus heterogeneous effects across firms. The effective tax cut, and therefore the cost reduction, is larger for domestic firms. We expect that their investments increase more than investments of multinational firms. We exploit the 2008 tax reform in Germany, which cut corporate taxes by about 10 percentage points, and use German firm-level data provided by Bureau van Dijk's *dafne* and *amadeus* databases. Based on a difference-in-differences setting applied to both a full and a matched sample of firms, we find that the reduction of corporate taxes resulted on average in a one-to-one increase of real investments of domestic firms. The effect is stronger for domestic firms which rely more on internal financing, such as small firms. Those firms do not only benefit from lower costs of capital, but also from higher after-tax cash flows. We also identify a concurrent increase in labor investments, suggesting that domestic firms increase not only capital investments compared to foreign firms, but also labor expenses to maintain their mix of input factors. Eventually, we find that the increase in investments results in higher sales growth of domestic firms.

How Corporate Tax Cuts Affect International Profit Shifting Strategies

I analyze whether a corporate tax cut in a high-tax country leads to a reduction of profit shifting to low-tax countries within multinational corporations. A reduction of the corporate tax rate reduces the tax rate differences to low-tax countries. If the tax rate difference is the main incentive for cross-border profit shifting, a lower tax rate difference should also reduce the extent of profit shifting in multinational firms. I argue that an adjustment of the profit shifting strategy can cause additional adjustment costs, which may make it favorable to pursue an existing strategy, and delay an adjustment. I identify firm reactions using a difference-in-differences approach that compares heterogeneous effects on earnings of multinational firms with more profit shifting opportunities and domestic firms with less profit shifting opportunities. Multinational and domestic firms are matched according to an exact one-on-one propensity score matching without replacement according to several firm characteristics. The study is based on firm-level financial data around the 2008 tax cut in Germany from the *dafne* database. My results do not suggest an immediate adjustment of profit shifting of multinational firms, consistent with the assumption that the incentives for profit shifting are stable over time, even if the tax rate difference changes. According to my results, multinationals reduce cross-border

profit shifting with a delay of at least two to three years.

Intertemporal Profit Shifting around a Large Tax Cut: The Case of Depreciations (with Prof. Dr. Sebastian Eichfelder, Prof. Dr. Frank Hechtner, and Prof. Dr. Jochen Hundsdoerfer)

We analyze whether corporations use depreciations and write-offs for intertemporal profit shifting. A corporate tax rate cut provides an incentive for corporations to shift taxable profits to periods after a tax rate cut, when profits are subject to a lower tax rate. Our study is based on a panel dataset of German firms from the manufacturing industry which provides data on depreciation expenses for tax purposes. We apply a difference-in-differences setting using partnerships as a control group, since they were not affected by the German corporate tax rate cut in 2008. Our results show that depreciations and write-offs of corporations increase significantly in 2007 compared to partnerships, resulting in lower taxable profits and consequently profit shifting to future periods. Intertemporal profit shifting requires flexibility in the assessment of depreciations and write-offs. We argue that opportunities are heterogeneous across firms, depending on their amount of real estate in their fixed assets. On the one hand, the depreciation of real estate was based on strict rules according to German tax law, which might have reduced discretion for intertemporal profit shifting. On the other hand, the extraordinary economic circumstances of the financial crisis might have provided better opportunities for firms with high real estate, since real estate prices dropped and the decrease in value had to be reflected in the financial statements. We find that corporations with a high percentage of real estate in their fixed assets engage less in intertemporal profit shifting, suggesting that opportunities are a crucial factor. However, the effects of the financial crisis on real estate are hard to assess, and there may be opportunities for future research based on an economically less precarious observation period.

Does International Profit Shifting Substitute Intertemporal Profit Shifting?

The study identifies substitution effects between international profit shifting and intertemporal profit shifting of firms. I analyze whether the engagement in international profit shifting mitigates the incentive for intertemporal profit shifting using domestic firms without international profit shifting activities as a control group. Intertemporal profit shifting is measured through discretionary accrued expenses resulting from a Modified Jones Model. I focus on the year 2007, the year before the German corporate tax cut, and conduct both a cross-section test for 2007, and a difference-in-differences test for the years 2007 until 2009 based on financial data from Bureau van Dijk's *dafne* database. I find that multinational firms accumulate

significantly less discretionary accrued expenses in 2007 than domestic firms. This result points toward the rationale that multinationals reduce their effective tax rate through cross-border profit shifting, and therefore experience the corporate tax cut as a smaller incentive for intertemporal profit shifting than domestic firms.

Chapter 2

Do Corporate Tax Cuts Increase Investments?

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Chapter 3

How Corporate Tax Cuts Affect International Profit Shifting Strategies

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Abstract: The study analyzes whether a corporate tax cut in a high-tax country leads to a reduction of profit shifting to low-tax countries within multinational corporations. I identify firm reactions by using a difference-in-differences approach that compares earnings differences of multinational and domestic firms around the German Corporate Tax Reform in 2008, which cut corporate taxes by about 10 percentage points. The study is based on firm-level data of 4,504 German corporations, resulting from an exact one-on-one propensity score matching of domestic firms to firms with foreign affiliates. In contrast to policymakers' expectations that a corporate tax cut would reduce incentives to take advantage of lower tax rates abroad, I do not find empirical evidence that multinationals adjust cross-border profit shifting immediately. Consistent with the assumption that altering existing profit shifting strategies induces adjustment costs, I identify an adjustment effect with a delay of two to three years.

Keywords: International Profit Shifting, Corporate Taxation, Multinational Enterprises, Transfer Pricing

JEL Classification: F23, H25

3.1   Introduction

Profit shifting of multinational companies challenges high-tax countries, as it reduces taxable profits and thus domestic tax revenue. Companies with affiliates in low-tax countries can use various shifting strategies, for example, leeway in or manipulation of transfer prices or intercompany financing strategies, to reallocate profits and to reduce the overall tax burden on the group level. Several high-tax countries cut corporate tax rates in order to reduce tax rate differences to low-tax countries, and thus incentives to shift profits abroad to avoid domestic taxation: The German government identified a reduction of tax incentives for profit shifting to be a major goal of the 2008 tax reform.[2] Similarly for the U.S., *The President's Framework for Business Tax Reform: An Update* states that a "*lower U.S. corporate rate would (...) reduce incentives for U.S. companies to move their operations abroad or to shift profits to lower-tax jurisdictions*".[3]

Many studies have found empirical evidence for profit shifting within multinational enterprises (see surveys by Heckemeyer and Overesch, 2013; Dharmapala, 2014, for summaries of the prior literature). Subsidiaries in high-tax countries which are part of an international group show lower profitability than comparable subsidiaries without foreign affiliates (e.g., Dworin, 1990; Oyelere and Emmanuel, 1998; Langli and Saudagaran, 2004; Egger, Eggert, and Winner, 2010). Moreover, there is empirical evidence that the level of reported pre-tax earnings is sensitive to the local tax rate compared to the affiliate's tax rate (e.g., Rousslang, 1997; Collins, Kemsley, and Lang, 1998; Mills and Newberry, 2004; Clausing, 2009; Dischinger and Riedel, 2011; Klassen and Laplante, 2012b). Studies attempt different approaches to identify profit shifting through transfer pricing, on the one hand, and intercompany financing strategies, on the other hand. Analyzing prices for imported and exported goods (e.g., Swenson, 2001; Clausing, 2003), the amount of international intrafirm trading (e.g., Clausing, 2001; Grubert, 2003; Clausing, 2006), or the level of earnings before interest and taxes (EBIT) (e.g., Hines and Rice, 1994; Huizinga and Laeven, 2008;

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[2]   See the draft legislation of the tax reform act from 3/27/2007, available at http://dip21.bundestag.de/dip21/btd/16/048/1604841.pdf, last accessed on 4/20/2016.

[3]   See the President's Framework for Business Tax Reform: An Update, A Joint Report by the White House and the Department of the Treasury, available at https://www.treasury.gov/resource-center/tax-policy/Documents/The-Presidents-Framework-for-Business-Tax-Reform-An-Update-04-04-2016.pdf, last accessed on 4/22/2016; also, pp. 20/21 of the Budget Statement from the Budget Bill 2013 in Sweden assumes that "*internationalization means that international companies have great opportunities for tax planning by exploiting differences in national tax systems. (..) Competition for investment and the opportunities for tax planning in international groups demands active tax policy. In order to attract investment and provide good conditions for entrepreneurship in Sweden, it is important to have a competitive tax rate*", available at http://www.government.se/contentassets/24e79b514b5b4474aa3d6f5eadb738a4/from-the-budget-bill-for-2013-budget-statement, last accessed on 4/20/2016.

Maffini and Mokkas, 2011) filters transfer pricing strategies. Numerous studies also provide evidence that the amount of internal loans is sensitive to the tax rate or tax rate difference (e.g., Desai, Foley, and Hines, 2004; Hebous and Weichenrieder, 2010; Buettner et al., 2011).

While there is a large body of literature that profit shifting through transfer pricing and financing strategies exists, only little is known about why and when companies change an existing shifting strategy. Prior studies find the introduction of thin capitalization rules (e.g., Buettner et al., 2012; Blouin et al., 2014), or stricter transfer pricing rules (e.g., Beer and Loeprick, 2015; Riedel, Zinn, and Hofmann, 2015), to reduce profit shifting effectively. While many studies use tax rate variation to identify profit shifting, fewer studies are based on large tax policy shocks. Studies analyzing tax cuts use tax reforms more than 20 years ago (e.g., Harris, 1993; Klassen, Lang, and Wolfson, 1993), but internationalization has increased since then and a lot more companies operate globally today. Also, transfer pricing strategies may have become more widespread and elaborate in the last 25 years.

With tax base erosion being a growing concern for high tax countries, I analyze whether cutting the corporate tax rate is an efficient provision to keep taxable profits from being shifted to low-tax countries. Although previous studies find multinationals' reported income to be sensitive to the home country's tax rate, the estimates of tax elasticities have decreased over time.[4] This raises the question whether a corporate tax cut can actually reduce profit shifting of multinationals.

My empirical identification strategy is based on a difference-in-differences setting, exploiting a large policy shock: I compare income of multinational and domestic German corporations around the German tax reform in 2008, which reduced the tax rate significantly from about 40% to 30%, and additionally increased legal barriers to profit shifting and documentation requirements. I use a dataset of more than 4,500 listed and unlisted German corporations over the period 2004–2012, which also includes information on foreign affiliates.[5] An exact one-on-one matching procedure without replacement according to pre-reform characteristics ensures that the companies compared are similar in size, asset structure, turnover, and the industry they operate in, and that the differences identified result from their affiliates being foreign or domestic. The difference-in-differences approach also allows a separation of earnings changes due to profit shifting from a general economic trend.

A graphical comparison of foreign-owned and domestically owned firms reveals a parallel trend in both earnings before interest and taxes, and pretax earnings,

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[4]   Hines and Rice (1994) report semi-elasticities of 2.25, Huizinga, Laeven, and Nicodème (2008) find 1.3, and Riedel, Zinn, and Hofmann (2015) find 0.4 (see Dharmapala, 2014).

[5]   While Harris (1993) and Klassen, Lang, and Wolfson (1993) use samples of between 37 and 191 multinational firms, my sample includes more than 2,200 multinational firms.

that persists even after the tax rate cut. The increase in multinationals' earnings is not visible before 2010, two years after the tax rate change. The difference-in-differences approach analyzes the difference in EBIT and pre-tax earnings between foreign subsidiaries and domestically owned subsidiaries around the 2008 tax cut. The setting includes several firm-level control variables, firm fixed and year fixed effects. If foreign-owned companies have adjusted their shifting strategy due to lower incentives, taxable earnings of multinationals should increase after the tax cut compared to domestic corporations. While the empirical analysis does not suggest an immediate change in earnings of foreign-owned subsidiaries compared to domestically owned subsidiaries after the tax cut, I identify a delayed increase in 2011 and 2012 that points toward a reduction of cross-border profit shifting. I find that the 10 percentage points tax cut in Germany eventually increased pre-tax income of multinational firms by about 8%. This magnitude is in line with the consensus estimate determined by Dharmapala (2014). However, the effect is delayed by two to three years.

I conduct several robustness tests to account for certain influences that may impact my approach in a way that prohibits the identification of a profit shifting effect. One concern is that the financial crisis around 2008 and 2009 affects subsidiaries of domestic and foreign shareholders differently. As foreign countries were hit by the crisis more severely than Germany, economic consequences in the shareholder country may have had an effect on the subsidiary as well. Such an influence may eliminate a potential change in the difference between the two groups, and thus the identification of an effect. The impact of the financial crisis is captured by two robustness tests: First, I include the shareholder country's gross domestic product (GDP) growth rate to account for the shareholder's economic situation. Second, I limit the sample to firms that survive all sample years, and thus exclude corporations that went bankrupt and showed an abnormal, crisis-related performance. As profit shifting requires an elaborate tax planning strategy, I focus on large companies in another robustness test, since these companies may be more likely to have the resources needed for proficient tax planning. None of these tests provides significant evidence for an immediate change in taxable earnings of multinational firms compared to domestic firms.

My results add to the controversial debate on whether multinationals reduce cross-border profit shifting after a corporate tax cut. Prior research finds evidence for profit shifting activities (e.g., Huizinga and Laeven, 2008; Weichenrieder, 2009; Dharmapala and Riedel, 2013), and for the reduction of such activities after a corporate tax cut (e.g., Harris, 1993; Klassen, Lang, and Wolfson, 1993). However, Riedel, Zinn, and Hofmann (2015) identify a decreasing trend in tax elasticities per year which reflects historical empirical results as summarized by Dharmapala

(2014). This could be an indicator that profit shifting has decreased over time, contrarily to Grubert (2012). However, a lower tax elasticity might also suggest that profit shifting is persistent, but does not necessarily vary with tax rate changes. Klassen and Laplante (2012a) argue that the incentive may be stable across years due to transaction costs, administrative issues, and foreign tax credits. A recent study by Alexander, De Vito, and Jacob (2016) shows that the size of the tax rate difference may not be the only incentive for profit shifting as long as the sign of the tax rate difference remains unchanged. Moreover, there may be other non-tax factors, for example, economic or institutional circumstances in the host country and the parent country that affect profit shifting decisions. Bucovetsky (2014) derives from a model-based approach that sheltering of income depends on the fee that a tax haven charges, which is an indicator for its credibility. In this model, tax rates in high-tax countries have an impact on the number of tax havens, but not on the amount of income shifted. Hence, according to findings in latest research, there might not be a clear adjustment effect of cross-border profit shifting as suggested by earlier literature. My results share these doubts, and show that effects may be considerably delayed.

Other reasons could relate to a lower disadvantage from profit shifting for the government after the tax cut. Therefore, the government might allocate fewer resources to tax audits. Shifting costs would thus decrease and counteract the reduced tax incentive for profit shifting after the reform. Moreover, due to the financial crisis, companies' competitive goals may have been distorted. For companies which are economically affected by the crisis advantages from profit shifting may be even more important.

Many countries cut corporate tax rates in recent years, aiming to improve their tax competitiveness internationally.[6] According to my results, tax rate cuts do not necessarily reduce profit shifting to low tax countries immediately. A potential effect is detectable only with a delay of two to three years. These results are important for policymakers when evaluating the effectiveness of the reform goal to prevent tax base erosion; the benefits of shifting earnings to tax havens may still be favorable after the tax cut. In contrast, anti-avoidance rules are effective. Thin-capitalization rules are identified to limit income shifting through financing strategies (e.g., Overesch and Wamser, 2010; Buettner et al., 2012). However, tax rate cuts have other positive effects, for example, on investment and sales (Dobbins and Jacob, 2016).

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[6]   Overesch and Rincke (2011) analyze tax rates developments in 32 European countries, finding that tax competition between countries has led to the observed race to the bottom. According to their simulation, the 2006 tax level would have been 12.5 percentage points above the actual level, if tax competition did not play a role. Following Heinemann, Overesch, and Rincke (2010), a tax cutting reform is especially probable in countries which are surrounded by low-tax countries. This suggests a possible chain reaction.

First, the paper gives an overview of the institutional background, and introduces a simple model to develop my hypotheses. Section 3.3 describes the empirical design and the data used. The empirical results are presented in Section 3.4 and discussed in Section 3.5. Section 3.6 concludes.

3.2 The Effect of a Tax Rate Cut on International Profit Shifting

3.2.1 Hypothesis Development

I follow a standard model in prior research that the tax benefits of profit shifting are higher, the higher the tax rate difference between the two affiliated companies is (e.g., Huizinga, Laeven, and Nicodème, 2008; Weichenrieder, 2009; Dischinger, 2010; Dharmapala and Riedel, 2013). Assume a domestic corporation D in a high-tax country (tax rate τ_D) with a foreign affiliate F in a low-tax country (tax rate τ_F). If D shifts a certain amount S of its taxable income to the affiliate F, it avoids taxation at the high tax rate τ_D. Instead, S is taxed at the lower rate τ_F. Consequently, the group saves tax payments of $(\tau_D - \tau_F)$ per unit of S.

Shifting taxable income to a low-tax affiliate comes with costs (e.g., Huizinga, Laeven, and Nicodème, 2008). Such costs may arise due to, for example, tax compliance, documentation requirements, or non-tax costs such as the distortion of intragroup incentive systems. I impose some basic assumptions on shifting costs C per units of S (see, e.g., Grubert, 2003): First, costs $C(S)$ are positive if a multinational enterprise engages in profit shifting ($C(S = 0) = 0$ and $C(S > 0) > 0$). Second, the cost function is a convex function: Marginal shifting costs are higher for a higher amount of S ($\frac{d^2 C(S)}{d(S)^2} > 0$).

Profit shifting is advantageous as long as the tax savings per shifted unit of taxable income, which are constant, outweigh the marginal shifting costs, which increase in S:

$$\tau_D - \tau_F = \frac{dC(S)}{d(S)} \tag{3.1}$$

This condition results in an optimal amount S^* of profit shifting.

If the tax rate τ_D in high-tax country D is cut to a lower rate $\tau_{D^{cut}} > \tau_F$, the optimal amount of profit shifting decreases according to Equation (3.1): With a lower tax-advantage from profit shifting ($\tau_{D^{cut}} - \tau_F$), a lower amount of profit shifting S^{cut} gets optimal which induces lower marginal shifting costs. For profit shifting between S^{cut} and the former optimum S^*, marginal shifting costs exceed the tax advantage per unit of shifted taxable profits. For example, at the former optimum S^*, marginal shifting costs would still be $(\tau_D - \tau_F)$, while the marginal tax benefits amount to a lower $(\tau_{D^{cut}} - \tau_F)$ after the tax cut. Therefore, marginal shifting costs would exceed the tax savings by the tax rate reduction $(\tau_D - \tau_{D^{cut}})$. If the optimal condition

from Equation (3.1) still holds, D should immediately reduce the amount of shifted taxable profits when the tax rate changes. Consequently, I test the following first hypothesis:

Hypothesis 1: A corporate tax cut in a high-tax country leads to an immediate reduction of profit shifting to low-tax countries within multinational enterprises.

However, a sudden adjustment might induce additional costs. Establishing a profit shifting strategy (e.g., setting up a certain financial structure, or establishing operations abroad) is costly, and, depending on firm characteristics, modifying it may be just as costly (e.g., the location of a patent may be switched more easily than the location of a manufacturing plant). Moreover, substantial changes may arouse administrators' suspicion (see Klassen and Laplante, 2012a). Adjustment costs can also vary depending on the time frame of the shifting strategy. Strategies might be tied to a certain duration due to fixed advance pricing agreements[7] or foreign tax credits carried over to multiple years. At the end of such a cycle, transfer pricing strategies can be renegotiated, and adjusted to the new tax environment. Klassen and Laplante (2012a) conclude that while the tax rate difference might vary over time, the incentive is stable across several periods. I assume that adjustment costs $C_{Adj}(\Delta S)$ incur additionally to $C(S)$ if a corporation adjusts the amount S of shifted taxable income, and increases in the extent of the yearly adjustment ΔS as a convex function. An adjustment of profit shifting after a tax cut from the original optimum to the new optimum ($\Delta S^{cut} = S^* - S^{cut}$) is then advantageous if the adjustment costs do not exceed the excess costs of maintaining the original stratagy.

$$C_{Adj}(\Delta S^{cut}) \leq C(S^*) - C(S^{cut}) \tag{3.2}$$

An adjustment as sugessted in Equation (3.1) might then not necessarily be favorable. If a full adjustment is rejected as of Equation (3.2), a gradual adjustment might be an option (e.g., gradually adjusting a transfer price might arouse less suspicion in administrators). If marginal excess costs are higher than the marginal costs for adjustment, the level of profit shifting after a tax cut is reduced until marginal costs are identical:

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[7]   Companies negotiating an advance pricing agreement usually have to commit to an extended period of around five years. See, for Germany, the announcement of the Federal Ministry of Finance on advance pricing agreements (from October 5, 2006, IV B 4-S 1341-38/06), and similarly, for the U.S., the Revenue Procedure 2006-9 by the Internal Revenue Service (from December 19, 2005).

$$\frac{dC_{Adj}(\Delta S)}{d(\Delta S)} = \frac{dC(S)}{d(S)} - (\tau_{D^{cut}} - \tau_F) \tag{3.3}$$

Thus, the adjustment process may prolong across several periods, or result in a delayed adjustment. I therefore state the following second hypothesis:

Hypothesis 2: Multinational enterprises do not immediately reduce profit shifting after a corporate tax cut. Adjustment costs lead to a delayed effect.

3.2.2 Institutional Setting

Germany reduced the corporate tax rate from about 40% to about 30% in 2008. The corporate tax rate consists of the statutory corporation tax rate and a local business tax rate, which varies depending on the municipality where the corporation is located. The tax cut resulted from the international tax competition, and countries' efforts to establish an attractive tax environment for companies. However, even after a remarkable tax cut by about 10 percentage points, a tax burden of 30% is still high.

The reform also included base broadening elements that introduced stricter transfer pricing rules, and the interest barrier rule which limits the amount of interest expenses that are deductible for tax purposes. This thin capitalization rule aims at cutting profit shifting through financing strategies. Both provisions may lead to a reduction of profit shifting, and act in favor of finding an adjustment effect (see, e.g., Buettner et al., 2012; Alberternst and Sureth, 2015; Beer and Loeprick, 2015). Their effects are not separable from the effect of the corporate tax cut. However, Blaufus and Lorenz (2009) suggest that the interest barrier rule is only applicable to very few firms, due to several escape clauses. Therefore, I do not expect this rule to bias my results. In contrast, the stricter transfer pricing rules may strengthen results in support of Hypothesis 1.

The reform in 2008 also changed dividend taxation for non-incorporated business shareholders. The tax-free portion of dividend income decreased from 50% to 40%. The taxable 60% of dividend income are subject to the shareholder's progressive personal income tax rate. This increase in the tax rate makes equity financing relatively more expensive. Moreover, in 2009, Germany has introduced a flat tax of 26.375% on capital income for private shareholders, providing an advantage for shareholders with a higher personal income tax rate. Both provisions might affect debt financing of corporations.[8] Due to data limitations, the exact shareholder structure of firms is not available, especially regarding smaller shareholdings. Both

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[8] Fossen and Simmler (2016) find that partnerships increase leverage after the introduction of the flat tax on interest income.

groups of firms, multinational and domestic, might have German shareholders to which these changes apply. Therefore, I assume that the difference-in-differences approach absorbs these effects. Moreover, since I analyze EBIT, which is independent of the financing structure, in addition to pre-tax income, I am confident that these provisions do not bias my results.[9]

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[9] In Table B.1 of the Online Appendix, I restrict the sample to industrial direct shareholders to address a potential influence of the changes in shareholder taxation. Results remain unchanged.

3.3 Empirical Research Design and Data

3.3.1 Estimation Strategy

I use a difference-in-differences setting to test the hypotheses. This strategy compares earnings before interest and taxes and pre-tax income of multinational and domestic corporations around the 2008 tax cut in Germany. That way, my approach covers shifting effects in transfer pricing and financing strategies. The following two main regression equations are used:

$$EBIT_{i,t} = \alpha_0 + \beta_1 MNE \times Reform + \beta_2 Sales_{i,t} + \beta_3 Labor_{i,t}$$
$$+ \beta_4 Fixed_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t} \tag{3.4}$$
$$PreTax_{i,t} = \alpha_0 + \beta_1 MNE \times Reform + \beta_2 Sales_{i,t} + \beta_3 Labor_{i,t}$$
$$+ \beta_4 Fixed_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t} \tag{3.5}$$

Dependent variables are earnings before interest and taxes of firm i in year t ($EBIT_{i,t}$) in Equation (3.4), and pre-tax earnings ($PreTax_{i,t}$) in Equation (3.5). The independent variable of interest in both equations is the interaction term $MNE \times Reform$. The dummy variable MNE equals one for multinational enterprises with more profit shifting opportunities and 0 for domestic enterprises with less profit shifting opportunities. I define corporations as multinational if their direct shareholder which holds an interest of more than 50 percent in the subsidiary is situated in a country other than Germany. Additionally, corporations with foreign subsidiaries are defined as multinational as well.[10] Firms with their direct shareholder located in Germany and only domestic subsidiaries are defined as domestic. Since information on subsidiaries is not available for all sample firms, the location of the shareholder is the main criterion for the definition of MNE, and the location of subsidiaries is subordinate.[11] The dummy variable $Reform$ equals one for the post-reform years starting 2008 in the main specification. This period is moved forward when analyzing the delay in adjustment effects. The interaction term $MNE \times Reform$ captures the increase in earnings of multinational firms compared to domestic firms after the 2008 tax cut. According to Hypothesis 1, both EBIT and pre-tax earnings of multinationals should increase compared to domestic companies after the tax

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[10] Note that information on the ownership percentage in the subsidiaries is not available. In my dataset, 846 firms are classified as multinational based on the location of their subsidiaries, despite having a German direct shareholder.

[11] I focus on German inbound investment as prior research finds significant evidence for profit shifting analyzing German inbound investment, but no or only weak evidence for German outbound investment (e.g., Weichenrieder, 2009).

cut. This results from the adjustment of profit shifting strategies: Due to lower tax incentives, multinationals are assumed to shift less taxable profits abroad, and keep more earnings in Germany. Domestic companies engage less in profit shifting, and do not show the respective reaction. Thus, the estimated coefficient of $MNE \times Reform$ is expected to be positive.

The rationale is the same for Hypothesis 2, but the definition of the dummy variable identifying the time period of interest changes. While $Reform$ identifies the whole post-reform period starting in 2008, I define the dummy variables $Post2009$, which equals one for the years 2009 until 2012, until $Post2011$, which captures the years 2011 and 2012. $Post2012$ equals the year dummy for 2012. Postponing the period of interest accounts for the assumption that the shifting effect might be delayed due to adjustment costs. These modified regression equations ensue:

$$EBIT_{i,t} = \alpha_0 + \beta_1 MNE \times Post20*_+ \beta_2 Sales_{i,t} + \beta_3 Labor_{i,t}$$
$$+ \beta_4 Fixed_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t} \tag{3.6}$$
$$PreTax_{i,t} = \alpha_0 + \beta_1 MNE \times Post20* + \beta_2 Sales_{i,t} + \beta_3 Labor_{i,t}$$
$$+ \beta_4 Fixed_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t} \tag{3.7}$$

The interaction term then compares a shorter period of a potential adjustment to a longer pre-effect period. For example, $MNE \times Post2010$ compares the difference in earnings between multinationals and domestic firms in the years 2010 until 2012 to years before 2010. A positive and significant coefficient estimate of the interaction term between MNE and the respective dummy variable $Post2009$ until $Post2012$ suggests that there is an adjustment of profit shifting which occurs belatedly in the year as indicated by the dummy.

The advantage of the difference-in-differences setting is that it accounts for the general trend in earnings: The observation period is severely affected by the financial crisis, which resulted in lower corporate earnings. If the consequences are identical for all companies, the difference-in-differences approach is efficient, as the effect results from changes in the difference between foreign and domestic corporations.[12]

Another underlying assumption of the strategy is that treatment and control group, that is, multinational and domestic corporations, only differ in the location of their affiliates, and that differences in their reactions to the 2008 tax cut are only due to that criterion. To make sure that there are no other structural differences

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[12]   If the financial crisis affects domestic firms differently than foreign firms, my results may be biased. Therefore, I conduct two robustness tests to control for further potential influences of the crisis (see Section 3.4.2.2).

between these two groups, which may bias the results, I conduct a one-on-one matching without replacement. Each domestic firm is matched to a multinational firm according to the natural logarithms of sales, labor costs, fixed and total assets of each year prior to the tax cut in the sample. Also, firms are matched within one industry. This approach ensures that the composition of the matched treatment and control groups does not change after the reform, and is thus not affected by reform effects. The matching procedure results in two equally large groups of companies with similar economic activities.

The regression model also controls for the influences of sales, wages, and the level of fixed assets on EBIT, or pre-tax earnings, respectively.[13] Firm fixed effects control for firm-specific characteristics that do not vary over time. Therefore, the main effect of MNE cannot be added separately.[14] Year fixed effects capture effects of the business cycle, and any other effects that are identical for every firm in the respective year. Similar to above, year dummies also cover the main effect of the *Reform* dummy.

3.3.2 Data Description

I apply firm-level company data from Bureau van Dijk's *dafne* database to test the hypotheses. The database provides financial data[15] for German companies, as well as information about the company structure[16], industry, or business activity. The unbalanced panel covers an observation period from 2004 to 2012, and consists of 2,252 domestic firms and 2,252 subsidiaries with foreign affiliates[17] (28,093 observations in total). The composition of the two groups results from an exact one-on-one propensity score matching strategy without replacement. I obtain the propensity score for MNE from estimating a probit model for the year 2007. The natural

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[13] As the matching procedure is only based on pre-reform characteristics, the inclusion of control variables is efficient even if the same variable was used as a matching variable.

[14] This is based on the assumption that the ownership structure does not change over time. As the database *dafne* provides holding information only for the last reporting date, potential changes in the ownership structure are not observable. Therefore, MNE is constant over time in this sample. Following Budd, Konings, and Slaughter, 2005, I assume that this measurement error produces a bias towards zero.

[15] Financial information used in this study is based on German accounting rules.

[16] The database provides information on the location of the affiliate corporation, but there is no detailed shareholder information available. I have basic information on the shareholder type, and therefore restrict the sample to companies with an industrial company as immediate shareholder in Table B.1 of the Online Appendix. Due to data limitations, this restriction would reduce my sample size significantly. Since results are similar to my baseline results, I do not apply this restriction in my main analysis.

[17] Subsidiaries in the sample are limited liability companies in the German legal forms *Aktiengesellschaft*, *Gesellschaft mit beschränkter Haftung*, and *Kommanditgesellschaft auf Aktien (KGaA, GmbH& Co. KGaA, and AG& Co. KGaA)*, and other corporations. Furthermore, I exclude companies offering financial or insurance services.

Table 3.1: Matching Quality

This table gives an overview of the efficiency of the one-on-one propensity score matching without replacement. It presents the mean values of the matching criteria (logs of variables in thousand €) for multinational and domestic firms before and after the matching procedure for the pre-reform period. It also lists the t-statistics and the p-values of the significance of the difference between the groups.

| Variable | Year | Before Matching | | | | After Matching | | | |
| | | Mean | | t | p | Mean | | t | p |
		MNE	Domestic			MNE	Domestic		
Sales$_t$ (ln)	2005	9.7719	7.7516	-57.51	0.00	10.4117	10.2987	-2.49	0.01
	2006	9.9169	7.8924	-57.08	0.00	10.5265	10.4191	-2.41	0.02
	2007	10.0416	8.0526	-55.16	0.00	10.5786	10.4752	-2.32	0.02
Labor$_t$ (ln)	2005	7.9278	6.5023	-49.39	0.00	8.5839	8.5351	-1.09	0.27
	2006	8.0066	6.6889	-48.48	0.00	8.6506	8.6064	-1.01	0.31
	2007	8.1313	6.9113	-45.71	0.00	8.6966	8.6454	-1.19	0.24
Fixed$_t$ (ln)	2005	7.0634	5.2075	-52.39	0.00	7.9281	7.9061	-0.30	0.76
	2006	6.9927	5.1279	-60.68	0.00	7.9757	7.9653	-0.14	0.89
	2007	7.0585	5.1690	-62.73	0.00	8.0380	8.0300	-0.11	0.91
Total$_t$ (ln)	2005	8.8117	6.7771	-72.54	0.00	9.8678	9.7731	-1.97	0.05
	2006	8.7279	6.6867	-83.49	0.00	9.9601	9.8687	-1.93	0.05
	2007	8.7925	6.7302	-85.56	0.00	10.0330	9.9455	-1.86	0.06

logarithms of turnover, wages, fixed and total assets, as well as lagged variables of the two previous years are the independent variables. Also, a code for the industry a company operates in is included. I match each observation from foreign companies to an observation of domestically owned companies according to the nearest neighbor propensity score. The two groups of foreign and domestically owned corporations resulting from this procedure do not change over the observation period. That is, changes in economic activities after the tax cut do not affect the composition of the groups. To make sure that treatment and control group are comparable, I estimate yearly t-tests analyzing the means of the natural logarithms of turnover, wages, fixed and total assets for the pre-reform period. The tests suggest that the groups do not significantly differ from each other regarding wages and fixed assets (see Table 3.1). However, for sales and total assets, the groups are still slightly, but significantly, different. Table 3.1 nevertheless shows that the matching procedure decreased the differences tremendously. I am thus confident that differences in economic activities between the two groups do not bias my results.

Table 3.2 presents descriptive statistics for the data used. Companies observed

have average EBIT of €6.0m and average pre-tax income of €6.4m.[18] Average turnover amounts to €153m, average wages to €18.8m, and average fixed assets to €50.4m.

Table 3.2: Summary Statistics

This table presents summary statistics of the firm-level data used for the analysis. The panel consists of 4,504 firms, resulting in 28,093 observations (26,522 for pre-tax income). Data source is Bureau van Dijk's *dafne*-database.

Variable	Description	Mean	Std Dev.	p25	p75
Dependent Variables					
EBIT	Earnings before interest and taxes in thousand €	5,994	39,929	204	4,633
	/Total_{t-1}	0.0925	0.1407	0.0204	0.1488
	ln	7.4813	1.7803	6.4316	8.6283
PreTax	Pre-tax income in thousand €	6,352	48,847	161	4,795
	/Total_{t-1}	0.0888	0.1454	0.0133	0.1491
	ln	7.5082	1.8305	6.4300	8.6824
Independent Variables					
Sales	Turnover in thousand €	153,028	1,417,546	17,901	98,914
	/Total_{t-1}	2.3314	1.8024	1.1553	2.9704
	ln	10.6337	1.4445	9.7780	11.4850
Labor	Wages in thousand €	18,829	61,506	2,853	16,914
	/Total_{t-1}	0.4503	0.4932	0.1577	0.5627
	ln	8.7600	1.4079	7.8939	9.6785
Fixed	Fixed assets in thousand €	50,365	407,342	850	19,257
	/Total_{t-1}	0.3090	0.2708	0.0769	0.4844
	ln	8.2012	2.3726	6.6693	9.8052

The model developed above is based on the assumption that after the tax cut, the tax rate difference to low-tax countries, and thus the incentive to shift profits abroad, decreases. However, if foreign tax rates drop correspondingly, the model does not predict an effect on profit shifting.[19] Compared to available tax rates in the sample, Germany dropped from about the 90th percentile of highest corporate tax rates in 2007 to about the 70th percentile in 2008.[20] This change in ranks alone rejects the

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[18] Data coverage for pre-tax earnings is lower than for the other variables: there are only 26,522 observations available. For this particular subsample, the average EBIT are €6.3m.

[19] Overesch and Rincke (2011) analyze tax rates developments in 32 European countries. They find that tax competition between countries has led to the observed race to the bottom. According to their simulation, the 2006 tax level would have been 12.5 percentage points above the actual level, if tax competition did not play a role. Following Heinemann, Overesch, and Rincke (2010), a tax cutting reform is especially probable in countries which are surrounded by low-tax countries. This suggests a possible chain reaction.

[20] I use business tax rates for the foreign direct shareholders based on data from KPMG International (2011), which contains an overview of corporate tax rates for many countries between 2000 and 2011. In addition, I use another overview of foreign corporate tax rates

concern that the international tax rates' race to the bottom could have eliminated the influence of the German tax cut on global tax competition, and therefore the tax rate difference analyzed. Even if the international trend in tax rates lowers the effect of the tax cut analyzed, I assume that a tax cut of 10 percentage points is large enough to induce observable reactions.

provided by KPMG International (2016) for more recent years. I compare these foreign tax rates to the German business tax rate per year, consisting of the corporation tax, the trade tax, and the solidarity surcharge. For the computation of the German business tax rate, I use the yearly average trade tax multipliers as published by Statistisches Bundesamt (2013).

3.4 Results

3.4.1 Graphical Evidence

The graph in Figure 3.1 (Figure 3.2) plots the average EBIT (pre-tax earnings) divided by the prior year's total assets of multinational corporations compared to the matched sample of domestic corporations to get a first hint of potential profit shifting reactions after the 2008 tax cut. Average earnings of multinational firms and domestic firms are very similar prior to the reform.[21] If multinational corporations adjust their profit shifting strategy as a consequence of the 2008 tax reform, and thus shift less taxable profits abroad, multinationals' EBIT (pre-tax income) should increase compared to domestic companies after the tax cut. In the years 2008 to 2010, the graphs do not show an adjustment effect. However, in the years 2011 and 2012, earnings of multinationals increase compared to domestic firms.

Figure 3.3 (Figure 3.4) plots the difference in average EBIT (pre-tax income) divided by the prior year's total assets between multinational and domestic firms. Both figures show that the difference is closer to zero even right after the tax cut of 2008. In 2011 (2010 in case of pre-tax earnings) it jumps up to a higher level, suggesting an increase in earnings of multinationals compared to domestic firms. This difference in earnings is positive and significant.

While the graphical analysis does not reveal a change in profit shifting immediately in 2008, there is an increase in earnings of multinationals compared to domestic firms visible in 2011 and 2012. This might point towards a delayed adjustment of profit shifting as suggested by Hypothesis 2.

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[21] In 2007, earnings of domestic firms seem to slightly decrease compared to multinationals. This could point towards heterogeneous engagement in intertemporal profit shifting (see Dobbins, 2016a).

Figure 3.1: Average EBIT of Multinational and Domestic Firms

This figure depicts the average $EBIT$ (earnings before interest and taxes divided by the prior year's total assets) of foreign-owned firms (solid line) compared to domestic firms (dashed line).
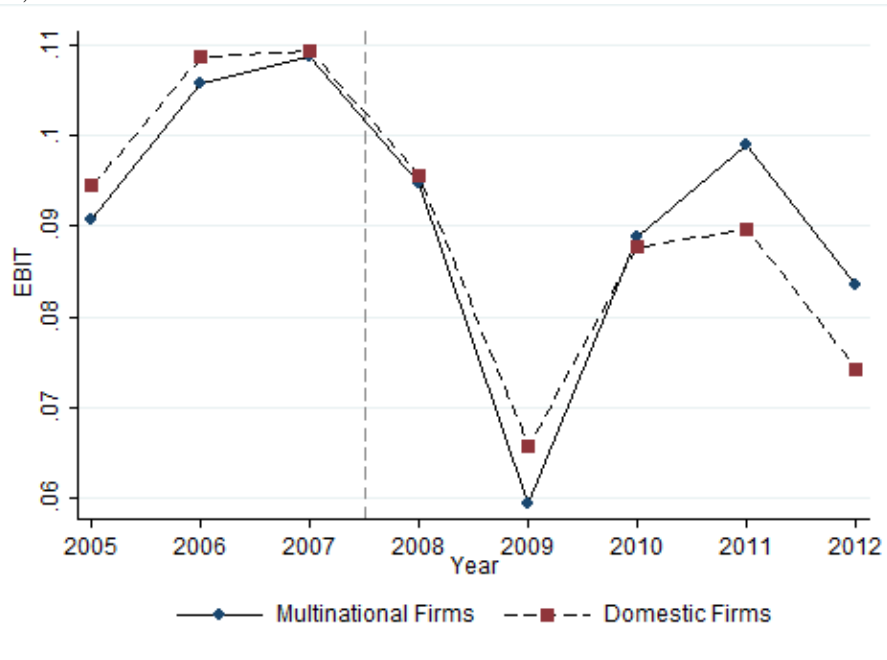
Figure 3.2: Average Pre-Tax Income of Multinational and Domestic Firms

This figure depicts the average $PreTax$ (pre-tax income divided by the prior year's total assets) of foreign-owned firms (solid line) compared to domestic firms (dashed line).

Figure 3.3: Difference between EBIT of Multinational and Domestic Firms

This figure depicts the difference between average $EBIT$ (earnings before interest and taxes divided by the prior year's total assets) of multinational and domestic firms (black line). The upper and lower 95% confidence intervals are indicated by the grey lines.

Figure 3.4: Difference between Pre-Tax Income of Multinational and Domestic Firms

This figure depicts the difference between average $PreTax$ (pre-tax income divided by the prior year's total assets) of multinational and domestic firms (black line). The upper and lower 95% confidence intervals are indicated by the grey lines.
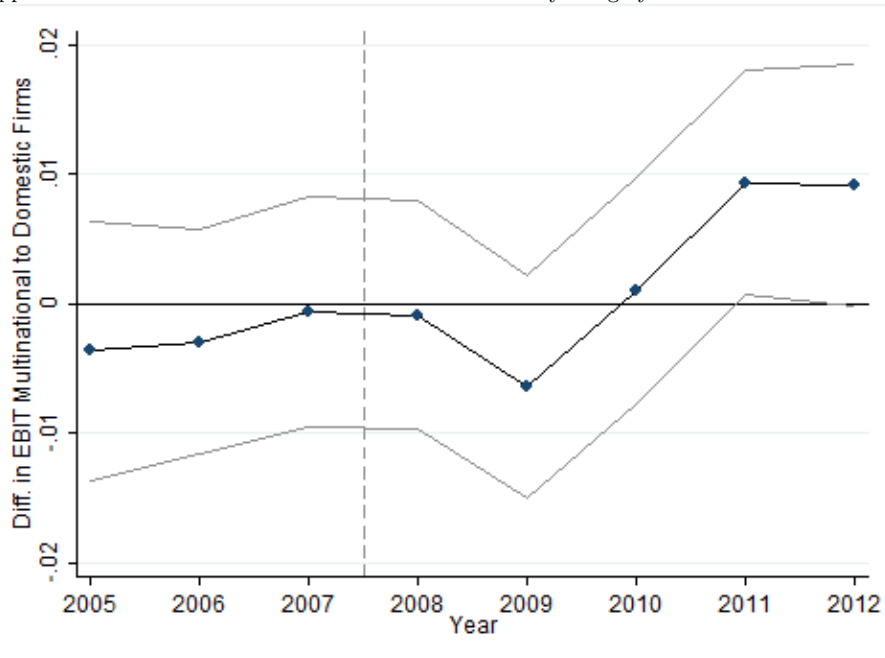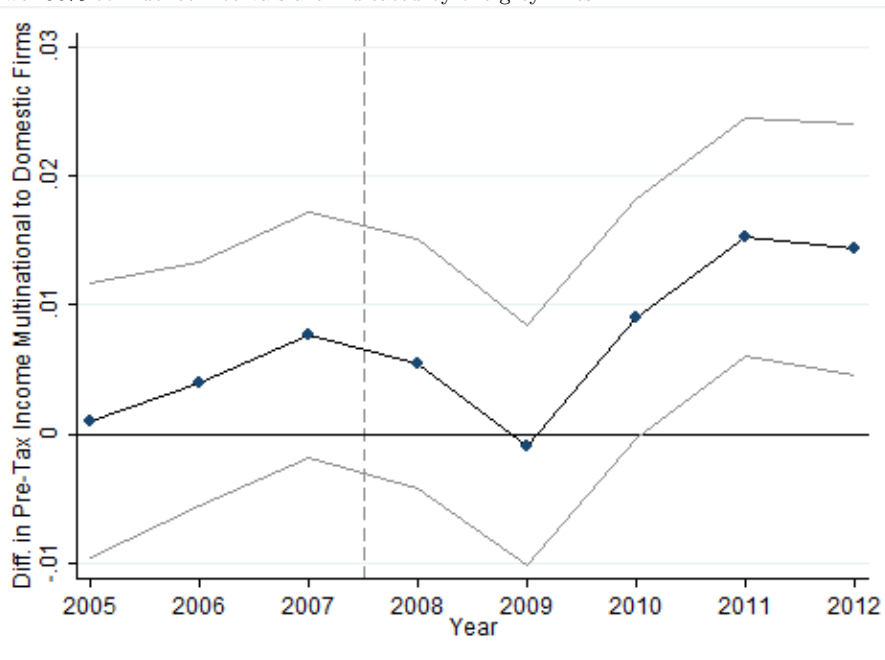
3.4.2   Immediate Adjustment in Profit Shifting

3.4.2.1   Main Results

First, I test Hypothesis 1 using a difference-in-differences approach. The independent variable of interest is the interaction between MNE and $Reform$. It captures the profit shifting reaction of multinational firms by comparing the difference in EBIT (Columns (1) and (2) of Table 3.3), or pre-tax earnings (Columns (3) and (4) of Table 3.3), respectively, to domestic firms after the tax cut to the difference before the tax cut.[22] Using $EBIT$ as the dependent variable covers shifting solely through the channel of transfer pricing, while using $PreTax$ captures both transfer pricing and financing strategies. Variables are used in natural logarithms in Columns (1) and (3), and are divided by the prior year's total assets in Columns (2) and (4). The latter approach also takes negative values of EBIT or pre-tax income into account, which cannot be achieved for the logarithms per definition.

The estimated coefficient of $MNE \times Reform$ is positive, yet not significant in any specification. That is, this approach does not provide empirical evidence that earnings of multinational firms increase compared to domestically owned subsidiaries immediately after the tax cut, which would indicate that more taxable profits remain in Germany. My results are therefore not consistent with Hypothesis 1.

3.4.2.2   Robustness to Financial Crisis Effects

The economic situation during the observation period has been severely affected by the financial crisis in 2008 and 2009. The matching procedure, also the inclusion of year fixed effects in the regression, and the difference-in-differences approach account for the business cycle. However, if the financial crisis has affected domestic and foreign companies in different ways, my results may be biased. I include the yearly GDP growth rate of the shareholder country in the regression to account for potential spillover effects on the German subsidiary.[23] If the financial crisis hit the economy of foreign countries differently than Germany, and this effect had an influence on foreign-owned companies which is different to the effect of the crisis on domestic companies, the variable GDP captures this impact. The results of this robustness test are presented in Table 3.4.

Table 3.4 duplicates the baseline results, but adds the variable GDP. The estimated coefficient of GDP is not significant in any specification. This suggests that the economic differences between the shareholder country and Germany do not

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[22]   The number of observations varies due to differences in data availability between EBIT and pre-tax income. Also, there are less observations in the specifications using the natural logarithm as it is not defined for negative values.

[23]   The GDP growth rates are based on published data by The World Bank Group (2016).

Table 3.3: Profit Shifting around the 2008 Tax Cut

This table presents the regression results on firm's EBIT and pre-tax income over 2005–2012. Dependent variable in Columns (1) and (2) is *EBIT*, defined as the natural logarithm of earnings before interest and taxes in (1), and earnings before interest and taxes relative to the prior year's total assets in (2). Dependent variable in Columns (3) and (4) is *PreTax*, defined as the natural logarithm of pre-tax income in (3), and pre-tax income relative to the prior year's total assets in (4). The independent variables are defined in Table 3.2. They are used in logs in Columns (1) and (3), and are divided by the prior year's total assets in Columns (2) and (4). I include firm fixed effects and year fixed effects in all specifications. Standard errors, clustered at the firm level, are reported in parentheses. ***, **, and * refer to a significance level of 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)
	EBIT		**PreTax**	
	ln	/Total$_{t-1}$	ln	/Total$_{t-1}$
MNE×Reform	0.0279	0.0012	0.0303	0.0010
	(0.027)	(0.003)	(0.030)	(0.003)
Sales$_t$	0.8881***	0.0421***	0.8584***	0.0417***
	(0.046)	(0.002)	(0.046)	(0.002)
Labor$_t$	-0.0350	-0.0165*	-0.0298	-0.0130
	(0.044)	(0.009)	(0.044)	(0.009)
Fixed$_t$	0.0308**	0.0108	0.0110	0.0094
	(0.015)	(0.009)	(0.017)	(0.009)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	27,345	28,093	25,451	26,522
R-squared	0.860	0.670	0.856	0.671

Table 3.4: Profit Shifting around the 2008 Tax Cut: Controlling for Economic Situation in Shareholder Country

This table replicates Table 3.3, but the regressions further include *GDP*, the growth in the gross domestic product in the shareholder's country, as additional control variable. I include firm fixed effects and year fixed effects in all specifications. Standard errors, clustered at the firm level, are reported in parentheses. ***, **, and * refer to a significance level of 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)
	EBIT		**PreTax**	
	ln	/Total$_{t-1}$	ln	/Total$_{t-1}$
MNE×Reform	0.0196	0.0010	0.0225	0.0006
	(0.027)	(0.003)	(0.030)	(0.004)
GDP$_t$	-0.0107	-0.0004	-0.0095	-0.0008
	(0.007)	(0.001)	(0.008)	(0.001)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	27,326	28,068	25,433	26,497
R-squared	0.860	0.670	0.856	0.671

Table 3.5: Profit Shifting around the 2008 Tax Cut: Firms Surviving all Sample Years

This table replicates Table 3.3, but the regressions restrict the sample to firms that survived all sample years. I include firm fixed effects and year fixed effects in all specifications. Standard errors, clustered at the firm level, are reported in parentheses. ***, **, and * refer to a significance level of 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)
	EBIT		**PreTax**	
	ln	/Total$_{t-1}$	ln	/Total$_{t-1}$
MNE×Reform	0.0300	0.0025	0.0243	0.0025
	(0.027)	(0.003)	(0.030)	(0.003)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	26,185	26,742	24,348	25,240
R-squared	0.860	0.671	0.856	0.674

influence the level of EBIT and pre-tax earnings in a certain way. The negative sign of the estimated coefficients suggests that a weaker economy in the shareholder's country could lead to higher earnings on the subsidiary level. This may be the result of higher investments in a country with a strong economy, rather than in an economic downturn, as this promises higher returns (e.g., Becker and Riedel, 2012; Dobbins and Jacob, 2016). As foreign countries have experienced worse impact by the financial crisis than Germany has, such an influence of the GDP growth rate should rather bias my findings towards a positive result. However, the estimated coefficient of $MNE \times Reform$ is still non-significant.

During the financial crisis, many companies left the market due to insolvency. Thus, there may be big differences across companies in the sample regarding how hard they have been hit by the crisis. If there are differences in insolvency risks between domestic and multinational firms, the estimated coefficient for $MNE \times Reform$ is biased. If multinational subsidiaries' earnings decrease more due to the crisis, the two effects — crisis and profit shifting adjustment — would even out. That is, the fact that there is no empirical evidence for an immediate change in shifting activities may actually be due to the economic circumstances in the observation period. To account for these differences in insolvency risk, I restrict the sample to companies which survive all sample years in the observation period (see Dobbins and Jacob, 2016). This excludes all corporations that have entered or exited the market during the years 2004 until 2012. All remaining companies should not have been existentially threatened by the crisis. Table 3.5 contains the results.

The estimated coefficient for $MNE \times Reform$ is positive, but non-significant even for the restricted sample. The differences in insolvency risk do not bias the

Table 3.6: Profit Shifting around the 2008 Tax Cut:
Large Firms

This table replicates Table 3.3, but the regressions restrict the sample to firms, whose total assets are above the median of total assets in the sample. I include firm fixed effects and year fixed effects in all specifications. Standard errors, clustered at the firm level, are reported in parentheses. ***, **, and * refer to a significance level of 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)
	EBIT		**PreTax**	
	ln	/Total$_{t-1}$	ln	/Total$_{t-1}$
MNE×Reform	0.0077	-0.0006	0.0164	-0.0008
	(0.040)	(0.004)	(0.040)	(0.005)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	13,672	14,394	13,340	14,160
R-squared	0.783	0.722	0.798	0.715

results in such a way that would not allow identifying changes in profit shifting. There is still no empirical evidence for an immediate change in profit shifting as a reaction to the 2008 tax cut.

3.4.2.3 Restriction to Large Firms

In another robustness test, I focus on large companies, which may be more likely to shift profits abroad than smaller companies due to scale economies in tax planning, that is, which are also more likely to adjust their shifting strategy after the tax cut (Dyreng, Hanlon, and Maydew, 2008). Profit shifting requires a certain effort and experience in international tax planning that not all companies have access to. Moreover, the absolute benefit from shifting profits abroad may have an influence on the shifting decision in general, which means that profit shifting may only be interesting for larger companies with higher profits that can be subject to shifting. Smaller firms might not be involved in elaborate tax planning. I therefore conduct the baseline regressions for companies whose total assets are higher than the median of total assets in the sample. Table 3.6 contains the regression results.

The estimated coefficient of $MNE \times Reform$ is not significant and economically very small. Even if the sample is restricted to those companies which are more likely to engage in elaborate tax planning, I do not find empirical evidence that companies shift less profits abroad after the 2008 tax cut.

Table 3.7: Profit Shifting around the 2008 Tax Cut: Sensitivity to Tax Rate Variation

This table replicates Table 3.3, but the regressions measure the sensitivity of earnings to tax rate variation instead of level changes. I include firm fixed effects and year fixed effects in all specifications. Standard errors, clustered at the firm level, are reported in parentheses. ***, **, and * refer to a significance level of 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)
	EBIT		**PreTax**	
	ln	/Total$_{t-1}$	ln	/Total$_{t-1}$
taxdiff	-0.0013	-0.0000	-0.0021	-0.0001
	(0.004)	(0.000)	(0.004)	(0.000)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	27,307	28,057	25,416	26,486
R-squared	0.860	0.670	0.856	0.671

3.4.2.4   Sensitivity to Tax Rate Variation

Further, I test whether the sample companies' earnings show any sensitivity to tax rate variation in Germany or in the shareholder country. Even if most variation in the tax rates in the sample stems from the 2008 tax cut in Germany, other countries have also faced various tax rate changes. Tax rate variations in affiliates' countries also change the tax advantages from shifting profits abroad. If multinational corporations adjust their transfer pricing strategies to tax changes, there should be a significant effect of the corporate tax rate variation on the level of earnings. I thus replace $MNE \times Reform$ by the difference in business tax rates between Germany and the respective country of the shareholder in the baseline regression. The variable $taxdiff$ reflects all changes in corporate tax rates in the shareholder countries during the observation period 2005 to 2012. Results are displayed in Table 3.7.

The estimated coefficient of $taxdiff$ is non-significant in all four specifications. There is no evidence that the tax rate difference explains the level of earnings of multinational subsidiaries. This finding is consistent with concerns mentioned by Klassen and Laplante (2012a) about using the foreign tax rate as a proxy for income shifting, as they assume the incentive for profit shifting to be stable across periods. Moreover, the tax rate difference between two countries does not accurately represent a potentially complex group structure with various shifting destinations. Consistent with my prior results, this test does not show empirical evidence that German subsidiaries reduce outbound profit shifting to low-tax countries immediately after the tax cut.

**Table 3.8: Profit Shifting around the 2008 Tax Cut: De-
layed Adjustment Effect**

This table replicates Table 3.3, but the regressions compare earnings differences in shorter post-treatment periods
to longer pre-treatment periods. I include firm fixed effects and year fixed effects in all specifications. Standard
errors, clustered at the firm level, are reported in parentheses. ***, **, and * refer to a significance level of 1%, 5%,
and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	lnEBIT	lnPreTax	lnEBIT	lnPreTax	lnEBIT	lnPreTax	lnEBIT	lnPreTax
MNE×Post2009	0.0263	0.0460						
	(0.028)	(0.031)						
MNE×Post2010			0.0422	0.0704**				
			(0.029)	(0.032)				
MNE×Post2011					0.0581*	0.0812**		
					(0.031)	(0.035)		
MNE×Post2012							0.0421	0.0935**
							(0.041)	(0.045)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	27,345	25,451	27,345	25,451	27,345	25,451	27,345	25,451
R-squared	0.860	0.856	0.860	0.856	0.860	0.856	0.860	0.856

3.4.3 Delayed Adjustment of Profit Shifting

Due to adjustment costs, there might be a delay in the adjustment of cross-border
profit shifting to a reduction in corporate taxes (Hypothesis 2). Compared to my
main specification, I now change the definition of the comparison period. Originally,
my approach compared the pre- and post-reform period defined by the date when
the tax rate reduction came into effect at the beginning of 2008. Assuming that the
effect might be delayed, I move forward the date that defines the period before the
treatment. For example, in Columns (1) and (2) of Table 3.8, I compare earnings
in the years 2009 until 2012 to the new pre-effect period from 2005 until 2009. In
Columns (3) to (8), I push the date forward in yearly steps and compare shorter
post-effect periods to longer pre-effect periods. In Columns (7) and (8), I compare
the difference in EBIT (pre-tax earnings) between multinational firms and domestic
firms in 2012 to the average difference in the years 2005 until 2011.

Table 3.8 only displays results for the specifications with variables in natural
logarithms since I expect results to be stronger when loss firms are excluded, due
to potentially very different profit shifting incentives (see, e.g., Klassen, Lang, and
Wolfson, 1993). The estimated coefficient for the interaction term amounts to 0.0704
and is significantly positive ($p < 0.05$) for pre-tax earnings starting in 2010. More
precisely, considering the natural logarithm of the dependent variable, the tax cut
of about 10 percentage points has increased pre-tax earnings of multinational firms
by about 7.29% after 2010 compared to the period before 2010. Results for 2011
and 2012 are similar. The magnitude of the adjustment is in line with the consensus
estimate resulting from prior research results as suggested by Dharmapala (2014).

The effect is weaker for EBIT, which seems reasonable since EBIT only capture transfer pricing strategies, and pre-tax earnings capture both transfer pricing and financing strategies for profit shifting. Considering that the significant increase in earnings cannot be identified before 2010, the results are consistent with Hypothesis 2 that adjustment costs lead to a delayed reduction of profit shifting of multinational firms.

3.5 Discussion of the Results

My empirical analysis reveals no immediate decrease in profit shifting activities of multinationals. An adjustment of cross-border shifting can only be identified with a delay of two to three years after a corporate tax cut. This result adds to a controversial discussion in prior literature on profit shifting reactions to a tax rate change. While earlier studies (e.g., Collins, Kemsley, and Lang, 1998; Mills and Newberry, 2004; Huizinga and Laeven, 2008) identify a clear tax elasticity of earnings of multinationals, Riedel, Zinn, and Hofmann (2015) find that the tax elasticity has decreased over time. Comparing studies on profit shifting suggests the same trend (see Dharmapala, 2014). A lower tax elasticity may indicate that multinational corporations do not necessarily change an established profit shifting strategy after a tax rate change. I argue that an adjustment induces costs (e.g., for the relocation of intangible assets or a reevaluation of financing strategies) that may temporally exceed the disadvantages of a non-optimal transfer pricing strategy. It would then be favorable for multinationals to continue their original strategy and shift profits to an affiliate country where taxes are still lower (see, also, Alexander, De Vito, and Jacob, 2016). This assumption is consistent with Klassen and Laplante (2012a) who state that the incentive for profit shifting may be stable over a certain period of time due to transaction costs, tax administrative issues that would arise from a new strategy, and foreign tax credits that are tied to one country. Also, Bucovetsky (2014) derives from a model-based approach that tax rates in high-tax countries do not have an impact on the amount of income shifted, but on the number of tax havens. Sheltering of income rather depends on the fee that a tax haven charges, and thus its credibility that is connected with this fee.

Another reason for the result may be that, given the lower business tax rate, the government's disadvantage from profit shifting is lower and consequently there may be less governmental control mechanisms (e.g., tax audits). That way, shifting costs would decrease and allow more profit shifting after the reform. The financial crisis could also have distorted companies' competitive goals: Companies facing economic trouble might especially rely on profit shifting to improve their performance level.

3.6   Conclusion

The study analyzes whether a corporate tax cut in a high-tax country has an effect on the profit shifting of foreign firms to tax havens, that is, if multinationals shift less taxable income to countries where profits are taxed at a lower rate. I use a difference-in-differences setting that compares EBIT and pre-tax earnings of multinational and domestic German companies around the 2008 tax reform in Germany. The empirical tests do not provide significant evidence that earnings of foreign subsidiaries have increased immediately after the tax cut compared to domestically owned subsidiaries. I do not identify adjustment effects until two to three years after the tax reduction. According to multiple robustness tests, these results are not explained by the special economic circumstances in the observation period due to the financial crisis.

My study contributes to the literature on international profit shifting that analyzes why and when multinationals change an existing profit shifting strategy. This discussion has experienced new impulse in recent years since empircal studies suggest that the tax elasticity of multinationals' earnings has decreased, and that firm reactions to a change in corporate tax rates may not be as clear as predicted in earlier analyses (e.g., Klassen and Laplante, 2012a; Riedel, Zinn, and Hofmann, 2015; Alexander, De Vito, and Jacob, 2016).

Policy makers in many countries (e.g., Germany, U.S., Sweden) associate a reduction of corporate tax rates with a decrease in profit shifting of multinational companies. They expect that a lower tax rate difference to tax havens would reduce the incentive for shifting strategies. My results, however, suggest such an adjustment effect is delayed, and that a corporate tax cut does not necessarily prevent tax base erosion. Other evidence (e.g., Dobbins and Jacob, 2016), in contrast, shows immediate positive effects of a tax rate cut on firm investment, which coincides with prior policy expectations. The effects of a tax rate cut on firms' behavior, and the efficiency of policy provisions concerning the reform goals (e.g., the partial self-financing of tax cuts) can be of high importance for the evaluation of past reform efforts. Considering the ongoing "race to the bottom" in tax rates in many countries, the results can also be valuable for future tax reforms.

Online Appendix—Not for publication

Table B.1: Profit Shifting around the 2008 Tax Cut: Firms with Industrial Shareholders

This table replicates Table 3.3, but the regressions restrict the sample to firms with industrial shareholders. I include firm fixed effects and year fixed effects in all specifications. Standard errors, clustered at the firm level, are reported in parentheses. ***, **, and * refer to a significance level of 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)
	EBIT		**PreTax**	
	ln	/Total$_{t-1}$	ln	/Total$_{t-1}$
MNE×Reform	0.0226	0.0030	0.0230	0.0017
	(0.033)	(0.004)	(0.035)	(0.004)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	18,993	19,790	18,047	19,004
R-squared	0.846	0.664	0.843	0.666

Chapter 4

Intertemporal Profit Shifting around a Large Tax Cut: The Case of Depreciations

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Abstract: A corporate tax rate cut provides an incentive for corporations to shift taxable income from years before the tax rate cut to post-reform years. Our study analyzes whether depreciations and write-offs are used to achieve intertemporal income shifting. Using a panel of German manufacturing firms, we test in a difference-in-differences setting whether firms reacted to the announced 2008 corporate tax rate cut of 10 percentage points by accumulating depreciation expenses in the pre-reform year. Our analysis also sheds light on differences in opportunities for income shifting across firms. The main results show that depreciation expenses in 2007 are on average about 2.87% higher than in the other observation years. We also find that shifting depreciation expenses to the year prior to the tax cut requires certain flexibility in the assessment of depreciations or write-offs. Our results suggest that companies with a high percentage of real estate in their fixed assets shift less depreciation expenses. We attribute this result to a lower flexibility in depreciation schedules and write-offs for buildings, than for other assets, like machinery or low-value assets.

Keywords: Tax Planning, Intertemporal Taxable Income Shifting, Depreciations, Write-offs

JEL Classification: H25, M41

4.1   Introduction

For constant proportional corporate tax rates, allocating taxable income to different tax assessment periods only changes the present value but not the sum of tax payments. As interest rates are historically low, the resulting changes in the present value of taxes are small. However, anticipated changes in the corporate tax rate set strong incentives to shift taxable income to years with lower tax rates. In 2008, the German corporate tax rate was cut by 10 percentage points (from 25% to 15%). This measure decreased the overall corporate income tax burden that comprises the corporate tax, the local trade tax and the solidarity surcharge by about 10 percentage points. The reform was passed in July 2007; therefore, the tax rate cut was well known to the public quite early, and corporations had enough time to adjust their tax strategy and shift income from 2007 to 2008.

Shifting €1 of taxable income resulted in a permanent tax saving of €0.10. This provides a powerful setting to measure whether and how firms react to intertemporal income shifting incentives. Depreciations are one possible channel to shift income between years: By bringing forward depreciations into 2007, taxable income in 2007 decreases, whereas taxable income after 2007 increases. We analyze whether German corporations used depreciations as an intertemporal income shifting channel in 2007. Based on a comprehensive sample of firms from the German manufacturing industry, we conduct a difference-in-differences approach based on the legal form of the firms. We compare depreciations of corporations, which faced a tax rate reduction in 2008, and partnerships, which did not experience a tax cut, between 2003 and 2008. We also analyze heterogeneity in incentives and opportunities for profit shifting across firms.

The detailed quantification of firm reactions to anticipated tax rate adjustments is interesting for business tax managers who appreciate information on their peers' tax planning strategies. Furthermore, intertemporal income shifting is one channel for corporate tax elasticity. The magnitude of firm reactions is an important determinant for the revenue consequences of tax rate adjustments. For tax policy decision makers, firm reactions are therefore indispensable in estimating short-term budgetary consequences of tax cuts. Especially for countries with strong book-tax conformity, tax planning strategies may influence financial accounting profits. Thus, knowing firm reactions to anticipated tax cuts can help interpret financial accounting data.

Early research analyzes intertemporal income shifting around anticipated tax rate changes and identifies shifting channels. Scholes, Wilson, and Wolfson (1992) exploit the corporate tax cut through the U.S. Tax Reform Act (TRA) 1986 and find that large firms pursue income shifting, and that they rather defer income than prepone

expenses. According to Boynton, Dobbins, and Plesko (1992), firms accumulated accrued expenses to avoid additional tax burden through the Alternative Minimum Tax in 1987, which was part of the TRA 1986. Sundvik (2016) provides evidence that private Swedish firms primarily use accounts receivable for intertemporal income shifting; for inventory and depreciation accrual vehicles he finds smaller effects.

A related stream of literature focuses on the tax incentives for intertemporal income shifting. Firms without net operating losses (NOL) are more likely to shift earnings to years after a tax cut than firms without taxable income (Manzon Jr., 1992). According to Lopez, Regier, and Lee (1998), more tax-aggressive firms (measured by a three-year generally accepted accounting principles (GAAP) effective tax rate) are rather prone to engage in intertemporal income shifting and also shift more. Tax-aggressive firms are assumed to make better use of tax shields in the tax code, and to be more affected by the tax change in their operations. Andries, Cools, and Van Uytbergen (2015) exploit the introduction of an allowance for corporate equity in Belgium in 2005 and find that firms with low positive earnings in 2006 deferred profits in 2005, and firms with high profits in 2006 and net operating loss carryforwards in 2005 accelerated profits.

However, financial reporting costs may mitigate the tax incentives. If management of taxable income is reflected by financial accounting, this may send a negative signal to stakeholders. Cloyd, Pratt, and Stock (1996) derive from survey data that firms are more willing to integrate the financial and tax accounting choice the higher the expected tax savings are, even if the modification reduces book income. The effect is smaller for public firms with higher capital market demands or agency costs (non-tax costs). According to Lin, Mills, and Zang (2014), private firms in China shifted more income than public firms around a corporate tax cut. That way, private firms saved about 8.58% of their total tax expenses. In a sample of European public and private firms, Burgstrahler, Hail, and Leuz (2006) associate stronger book-tax conformity with more earnings management. The effect is mitigated for public firms, consistent with public firms being less likely to sacrifice earnings informativeness for tax advantages. Similarly, firms with a higher leverage that depend more on lenders engage less in income shifting (Guenther, 1994). Calegari (2000) presents evidence that firms simultaneously increase discretionary accruals that are not tax related when shifting taxable income through discretionary accruals with high book-tax conformity to avoid violations of covenants. In a sample of private firms in Slovenia writing off assets in a tax-saving regime and a non-tax-saving regime, Kosi and Valentincic (2013) disentangle tax and non-tax incentives and costs. They observe that tax savings are drivers for the extent of write-offs, but that non-tax benefits and costs for reporting lower income are also important considerations. According

to Maydew (1997), firms increased NOL carrybacks to pre-TRA years not only by deferring operating income, but also by accelerating the recognition of nonrecurring losses. The latter induces lower financial reporting costs than shifting recurring items. Firms with high investment tax credits shifted less since higher carrybacks might reduce the possible investment tax credits.

Our study adds to prior research in several ways: First, our empirical results are based on a unique set of tax data of German public and private firms. Using this dataset allows us to draw more reliable consequences on corporate taxable income shifting than prior literature, which is solely based on financial accounting data, as we do not have to rely on assumptions on book-tax conformity. Participation in the underlying data collection is — apart from very small firms — obligatory for the targeted manufacturing industry. Therefore, the data do not suffer from non-response, sample selection, or disclosure bias. Moreover, analyzing both public and private firms integrates a very large and relevant group of German companies in our analysis. The major part of research on intertemporal income shifting as a reaction to (upcoming) tax rate changes focuses on public firms. However, Lin, Mills, and Zang (2014) and Sundvik (2016) point out that private firms are an important part of the economy with special accounting incentives. Second, we provide deeper insight into intertemporal profit shifting by identifying heterogeneity in shifting reactions to a tax cut across firms depending on their shifting opportunities. Whereas prior research has analyzed shifting channels, the literature has not succeeded in identifying shifting opportunities.

Our study uses data from the German manufacturing and mining industry. We find that corporations anticipating the corporate tax cut in 2008 increased depreciation expenses for tax purposes in 2007 on average by 2.87%. We cannot obtain a significant correlation between leverage and depreciation expenses that could provide further information on differences in shifting incentives due to non-tax costs associated with higher debt. Eventually, we show that opportunities to accumulate depreciation expenses differ depending on a firm's amount of depreciable buildings. Our results suggest that the depreciaton of buildings is rather inflexible, and that they allow less discretion to accumulate write-offs in 2007. Consequently, firms with a high share of buildings in their fixed assets seem to have less opportunities for intertemporal profit shifting.

The paper is organized as follows. We develop the hypotheses in Section 4.2, followed by the research design in Section 4.3. Section 4.4 presents an overview of the institutional background, and describes the dataset used for the analysis. The main findings and the robustness tests are discussed in Section 4.5. Section 4.6 concludes.

4.2 Hypotheses

4.2.1 Intertemporal Profit Shifting

Our study analyzes whether corporations accumulate depreciation expenses in the year before a corporate tax cut to shift taxable profits to post-reform years. The rationale is simple: We assume that a corporation tries to minimize its tax burden across years. If the corporation anticipates a change in the applicable tax rate for a certain year, it is favorable to subject taxable profits to the lower rate. This decreases the tax burden, and increases after-tax profits across years. Tax-induced intertemporal profit shifting requires flexibility in the assessment of accounting rules, as GAAP obviously do not allow to randomly shift profits across periods. Depreciation of fixed assets requires a firm's discretion in several ways: The assessment of the expected useful life, or any changes in yearly write-offs involve leeway that might be used for the purpose of tax minimization. We suggest that companies accumulate depreciation expenses in the year before the tax rate reduction because the advantage of deductible expenses is higher when profits are subject to a high tax rate. Consequently, we test the following hypothesis:

Hypothesis 1: Firms shift income from 2007 into the following years by accelerating depreciations in 2007.

4.2.2 Tax Incentives for Intertemporal Profit Shifting

The incentives to shift profits to the next period to take advantage of a lower corporate tax rate are heterogeneous across firms. On the one hand, we assume that it is only advantageous for a company to accumulate tax-deductible depreciation expenses in one year if this reduces taxable profits and avoids high tax payments due to the higher corporate tax rate. For corporations without positive taxable profits in the year prior to the tax rate cut, there is no incentive to reduce tax payments through higher depreciations (Manzon Jr., 1992, see). Unfortunately, due to data limitations, it is difficult for us to identify loss firms in the sample and replicate the findings. On the other hand, incentives for profit shifting may also be heterogeneous across firms with positive taxable profits, but differences in leverage. The amount of profits may act as a signal to creditors of companies with high third-party loans. Considering that reported net income and taxable income of German firms were closely related due to a strong book-tax conformity in 2007, shifting income away from 2007 into the future may have caused significant non-tax costs for companies with high loans

if such a strategy led to a violation of covenants. In this context, we proxy for loss firms according to their tax payments. We assume that firms with positive taxable profits will exhibit positive tax payments, whereas firms with zero or negative taxable profits will not. In line with Guenther (1994), we expect that leverage reduces the propensity to engage in intertemporal income shifting. Therefore, we also test the following hypothesis:

Hypothesis 2: Firms with high leverage shift less depreciation expenses to the year before the corporate tax cut than firms with less third-party loans.

4.2.3   Intertemporal Profit Shifting Opportunities

Eventually, not only incentives for profit shifting may be heterogeneous across firms. Also, firms have different opportunities to prepone depreciation expenses. Discretion in the assessment of depreciation schedules may vary, depending on the characteristics of fixed assets of a firm. On the one hand, we assume that depreciation for real estate (e.g., storage or office buildings) might allow less discretion. Put differently, it might be easier to change depreciation schedules, or accumulate write-offs, for machinery or low-value assets. Depreciation of real estate is based on strict rules. According to the German tax code as of 2007, buildings had an expected useful life between 33 and 50 years. Write-offs were only possible in case of a permanent decrease in value. However, buildings are usually rather stable in value and do not underlie major fluctuation. In contrast, the expected useful life of machinery can very well vary, depending on the business' expected performance, or the economic situation. We assume that a write-off might be easier to justify for these goods. Consequently, opportunities for intertemporal profit shifting might be higher for firms with a lower fraction of real estate in their fixed assets, but more machinery or low-value assets.

On the other hand, during our observation period, shifting opportunities might have been distributed oppositely. Due to the circumstances of the financial crisis, depreciation expenses for buildings may have granted better opportunities for profit shifting around the reform. The beginnings of the financial crisis affected particularly the value of buildings and property. With the subprime crisis starting in the U.S. in 2007 and spilling over to Europe later in the year, prices for real estate dropped significantly. Firms with a large fraction of real estate in fixed assets faced a decrease in value of their property. Therefore, price reductions had to be taken into account in the financial statement positions, reflecting changes in real estate values. If a firm considered the drop in real estate prices due to the financial crisis to persist over time,

the balance sheet position had to be lowered, resulting in higher depreciation expenses in the respective year. However, assuming that these firms filed their tax return for 2007 in the second half of 2008 or in 2009, judgment of future price developments was precarious. The firms' discretion was required to estimate the carrying amount and to evaluate whether the reduction in the value of buildings was permanent. There are basically two possible scenarios: First, the loss in value and therefore the justification and extent of the write-off is unambiguous; consequently, there is no leeway for the firm. This effect can be exclusively attributed to the financial crisis. Second, there is no straightforward expectation of the value development, and it is arguable if and by how much the buildings should be written off. In this case, there is leeway to either treat the loss in value as permanent, which results in a write-off, or not. If real estate is written off due to a permanent loss in value, there is usually additional leeway in determining the carrying amount. Tax incentives for profit shifting can then influence the discretionary decisions. That is, the effects of the financial crisis on prices for real estate could have provided a special opportunity for firms to increase depreciation expenses in 2007, therefore shifting taxable profits to years after the corporate tax cut in 2008. This opportunity is better for firms with a high fraction of real estate in their fixed assets. Summarizing, the share of real estate in fixed assets might work against, or in favor of intertemporal profit shifting opportunities. Hypothesis 3 is thus stated as follows:

Hypothesis 3: The opportunities for intertemporal profit shifting are heterogeneous across firms depending on their share of depreciable real estate in their fixed assets.

4.3   Estimation Strategy

Our estimation approach is based on a difference-in-differences strategy, comparing depreciation expenses of German corporations and German partnerships around the corporate tax cut in 2008. The tax cut of about 10 percentage points in 2008 was only effective for corporations. There were marginal changes in tax burdens for partnerships[2], and consequently no tax incentive to accumulate depreciations in the pre-cut year. Partnerships are thus an efficient control group to identify intertemporal profit shifting of corporations through a difference-in-differences approach. We estimate the following regression equation:

$$lnDepr_{i,t} = \alpha_0 + \beta_1 Corp \times d2007 + \beta_2 lnCapitalStock_{i,t-1} + \alpha_i + \alpha_t + \epsilon_{i,t} \quad (4.1)$$

The dependent variable is the amount of depreciations for tax purposes for firm i in year t. The independent variable of interest is the interaction term between $Corp$ and $d2007$, with the dummy variable $Corp$ for firms in the legal form of a corporation if $Corp$ equals 1, and partnerships otherwise. The dummy variable $d2007$ indicates the year of interest before the tax cut ($d2007 = 1$ if $t = 2007$). Using the interaction term, we measure the difference in depreciation expenses between corporations and partnerships in 2007 compared to the difference in other years. According to our first hypothesis, we expect that depreciation expenses of corporations increase in 2007 compared to the other years, as firms prepone expenses by exercising discretion in their depreciation schedules. More precisely, corporations accumulate depreciation expenses and write-offs in 2007, while partnerships show no (or less) tax-induced change in depreciations. Thus, the difference in depreciation expenses between corporations and partnerships should be higher in 2007 than in other years. We therefore expect a significantly positive estimated coefficient β_1.

We control for the size of the capital stock of a company at the beginning of the year, acknowledging that companies with higher depreciable fixed assets have higher depreciation expenses. We include year fixed effects that account for general yearly effects, like the business cycle, that are identical for all companies. The set of year fixed effects also includes the base effect for $d2007$. Firm fixed effects account for time-invariant firm-specific characteristics. Firm fixed effects also capture the influence of the legal form of the company, which does not change during the observation period, thus the variable $Corp$ cannot be included in the regression separately. Industry-specific effects are also absorbed by firm fixed effects.

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[2]   See Section 4.4.1 for a detailed description of legal changes as effected by the 2008 tax reform.

4.4 Institutional Background and Data

4.4.1 2008 Business Tax Reform in Germany

We identify intertemporal profit shifting of corporations by analyzing depreciations for tax purposes before and after the Business Tax Reform in 2008, when corporate taxes in Germany were cut from about 39% to about 29%. Taxes for corporations in Germany consist of the corporation tax itself (26.375% before and 15.825% after the tax reform, including solidarity surcharge), and a trade tax that varies depending on the municipality the corporation is located in (about 19% before and about 14% after the tax reform). The trade tax burden was deductible from the corporate tax base before the reform, and non-deductible after the reform. Consequently, the effective decrease in the combined tax burden amounts to about 10 percentage points. Some of the changes in 2008 affected both, corporations and partnerships, or only partnerships. The trade tax applies to partnerships as well; consequently, partnerships also experienced the reduction in the trade tax rate and the abolition of its deductibility from the income tax base. Instead, partners were granted an increased tax credit. The trade tax burden is deductible from the income tax burden to a certain limit; depending on the local trade tax multiplier, this tax credit can fully compensate for the trade tax burden of partnerships. The personal income tax rate, the main tax burden for individual partners, was not subject to changes. Because the trade tax burden has been deductible from the income tax burden, the sum of income tax and trade tax in partnerships did not change significantly after the reform in most cases. Therefore, compared to corporations, partnerships underwent only minor changes through the reform, whereas corporations faced a high change in tax burden. However, this is based on the assumption that partnerships have only individual partners. Since partnerships are pass-through entities for income taxation, the legal form of the partner is decisive for taxation. For incorporated partners, there would also be an incentive for intertemporal profit shifting. A potential misclassification by assigning those partnerships to our control group would yet counter finding the expected results through our approach. We are thus still confident that partnerships are an efficient control group and that the difference-in-differences setting captures the effects caused by the different incentives for intertemporal profit shifting.

One of the reform's main goals was to reduce the incentives of multinational companies to shift profits abroad. Along with the tax cut, the reform introduced stricter transfer pricing rules broadening the corporate tax base. These rules should not have any immediate effects on firms' depreciation expenses. Moreover, since the transfer pricing rules were directed to all firms independent of their legal form, our difference-in-differences approach should not be biased in case of any influence.

4.4.2 Financial Crisis

The first influences of the crisis spilled over from the U.S. subprime crisis in late 2007. Real estate prices dropped. The peak of the financial crisis took place in 2009; however, our observation period ends in 2008. The crisis effects are extraordinary, and therefore challenging to deal with in empirical studies, as their potential influence on the variable of interest is hard to separate and to identify. In contrast, our setting uses the special circumstances of the financial crisis to shed light on the role of opportunities for intertemporal profit shifting of corporations around a tax cut. We assume that the drop in real estate prices could have provided better opportunities for firms with high amounts of real estate to vary the extent of depreciation expenses, when they reflect the decrease in value in the financial statement position. One advantage of our difference-in-difference-in-differences approach, which we use for this specification, is that it separates pure crisis effects, that is, write-offs without leeway, from write-offs for shifting purposes: First, both corporations and partnerships are hit by the financial crisis comparably. Therefore, the difference-in-difference-in-differences approach absorbs write-offs resulting from the crisis, and identifies only the change in the difference between corporations and partnerships in 2007 as profit shifting effect. Second, a crisis effect should be persistent over time, and we should identify it also for 2008.

Due to the cyclical effects of the financial crisis, German firms were granted the possibility of bonus depreciations in the years 2009 and 2010. Since our observation period ends in 2008, these bonus depreciations should not bias our results.

4.4.3 Data

We use firm-level panel data of German firms between 2003 and 2008 to analyze intertemporal profit shifting through depreciations. The data stem from the AFiD panel (*Amtliche Firmendaten in Deutschland*) for the manufacturing and mining industries[3] that can be accessed via remote data processing (see Malchin and Voshage,

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[3] Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, AFiD panel for the manufacturing and mining industries, 1995-2008; original titles: *AFiD-Panel Industrieunternehmen*, consisting of the *Jahresbericht für Unternehmen im Verarbeitenden Gewerbe, Bergbau und Gewinnung von Steinen und Erden* (yearly report), the *Unternehmensdatensätze der Investitionserhebung im Verarbeitenden Gewerbe, Bergbau und Gewinnung von Steinen und Erden* (investment survey on the firm level), and the *Kostenstrukturerhebung im Bereich Verarbeitendes Gewerbe, Bergbau und Gewinnung von Steinen und Erden* (cost structure survey), all available between 1995 and 2008, and *AFiD-Panel Industriebetriebe*, consisting of the *Jahresergebnisse des Monatsberichtes für Betriebe im Verarbeitenden Gewerbe, Bergbau und Gewinnung von Steinen und Erden* (monthly report), and the *Betriebsdatensätze der Investitionserhebung im Verarbeitenden Gewerbe, Bergbau und Gewinnung von Steinen und Erden* (investment survey on the permanent establishment level),

2009). The German Federal Statistical Office collects the data through mandatory surveys; therefore, the dataset covers all German companies in the respective industry.

The manufacturing and mining industries play a significant role in the German economy. They contribute about one quarter of the gross value added (see Destatis, 2015) and generated about 35% of the overall taxable sales in Germany in 2008. Compared to other industries (e.g., financial industries or information technologies), capital is an important factor in the manufacturing and mining industries. Firms in this industry with homogeneous capital intensity thus provide an optimal source for analyzing depreciations. The surveys contain company information on the level of permanent establishments; however, we only use the aggregated values on the company level. Data is generally available from 1995 until 2008, but we restrict the observation period to years after 2002 in order to avoid any biases due to the tax reform in 2001 (the tax reform previous to our reform of interest in 2008).

One feature of the dataset is that it contains information on depreciation and write-off expenses for tax purposes. Other databases like Compustat or *Orbis* usually comprise public accounting data, but lack tax information due to tax privacy settings. Using AFiD provides us with the scarce opportunity to base our analysis on actual tax accounting data.

Since access to AFiD data is very restricted, we believe that the data suffer less from companies trying to cover up their financial situation than it might be the case in publicly available databases. The data can only be used for scientific or governmental purposes, and only via remote data processing, and any insight in non-anonymized or non-aggregated data is strictly prohibited. Also, participation in the surveys is mandatory for all companies with more than 20 employees; therefore, non-response or sample selection do not bias our results.

The depreciation expenses for tax purposes can be directly extracted from the AFiD panel. As the depreciations are, according to our expectations, strongly skewed, we use the natural logarithm of depreciations for tax purposes as the dependent variable. The average taxable depreciation and write-off expenses for corporations and partnerships amount to €2.6m between 2003 and 2008. For corporations only, the average is €3.1m, compared to €1.67m for partnerships. The values for the arithmetic average and the median confirm a strongly left-skewed distribution of depreciations. We control for the amount of depreciable fixed assets by including the natural logarithm of the capital stock in the regression. The AFiD data does not include a variable for the capital stock, thus we approximate the variable through aggregated investments and depreciations. We compute the initial value at the

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also available between 1995 and 2008. We hereafter refer to these surveys as *AFid panel for the manufacturing and mining industries.*

beginning of our observation period by grossing up the depreciation expenses of real estate and other depreciable assets, assuming that the depreciation period for other depreciable assets amounts to seven years (see Devereux et al., 2009), and to 35.66 years for buildings.[4] As we intend to calculate the capital stock at the beginning of the (first) year, we subtract half of the period's net investments, assuming that investments are evenly distributed over the entire year and are depreciated on a pro-rata-temporis basis. Then, for every following year of the observation period, we compute the capital stock as last year's capital stock, reduced by depreciations and disinvestments, and increased by new investments in buildings and equipment. We observe a capital stock of €25.89m on average for corporations and partnerships between 2003 and 2008. The average capital stock for corporations is €30.47m, compared to €17.64m for partnerships. Again, comparing arithmetic average and median suggests a left-skewed distribution. Therefore, we use the natural logarithm of the capital stock as a control variable.

Table 4.1 also reports the average total tax rates *ttr* for corporations and partnerships in 2007 and 2008. This variable consists of the corporation tax, the trade tax and the solidarity surcharge for corporations. For partnerships, *ttr* contains the trade tax, the partners' personal income tax and the solidarity surcharge.[5] Due to data limitation, we assume that partnerships have only individual, not incorporated partners. While the average total tax rate for partnerships slightly increases from 45% in 2007 to 47% in 2008 due to changes in the local business tax rate, the average total tax rate for corporations decreases from 38% in 2007 to 29% in 2008. Consequently, the tax rate difference between 2007 and 2008 amounts to about 9 percentage points, providing an incentive for corporations to shift depreciations to the high-tax year 2007.

Our panel consists of 86,752 firm-year observations, with 55,914 observations from corporations and 30,838 observations from partnerships. Therefore, approximately two thirds of firms are incorporated. While this ratio is quite constant over the period 2003 to 2007, we observe a slightly higher number of corporations in 2008.

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[4]   The tax depreciation period increased from 29 years (average for old and new buildings) to 33 to 50 years in 2001. We assume that the average depreciation period D per firm in a year follows a declining adaptation process over 25 years: $D_{2000+x} = D_{2000} + \Delta \cdot \sqrt{\frac{x}{25}}$, with x being the number of years after 2000 and Δ the increase in the average depreciation period. This results in an average depreciation period of 35.66 years in 2008 (see Eichfelder and Schneider, 2014).

[5]   For the computation of the trade tax, we use local trade tax multipliers as published in annual reports by the Statistische Ämter des Bundes und der Länder (*Hebesätze der Realsteuern*) for the years 2003 until 2008.

Table 4.1: Descriptive Statistics

This table reports variable definitions and summary statistics. It shows the average values of the variables from 2003 to 2008. Source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, AFiD panel for the manufacturing and mining industries, 2003-2008, own calculations. Tax rates are presented as yearly values for 2007 and 2008. Source: Statistische Ämter des Bundes und der Länder (*Hebesätze der Realsteuern*) (2003-2008). Due to the fact that we use confidential data, we are not allowed to report minimum or maximum values. Therefore, we report the first and the 9th decile as approximated values for minimum and maximum.

Variable	Description	Mean	Std Dev.	Median	p10	p90
Depr	Amount of taxable depreciation (mean 2003-2008) in thousand €	2,595	32,767	290	24	3,558
	Amount of taxable depreciation (mean 2003-2008, corporations) in thousand €	3,104	40,256	277	21	3,786
	Amount of taxable depreciation (mean 2003-2008, partnerships) in thousand €	1,666	8,579	313	32	3,198
CapitalStock	Size of capital stock (mean 2003-2008) in thousand €	25,887	220,089	3,989	452	39,081
	Size of capital stock (mean 2003-2008, corporations) in thousand €	30,446	268,829	3,781	402	41,661
	Size of capital stock (mean 2003-2008, partnerships) in thousand €	17,644	72,400	4,358	566	35,534
ttr	total tax rate 2007 (corporations)	0.3795	0.0128			
	total tax rate 2008 (corporations)	0.2889	0.0172			
	total tax rate 2007 (partnerships)	0.4509	0.0112			
	total tax rate 2008 (partnerships)	0.4742	0.0091			

4.5   Results

4.5.1   Intertemporal Income Shifting

We use a difference-in-differences approach to test our first hypothesis. Results are presented in Table 4.2. In the baseline regression, we regress depreciations on the interaction of *Corp* and the dummy variable for the year 2007. The capital stock is used as a control variable. Column (2) additionally includes the interaction of *Corp* and the dummy variable for the year 2008, and Column (3) uses the business tax rate as a second control variable. All regressions include firm fixed effects and year fixed effects. Standard errors are clustered at the company level.

The estimated coefficient of the interaction variable between *Corp* and the year dummy for 2007 is positive and significant ($p < 0.01$) in all specifications. There is a significant peak in depreciation expenses of corporations in the year 2007 compared to partnerships. The size of the estimated coefficient ranges between 2.67% in Column (3) with both control variables and 2.83% for the baseline regression, referring to the natural logarithm of depreciations. That is, absolute depreciation expenses of corporations in 2007, compared to partnerships, increase by about 2.87% relative to other observation years due to the expected corporate tax cut.[6] Corporations prepone depreciation expenses and shift taxable profits to years after the tax cut to increase after-tax profits across years. Therefore, our results support Hypothesis 1.

Contrarily, the estimated coefficients of the interaction term between *Corp* and the year dummy for 2008 are not significant in Columns (2) and (3). This is in line with our hypothesis: In 2008, there is no incentive to accumulate depreciation expenses anymore due to the lower tax rate compared to 2007. Increased depreciations in 2007 even out over the whole depreciation period; therefore, depreciation expenses in 2008 are not significantly lower either. The estimated coefficients of *CapitalStock* are positive and significant ($p < 0.01$) in all specifications. Depreciations are higher for companies with higher amounts of fixed assets.

Eventually, we do not find a significant influence of small differences in business taxes between corporations. Companies facing higher taxes due to their location's higher trade tax multiplier do not have significantly higher depreciation expenses. These marginal differences in tax incentives do not measurably impact yearly depreciation expenses.

We can put the size of our effect into perspective using the federal income tax statistics for corporations in 2010. The overall taxable income for corporations

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[6]   In semilogarithmic regressions, the coefficient estimate of the interaction term cannot be directly interpreted as a percentage effect. We compute the effect as $exp(2.83\%) - exp(0) = 2.87\%$. Kennedy (1981) suggests to additionally account for the variance of the estimate for a less biased interpretation. For our effect size, the adjustments yield only marginal differences.

**Table 4.2: Shifting of Depreciation Expenses around the
2008 Corporate Tax Cut**

This table reports regression results on intertemporal profit shifting of corporations around the 2008 tax cut. The dependent variable is the natural logarithm of depreciation expenses. We control for the natural logarithm of the capital stock in all specifications, and for the tax rate in Column (3). All regressions include firm and year fixed effects. Standard errors are clustered at the company level. ***, **, and * refer to significant results on the 1%, 5%, and 10% level.

	(1)	(2)	(3)
Corp×d2007	0.0277***	0.0283***	0.0267***
	(0.009)	(0.010)	(0.009)
Corp×d2008		0.0070	-0.0070
		(0.014)	(0.024)
CapitalStock$_{t-1}$	0.3199***	0.3199***	0.3279***
	(0.016)	(0.016)	(0.016)
ttr$_t$			-0.1041
			(0.185)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	86,752	86,752	85,114
R-squared	0.059	0.059	0.061

in 2010 amounts to €169.7bn. The statistics published by the German Federal Reserve report a depreciation-to-revenues ratio of 2.9%, a net profit-to-revenues ratio of 3.0%, and an income taxes-to-revenues ratio of 0.9% (adding up to a taxable income-to-sales ratio of 3.9%). According to these values, our estimated value of 2.87% would translate into an amount of shifted income of approximately €3.6bn ($= 2.87\% \cdot \frac{€169.7bn}{3.9\%} \cdot 2.9\%$). Consequently, the corporate income tax revenue around the tax cut could be reduced by up to 0.92% if income is shifted to a period with a lower tax rate by 10 percentage points ($= \frac{€3.6bn \cdot 10\%}{\frac{€169.7bn}{3.9\%} \cdot 0.9\%}$).

4.5.2 Differences in Incentives across Firms

The incentive to shift profits to the following year does not only depend on the nominal tax rate, but also on firm characteristics. Due to data limitations, we cannot replicate the results of Manzon Jr. (1992), suggesting that loss firms do not engage in management of taxable earnings, since they do not have incentives to further lower their taxable earnings. However, incentives may also be heterogeneous across firms with positive taxable profits in 2007, but with differences in leverage. Companies which rely heavily on third-party loans may send a negative signal to creditors by reducing taxable profits in 2007, or violate covenants. Since Germany had a strong book-tax conformity in 2007 with book and tax depreciations being mostly identical, firms had to choose a congruent strategy in both book and tax accounting.

Table 4.3: Differences in Shifting Incentives and Opportunities

This table reports regression results on differences in incentives and opportunities for intertemporal profit shifting of corporations. All regressions include firm and year fixed effects. Standard errors are clustered at the company level. ***, **, and * refer to significant results on the 1%, 5%, and 10% level.

	(1)	(2)
HighDebt×Corp×d2007	-0.0269	
	(0.020)	
HighDebt×d2007	-0.0008	
	(0.015)	
HighDebt×Corp	0.1085***	
	(0.011)	
HighRealEstate×Corp×d2007		-0.0531***
		(0.018)
HighRealEstate×d2007		0.0347**
		(0.014)
HighRealEstate×Corp		0.1021***
		(0.011)
Corp×d2007	0.0313***	0.0365***
	(0.011)	(0.011)
CapitalStock$_{t-1}$	0.3155***	0.3626***
	(0.016)	(0.017)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	85,450	83,144
R-squared	0.063	0.070

Thus, non-tax costs of intertemporal profit shifting may be higher for high-leverage firms than for firms with lower loans. As we cannot directly observe leverage, we identify firms with high interest payments in the upper quartile of observations as the debt intensive firms. Interest payments are scaled by sales. The dummy variable *HighDebt* equals 1 for corporations that qualify for high-debt firms according to our definition. In 2007, 3,321 of 14,359 firms (23%) are in the high-debt group. This group consists of 1,921 (58%) corporations and 1,400 (42%) partnerships. Since our dataset does not contain a variable to directly derive loss firms, we alternatively identify firms with negative profits if a firm does not have tax expenses for the year 2007. This covers actual losses in 2007 as well as loss carryforwards used in 2007.

Using a difference-in-difference-in-differences approach, we compare depreciation expenses of high-debt corporations (first difference) and those of lower-debt corporations (second difference) to depreciation expenses of partnerships (third difference). That means, we analyze if the peak in depreciation expenses in 2007 is lower for corporations that depend more on creditors than for corporations with low debt. Thus, we use our baseline regression from Table 4.2, Column (1), but add the interaction

term between *HighDebt*, *d*2007, and *Corp*, as well as all double interaction terms. The results are presented in Column (2) of Table 4.3.

The estimated coefficient for the triple interaction term is negative, but not significant ($p < 0.18$). The coefficient estimate for the interaction between *Corp* and the year dummy for 2007 amounts to 0.0313, which is a slightly higher effect than in the baseline specification, and significant ($p < 0.01$). The sign and the size of the estimates are in line with the rationale that the profit shifting effect is mainly driven by firms with a lower debt intensity. However, our estimate for the triple interaction coefficient is not significant, and therefore cannot support findings of Guenther (1994), and Hypothesis 2. Considering that the majority of firms in our sample is private, the information content of their financial statements might be less important for creditors (e.g., Ball and Shivakumar, 2005). Instead, private companies can communicate information on a more private level to creditors.

4.5.3 Differences in Opportunities across Firms

Although a cut in corporate taxes provides a suitable setting for firms to incentivize tax-induced shifting strategies, legal intertemporal profit shifting requires opportunities to exercise leeway in tax accounting, that is, in depreciation expenses and schedules. We assume that opportunities for intertemporal profit shifting are heterogeneous across firms depending on their share of depreciable buildings. Depreciation schedules for real estate are subject to strict rules according to the German tax law. Since buildings are usually not subject to cyclical fluctuations, write-offs might be harder to justify. Contrarily, changing depreciation schedules for machinery or low-value assets might be easier, since they are subject to competitive and cyclical variation. This points toward better opportunities for taxable earnings management for firms with a lower share of depreciable buildings in their fixed assets. During the extraordinary circumstances of the financial crisis, this rationale might have reversed. Influenced by the subprime crisis in the U.S. in 2007, real estate prices in Germany dropped later that year. Consequently, financial statement positions for buildings (e.g., residential buildings, office space, industrial buildings, retail property) had to be reevaluated for permanent decreases in values. However, discretion might have unfolded in the definition of a permanent price change, and offered an opportunity to follow a tax-minimization strategy by preponing depreciation expenses. If this is the case, our difference-in-difference-in-differences approach would separate pure crisis effects, which affect corporations and partnerships equivalently, from write-offs resulting from exercising discretion. A high percentage of real estate in firms' capital stock would then lead to higher opportunities for intertemporal profit shifting through depreciation expenses. We compute the real estate capital stock

according to the computation of the capital stock as described in Section 4.4.3, but only take the share of depreciation expenses for buildings, according to the share of buildings in investments, the amount of new investments in buildings, and the share of disinvestments in buildings into account. We generate the dummy variable $HighRealEstate$ that equals 1 for companies whose share of the real estate capital stock in the whole capital stock is in the upper quartile. We identify 3,515 of 13,141 (27%) firms with high real estate in 2007 (2,255 corporations and 1,260 partnerships).

A difference-in-difference-in-differences approach analyzes whether corporations with a high share of depreciable buildings shift more or less depreciation expenses to 2007 than corporations with less buildings, and may thus reveal heterogeneity in shifting opportunities. The interaction term between $HighRealEstate$, $Corp$, and the year dummy for 2007 captures the difference in depreciation expenses between real estate intensive corporations and corporations with less real estate in 2007. Results are displayed in Table 4.3, Column (2).

The estimated coefficient of the triple interaction term is negative and significant ($p < 0.01$). Corporations with a high share of depreciable real estate in their fixed assets increase their depreciation expenses and write-offs less than corporations with less real estate. Consequently, they shift significantly less profits to the post-reform period. This result suggests that exercising discretion in writing off buildings is harder than for other goods, for example, machinery. The coefficient estimate for the original interaction term between $Corp$ and the year dummy for 2007 is significantly positive ($p < 0.05$) and slightly larger than our baseline results in Table 4.2. We obtain a positive and significant estimate for the interaction term $HighRealEstate \times d2007$. This term might pick up a general crisis effect. Firms with a high share of real estate — both corporations and partnerships — increase depreciation expenses in 2007. According to our results, despite higher depreciation expenses of real estate intensive firms, which we attribute to the financial crisis, it seems to be harder to exercise discretion in real estate depreciation schedules and write-offs. Regarding Hypothesis 3, our analysis suggests that opportunities for intertemporal profit shifting are heterogeneous across firms, and that corporations with less real estate are more flexible to engage in intertemporal profit shifting. However, we also disclose that the financial crisis might have had very unpredictable effects on real estate, and these results might benefit from a replication based on an observation period with a more stable economy.

Table 4.4: Robustness Tests: Limitation of Observation Period, Pseudo-Tax Cut Analysis

This table reports regression results for robustness tests. All regressions include firm and year fixed effects. Standard errors are clustered at the company level. ***, **, and * refer to significant results on the 1%, 5%, and 10% level.

	(1)	(2)	(3)	(4)	(5)	(6)
Corp×d2003		-0.0105				
		(0.009)				
Corp×d2004			-0.0041			
			(0.007)			
Corp×d2005				-0.0074		
				(0.007)		
Corp×d2006					0.0065	
					(0.006)	
Corp×d2007	0.0286***					
	(0.010)					
Corp×d2008						0.0008
						(0.014)
CapitalStock$_{t-1}$	0.3060***	0.3203***	0.3204***	0.3204***	0.3204***	0.3204***
	(0.018)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	70,872	86,752	86,752	86,752	86,752	86,752
R-squared	0.056	0.059	0.059	0.059	0.059	0.059

4.5.4 Robustness to Financial Crisis: Limitation of Observation Period

The observation period between 2003 and 2008 covers mostly years prior to the financial crisis. However, we might capture the beginning of the crisis in Germany in 2008. Although the difference-in-differences approach eliminates influences of the business cycle, we additionally account for crisis effects that may have different effects on the treatment and control group by limiting the observation period to 2003 until 2007. Results are displayed in Table 4.4, Column (1).

The estimated coefficient of the variable of interest, the interaction term between the dummy *Corp* and the year dummy for 2007, is still significantly positive and the size of the effect (0.0286, $p < 0.01$) is very similar to our baseline results. We are therefore confident that the financial crisis does not bias our baseline results.

4.5.5 Pseudo-Tax Cut Analysis

According to our hypotheses, 2007 is the only year in the observation period that provides a tax incentive to accumulate depreciation expenses and therefore shift profits to periods with a reduced corporate tax rate. However, we conduct a robustness test establishing pseudo-tax cuts to confirm that our approach does not ignore other

effects that may cause a similar accumulation of depreciation expenses in other years. We thus rerun our baseline specification from Table 4.2, Column (1), for every interaction term of *Corp* and each year from 2003 until 2008 (except 2007) to analyze if there is a significant difference in depreciation expenses between corporations and partnerships compared to the rest of the observation period in any year. Table 4.4, Columns (2) to (6), displays the result.

The estimated coefficients of the interaction terms imitating tax cuts in every year of the observation period are not significant in any specification. That is, depreciation expenses of corporations only increase in 2007, but in no other year. We are thus confident that the effect on depreciations is caused by the tax incentive for intertemporal profit shifting resulting from the corporate tax rate reduction in 2008, since other effects that influence expenses would also occur in other observation years.

4.6   Conclusion

Our analysis shows that corporations shift taxable profits to years after a corporate tax cut. The tax rate reduction provides the incentive to accumulate depreciation expenses in the pre-reform high-tax year. We use a difference-in-differences approach to analyze depreciation expenses around a 10 percentage point tax cut in Germany that only applies to corporations, but not to partnerships. Based on actual tax accounting data for the German manufacturing and mining industry, we find that corporations increased depreciation expenses in 2007 by about 2.87%, which would translate into lower corporate tax revenues by approximately 0.9%. The result is robust to a battery of tests.

We analyze whether incentives for profit shifting are heterogeneous across corporations. We do not obtain significant results that non-tax costs mitigate the shifting incentive for highly levered corporations. We attribute this to the composition of our dataset: Our analysis is mainly based on financial data of private firms, which rather communicate information on a more private basis to creditors than through their financial statements.

Furthermore, our results suggest that opportunities to exert discretion in depreciations and write-offs effectively limit intertemporal profit shifting. Depreciable real estate allows less leeway in determining the depreciation schedule or write-offs. Consequently, firms with a high share of real estate in their fixed assets engage less in intertemporal profit shifting. We acknowledge that the financial crisis, which coincided with our observation period, might have had extraordinary effects, especially on real estate, and therefore encourage further research on this based on an economically more stable observation period.

Overall, our results provide evidence that firms react to a tax incentive for intertemporal profit shifting by adjusting their depreciations and write-offs. However, firm reactions are effectively limited by shifting opportunities.

Chapter 5

Does International Profit Shifting Substitute Intertemporal Profit Shifting?

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Abstract: The study analyzes substitution effects between international profit shifting and intertemporal profit shifting. I therefore compare the engagement in intertemporal profit shifting of multinational firms with more opportunities for international profit shifting to purely domestic firms. I exploit the German corporate tax rate cut in 2008 in both a cross-sectional and difference-in-differences approach using financial data of German corporations with and without foreign affiliates. I estimate discretionary accrued expenses using a Modified Jones Model as a measure for intertemporal profit shifting, and find that multinational firms accumulate less expenses in the year before the tax cut than domestic firms. This result points toward the rationale that a tax rate reduction provides a lower incentive for intertemporal profit shifting for multinational firms, because they reduce their effective tax rate through cross-border profit shifting and therefore perceive the tax rate cut as smaller than domestic firms do. Consequently, the results indicate that international profit shifting is a substitute for intertemporal profit shifting.

Keywords: Substitution Effects, International Profit Shifting, Intertemporal Profit Shifting

JEL Classification: F23, H25, H26

5.1   Introduction

Three important research steps among many aspects on profit shifting in multinational firms are (1) that multinationals shift profits to low-tax countries (e.g., Grubert and Mutti, 1991; Hines and Rice, 1994), (2) through which channels they shift profits to low-tax countries (differentiating between transfer pricing (e.g., Swenson, 2001; Huizinga and Laeven, 2008; Maffini and Mokkas, 2011) and financing strategies (e.g., Desai, Foley, and Hines, 2004; Hebous and Weichenrieder, 2010; Buettner et al., 2011)) and (3) if policymakers' provisions to close one of these channels are successful (e.g., Buettner et al., 2012; Riedel, Zinn, and Hofmann, 2015).

These three steps reflect profit shifting research becoming more advanced and precise over time, from a rough idea of international profit shifting to a detailed analysis of transfer pricing, debt shifting, or location of intellectual property, on the one hand. On the other hand, these three steps reflect the development of profit shifting research according to the changes in the institutional environment: With globalization proceeding and more internationally active enterprises, international sheltering of taxable income has become a threat for policymakers in high-tax countries who reacted by implementing provisions to prevent it. While multinational firms have a specific advantage to engage in international profit shifting compared to firms without foreign affiliates, they can both engage in intertemporal profit shifting, taking advantage of a favorable tax environment in another period. However, although we have detailed knowledge on many aspects of multinationals' profit shifting strategies, including the different channels of profit shifting, empirical evidence on interdependencies is comparably rare. My study adds to this research by analyzing substitution effects between international profit shifting and intertemporal profit shifting.

Having implemented a cross-border shifting strategy may influence a corporation's decision to shift income across periods. I argue that firms that successfully reduce their effective tax rate through sheltering taxable profits in low-tax countries (e.g., Rego, 2003; Dyreng and Lindsey, 2009) may have smaller incentives to pursue profit shifting across periods. On the other hand, if the corporation's marginal tax rate on the next unit of non-shifted taxable income is not affected (e.g., Weichenrieder, 2009; Dharmapala and Riedel, 2013), the incentive for intertemporal shifting may be stable. Besides that, the opportunities for timing taxable profits may be a critical factor for the decision (Dobbins et al., 2016). If international and intertemporal profit shifting are substitutes to some extent, corporations that engage in cross-border profit shifting should consequently engage less in intertemporal profit shifting. The effect should not work vice versa. While international profit shifting is a long-term

strategy, intertemporal profit shifting is a punctual opportunity to exploit a change in tax laws. This arises only in special settings, for example, a tax rate change. Moreover, Dobbins (2016b) finds no evidence that a reduced corporate tax rate leads to an immediate change in international profit shifting strategies of multinational firms.

Early research on intertemporal profit shifting analyzes the timing of earnings and expenses around the 1986 Tax Reform Act in the U.S. which reduced the corporate tax rate (e.g., Scholes, Wilson, and Wolfson, 1992; Guenther, 1994; Lopez, Regier, and Lee, 1998). Dobbins et al. (2016) find an accumulation of depreciation expenses for tax purposes in the year before the corporate tax cut through the 2008 Business Tax Reform in Germany, but identify heterogeneity across firms according to shifting opportunities. Based on a sample of Chinese firms, Lin, Mills, and Zang (2014) show stronger reactions for private firms than for public firms. Sundvik (2016) points out that accounts receivable are primarily used for earnings management based on a dataset of private firms in Sweden. Other papers base their identification strategy on events other than a tax cut, for example, a change in the deductibility of write-offs (Kosi and Valentincic, 2013), or the introduction of an allowance for corporate equity (Andries, Cools, and Van Uytbergen, 2015). However, none of these papers consider the role of international profit shifting.

International income shifting has been perceived a threat by high-tax countries not only since profit shifting within multinationals has reached public discussion, for example through the OECD's Base Erosion and Profit Shifting (BEPS) project. Several studies on multinationals' reactions reflect policymakers' effort to close profit shifting channels. Introducing a thin-capitalization rule to limit the deduction of interest expenses influences firms' capital structure and reduces profit shifting through the channel of internal financing (e.g., Weichenrieder and Windischbauer, 2008; Buslei and Simmler, 2012; Buettner et al., 2012; Blouin et al., 2014; Alberternst and Sureth, 2015). Similarly, Beer and Loeprick (2015) and Riedel, Zinn, and Hofmann (2015) find significant evidence that transfer pricing rules efficiently confine the channel of transfer pricing.

These studies, however, do not answer the subsequent question about what happens after one profit shifting channel is closed. Is it a permanent restriction of shifting strategies or do firms choose alternative channels?

Prior research tackles some aspects of this question. A set of studies analyzes whether transfer pricing or debt shifting is the prevalent shifting channel, but evidence is mixed. While Heckemeyer and Overesch (2013) find that transfer pricing is more widely used, Dharmapala and Riedel (2013) attribute their result mainly to financing strategies. Grubert (2003), in contrast, finds both strategies equally important. An

unbalanced relation between the shifting channels may be an indicator that the tax incentive alone, that is, a lower tax rate abroad, is not the only driver for international profit shifting. Opportunities may play a crucial role, for example, a high share in intangible assets that allow more leeway in assessing transfer prices (e.g., Harris, 1993; Harris et al., 1993; Grubert, 2003; Dischinger and Riedel, 2011). Related to this, Dharmapala and Riedel (2013) find a correlation between earnings shocks and the amount of profit shifted to tax havens. Thus, shifting strategies may not be interchangeable in channels, but corporations may rather engage in the strategy that their structure provides the optimal opportunities for. If this channel is closed by new regulations, a change in shifting channels may not be easily achievable.

Schindler and Schjelderup (2013) analyze mutual influences of debt shifting and transfer pricing using a model-based approach. To my best knowledge, Saunders-Scott (2015) conducted the only empirical study that explicitly addresses substitution effects between profit shifting channels. Based on firm-level panel data between 2003 and 2012, she analyzes whether higher costs for debt shifting through regulations that limit interest deductions in 38 countries influence profit shifting through transfer pricing. According to her results, such a provision coincides with reduced earnings before interest and taxes (EBIT) by 3.8%. She concludes that this results from shifting profits through transfer pricing instead of debt shifting, and that therefore, debt shifting and transfer pricing are substitutes.

The approach that Saunders-Scott (2015) pursues to identify a substitution effect seems very straight-forward: Does profit shifting switch over to another channel, if one channel is closed? I choose a somewhat opposite approach and analyze firm reactions to a new additional profit shifting channel. Moreover, my approach is wider as it is not limited to international profit shifting. My study focuses on substitution effects between international and intertemporal profit shifting of corporations. More precisely, do corporations which already engage in international profit shifting choose to additionally engage in intertemporal profit shifting if the opportunity unfolds? Or do they refrain from additional engagements, due to their involvement in international shifting?

Understanding potential interdependencies between profit shifting strategies adds a new level to existing research. It allows a comprehensive assessment of shifting activities and helps make results on both international and intertemporal profit shifting more comparable. More important, potential substitution effects are critical to correctly evaluate tax reforms. Provisions to prevent multinationals from shifting profits abroad are only successful if blocking one shifting channel does not alternatively increase profit outflow through another channel. An aggregate evaluation of all connected aspects is therefore important for both policymakers and

researchers when assessing the effects of certain provisions on corporations' strategies. Moreover, it helps understand financial accounting data and complex tax planning strategies.

The corporate tax reform in Germany in 2008, which reduced the tax burden for corporations by about 10 percentage points, provides a suitable setting to analyze potential substitution effects of international and intertemporal profit shifting. The anticipation of a lower tax rate incentivizes strategies to decrease taxable profits in the pre-reform year and postpone to future low-tax periods, when taxes on the same profit are lower. The tax rate cut was communicated to the public in July of 2007, providing plenty of time for tax managers to elaborate a strategy for earnings management.

My study is conducted in two steps. First, I identify companies that engage in intertemporal profit shifting. Following prior studies (e.g., Dobbins et al., 2016; Sundvik, 2016), I assume that firms accumulate negative accruals in the year previous to the tax cut to reduce the corporate tax base and shift taxable profits to future periods. I estimate the level of abnormal accruals using the Modified Jones model, and define companies with high discretionary accrued expenses as intertemporal profit shifters. In a second step, I analyze if there is a correlation between the amount of abnormal accrued expenses and the fact that the firm has an opportunity to shift taxable profits abroad to low-tax countries. I compare the level of abnormal accruals between foreign-owned corporations and domestic corporations, as I assume that corporations with foreign affiliates have better opportunities to engage in international profit shifting than purely domestic corporations. Having applied an exact one-on-one matching strategy without replacement, I use a cross-sectional ordinary least squares (OLS) approach for the year before the tax cut as a simple and direct approach. Additionally, I exploit a panel data structure and compare the differences between the groups across years using a difference-in-differences setting. If intertemporal profit shifting mainly occurs in the group of domestic firms, which do not engage in cross-border profit shifting, and less in multinational firms, then international profit shifting seems to be a substitute. On the other hand, if both domestic and foreign-owned corporations pursue intertemporal profit shifting likewise, there may not be an influence of existing cross-border shifting activities on the decision for intertemporal profit shifting.

My empirical tests are based on firm-level financial data from Bureau van Dijk's *dafne* database. I focus on German corporations in 2007, the year prior to the corporate tax cut. I differentiate the corporations according to their involvement in intertemporal profit shifting on the one hand, and international profit shifting on the other hand, and the correlation between the two groups.

According to my results, an existing international profit shifting strategy mitigates a corporation's incentive for intertemporal profit shifting, and therefore acts as a substitute. I find that corporations with more opportunities for international profit shifting (multinational firms) have lower discretionary accrued expenses in the incentive year than purely domestic firms. Consequently, they engage less in intertemporal profit shifting.

In the following paper, I first derive my hypotheses and lay out the institutional background. Section 5.3 presents the empirical approach and underlying data. Results are presented in Section 5.4. Section 5.5 concludes.

5.2 Hypotheses and Institutional Setting

There are two opposing rationales when analyzing whether international and intertemporal profit shifting are substitutes, that is, if there is a mutual influence, or if corporations engage in both strategies independently. To assess the influence of international profit shifting on intertemporal profit shifting, I compare multinational corporations, which have opportunities to engage in cross-border profit shifting, and domestic corporations without foreign affiliates that do not engage in cross-border profit shifting.

5.2.1 International and Intertemporal Profit Shifting as Substitutes

If international and intertemporal profit shifting are substitutes, international profit shifting of corporations mitigates their engagement in intertemporal profit shifting. I do not expect that the effect is directed oppositely since international profit shifting can be a long-term engagement, whereas intertemporal profit shifting is rather punctual. Therefore, intertemporal profit shifting should be subordinate.

International profit shifting may reduce the incentive for a corporation to engage in intertemporal profit shifting. Prior research has provided evidence that effective tax rates of firms decrease if they shelter taxable income across borders (e.g., Rego, 2003; Dyreng and Lindsey, 2009). Consequently, the effective tax cut may be lower than the nominal tax cut for multinationals, which take advantage of lower tax rates abroad.[2] Compared to that, the effective tax rate of domestic firms is not mitigated. If the effective tax cut as perceived by multinational or domestic firms reflects the extent to which a corporation pursues intertemporal profit shifting, multinational firms should engage less in profit shifting across periods. If this is the case, international and intertemporal profit shifting are substitutes.

5.2.2 International and Intertemporal Profit Shifting are Independent

If international and intertemporal profit shifting are mutually independent, corporations may engage in both strategies. This is the case if the incentive provided by the nominal tax rate cut is identical for both corporations with and without international profit shifting opportunities. Prior literature on international profit shifting measures the advantage of shifting one unit of taxable income abroad as the

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[2]   Dobbins and Jacob (2016) use this rationale to analyze heterogeneity in investment responses between foreign and domestic firms after a tax cut.

nominal tax rate difference between the high-tax country and the low-tax shifting destination (e.g., Weichenrieder, 2009; Dischinger, 2010; Dharmapala and Riedel, 2013). The tax rate difference characterizes the tax savings on one shifted unit of taxable income per period. While the incentive as the difference in nominal tax rates is constant, the costs are assumed to be a convex function, increasing in the amount of shifted income. Cross-border sheltering of income is advantageous as long as the costs for shifting the next unit of taxable profits do not exceed the resulting tax savings. That means that, in the optimum state, the marginal unit of taxable income which is not shifted abroad is subject to the nominal tax rate in the high-tax country. Consequently, the marginal tax burden on the non-shifted unit is not affected by the fact that the corporation engages in international profit shifting. Foreign-owned and domestically owned corporations then face the same incentive for intertemporal profit shifting: Postponing taxation for the one (not internationally shifted, in case of multinationals) unit of taxable profits would grant them a tax advantage in the amount of the nominal tax rate difference between the periods. If the marginal tax burden represents the incentive to engage in intertemporal profit shifting, international shifting activities should not affect the decision. International and intertemporal profit shifting would thus not act as substitutes, and multinational firms would pursue intertemporal profit shifting to a comparable extent as domestic firms.

5.2.3   Opportunities for Intertemporal Profit Shifting

It may be argued that the extent of the tax rate change is not the main incentive as long as the effective tax rate decreases.[3] Dobbins et al. (2016) suggest that opportunities for intertemporal profit shifting are actually a critical factor that determines intertemporal profit shifting. They find that corporations with a high fraction of real estate in their fixed assets have less opportunities for write-offs before a tax rate cut in Germany due to stricter tax rules that allow less discretion, and therefore engage less in intertemporal profit shifting. If opportunities are critical for intertemporal profit shifting, multinational and domestically owned corporations should engage equally in intertemporal profit shifting, assuming that opportunities are not heterogeneous across both groups of firms.

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[3]   Klassen and Laplante (2012a) had a similar assumption for international profit shifting; results of Dobbins (2016b) are in line with this result.

5.2.4 Hypotheses

Depending on firms' incentive structure and the role of shifting opportunities, there are two opposing hypotheses:

Hypothesis 1: If international and intertemporal profit shifting are substitutes, multinational firms with more international profit shifting opportunities should engage less in intertemporal profit shifting than domestic firms with less profit shifting opportunities.

Hypothesis 2: If international and intertemporal profit shifting are independent, multinational and domestic corporations should engage equally in intertemporal profit shifting.

5.2.5 Setting

The corporate tax rate in Germany decreased by about 10 percentage points through the German Business Tax Reform in 2008. The corporate tax rate consists of the corporation tax, which was reduced from 25% to 15%, and a trade tax rate that varies slightly depending on the municipality the corporation is located in. The trade tax was reduced by about 6 percentage points, too. However, since the reform abolished the deductibility of the trade tax from the corporation tax base, the combined tax cut amounts to about 10 percentage points, from around 40% to 30%.

The reform included several provisions that broadened the corporate tax base with the main goal to prevent international income shifting. The interest barrier rule limited the deductibility of interest payments for corporate tax purposes. Moreover, stricter transfer pricing rules were introduced against cross-border profit shifting within multinational enterprises.

The reform plans were publicly communicated in Germany in July 2007. Therefore, corporations had enough time to prepare an intertemporal profit shifting strategy that would shift taxable profits from 2007 to later periods.

5.3   Empirical Research Design and Data

5.3.1   Estimation Strategy

5.3.1.1   Identification of Intertemporal Profit Shifters

Postponing taxable profits to a future period requires leeway in assessing accruals. I therefore estimate the amount of discretionary accruals using the Modified Jones Model. In a first step, I compute total accruals using balance sheet positions (see, e.g., Dechow, Sloan, and Sweeney, 1995; Sloan, 1996).[4] All variables are scaled by the prior year's total assets.

$$
\begin{aligned}
TotalAccruals_{i,t} =& \Delta CurrentAssets_{i,t} - \Delta Cash_{i,t} - \Delta CurrentLiabilities_{i,t} \\
& - Depreciations_{i,t}
\end{aligned}
\tag{5.1}
$$

$\Delta CurrentAssets_{i,t}$ is the change in current assets compared to the prior year, $\Delta Cash_{i,t}$ is the change in cash and current securities. $\Delta CurrentLiabilites_{i,t}$ comprises changes in short-term liabilities compared to the prior year, and $Depreciations_{i,t}$ includes depreciation expenses and amortizations for intangible assets. On a second step, I apply the Modified Jones Model to assess the discretionary component of total accruals. The Modified Jones Model is widely used in accounting research (e.g., Dechow, Sloan, and Sweeney, 1995; Kothari, Leone, and Wasley, 2005) analyzing earnings management of firms. According to the Modified Jones Model, the non-discretionary part of accruals is determined by certain firm-level influences. The amount of total accruals which is not explained by these variables counts as the component of discretionary accruals ν_t. The regression contains sales[5] adjusted by receivables to control for a firm's performance, and the amount of property, plant and equipment to account for regular depreciations, which are included in the measure for total accruals.

$$
\begin{aligned}
TotalAccruals_{i,t} =& \alpha_0 + \alpha_1 \frac{1}{TotalAssets_{i,t-1}} + \alpha_2(\Delta Sales_{i,t} - \Delta Receivables_{i,t}) \\
& + \alpha_3 PropertyPlantEquipment_{i,t} + \nu_{i,t}
\end{aligned}
$$

$$
\tag{5.2}
$$

---

[4]   Compared to Dechow, Sloan, and Sweeney (1995), the computation is modified to better fit German accounting rules: I do not include the change in *debt included in current liabilities* as this position is not specifically reflected in German financial statements. In contrast to Sloan (1996), I also do not include the change in *income taxes payable* as my approach aims to exclude tax effects.

[5]   I use *sales* instead of *revenue* due to data availability.

Compared to the original Jones Model (Jones, 1991), the Modified Jones Model adjusts the change in sales to the change in receivables, thus recognizing that earnings management might be accomplished through the timing of receivables. Again, lagged total assets are used for scaling purposes to reduce a potential heteroskedasticity problem (see Kothari, Leone, and Wasley, 2005). I follow Kothari, Leone, and Wasley (2005) and include a constant in the regression, which addresses both the heteroskedasticity issue and potential problems resulting from not controlling for firm size. Also, I estimate a cross-sectional model (e.g., Defond and Jiambalvo, 1994; Subramanyam, 1996; Kothari, Leone, and Wasley, 2005), compared to a time-series setting (e.g., Dechow, Sloan, and Sweeney, 1995). Dechow, Sloan, and Sweeney (1995) suggest that the Modified Jones Model is the most effective model to identify the discretionary accruals.

I assume corporations with high discretionary accrued expenses in the pre-reform year to engage in intertemporal profit shifting. These firms exercise leeway, for example in accumulating write-offs in one year, to reduce taxable profits.

5.3.1.2 Substitution between International and Intertemporal Profit Shifting

Having identified a measure for intertemporal profit shifting, I analyze if there is a correlation between discretionary accrued expenses and the fact that a coporation is in the group of multinational firms with opportunities for international profit shifting. I therefore use a simple OLS regression for 2007, the year before the corporate tax cut in 2008:

$$DiscrAccrExpenses_i = \beta_0 + \beta_1 MNE + \epsilon_i \qquad (5.3)$$

The variable $DiscrAccrExpenses_i$ is the dependent variable. Discretionary accrued expenses are discretionary accruals as resulting from the Modified Jones Model implemented in Equation 5.2 multiplied by -1, which simplifies interpretation. Consequently, negative discretionary accruals translate to discretionary accrued expenses, which reduce taxable profits and therefore indicate intertemporal profit shifting. The independent variable is the dummy variable MNE that equals one for multinational enterprises. The estimated coefficient β_1 captures the difference in discretionary accruals between multinational firms and domestic firms. If international profit shifting substitutes advantages from intertemporal profit shifting, discretionary accrued expenses of multinational firms should be lower compared to domestic firms. The estimated coefficient β_1 should then be significantly negative. On the other

hand, if incentives for intertemporal profit shifting are similar for both groups, discretionary accrued expenses should not differ across the two groups, and β_1 should be non-significant. However, a non-significant result could also point towards the decisive factor of opportunities for intertemporal profit shifting.

Generally, multinational enterprises differ from purely domestic firms in many aspects. Multinational firms may be bigger and also have a different asset and financial structure than domestic firms. For my analysis, it is crucial that these two groups of firms are comparable. I analyze whether their decision for intertemporal profit shifting is heterogeneous because international profit shifting is a substitute. If they act differently due to general differences between multinational enterprises and domestic firms, my results may be biased. Therefore, I apply a matching strategy that considers firm size, wages, fixed and total assets, and the industry, making sure that the corporations compared are similar.

In addition, I exploit a panel dataset and track discretionary accrued expenses of multinational and domestic firms over a period of three years from 2007 to 2009 using a difference-in-differences approach.

$$DiscrAccrExpenses_{i,t} = \beta_0 + \beta_1 MNE \times 2007 + \alpha_i + \alpha_t + \epsilon_{i,t} \qquad (5.4)$$

The interaction term between MNE and the dummy variable for the year 2007 captures the difference between discretionary accrued expenses of multinational and domestic firms in 2007 compared to other years. The advantage of the difference-in-differences approach is that it takes general differences in discretionary accrued expenses into account that occur also in years after 2007 without an incentive for intertemporal profit shifting. The OLS approach for 2007 may attribute such differences to intertemporal shifting. The panel structure controls more effectively for differences between multinational and domestic firms in addition to the matching procedure. I include a full set of year dummies to control for yearly effects which are identical for each firm, for example the business cycle. Firm fixed effects account for time-invariant firm characteristics. The inclusion of firm fixed effects also captures the individual effect of the dummy variable MNE, which is constant over time.

5.3.2   Data Description

The empirical analysis is based on firm-level financial data from the *dafne* database by Bureau van Dijk. The database is limited to German firms, but additionally includes some ownership information for these firms, for example, the country of the ultimate owner, which is critical for my differentiation between multinational and

domestic firms. The sample contains only corporations[6], to which the Business Tax Reform 2008 applied. Companies in the financial services sector or insurance sector are excluded.

All financial data is based on German accounting rules. Due to very strict privacy rules in Germany, actual tax data is not available. My data choice is therefore based on the assumption that any earnings management conducted for tax purposes is also reflected by financial accounting data. In 2007, the year of interest, financial and tax accounting were connected by a strong book-tax-conformity. Reform provisions in 2009 (*Bilanzrechtsmodernisierungsgesetz*) limited the book-tax-conformity. However, financial and tax accounting in Germany were still related.

Two different group differentiations are important in my sample: While I use the amount of discretionary accruals resulting from a Modified Jones Model to identify corporations that shift profits intertemporally (see Section 5.3.1.1), I use the location of the ultimate owner of a German subsidiary to identify corporations that shift profits internationally. I assume that subsidiaries with an ultimate owner abroad have more opportunities to engage in international profit shifting than subsidiaries with a domestic ultimate owner. This is a simplified assumption because it ignores more complex ownership structures. Additionally, I consider information on foreign subsidiaries of corporations in my dataset if available. If information on subsidiaries is missing, the ultimate owner is the decisive factor. This is in line with Dischinger, Knoll, and Riedel (2014) who find that firms shift profits rather toward the owner than toward the subsidiary. Consequently, the dummy variable MNE equals one for German subsidiaries with an ultimate owner abroad, and, additionally, for German firms with foreign subsidiaries, which rather engage in cross-border income shifting than purely domestic firms.

However, multinational and domestic firms may be in general very different, for example, in size or asset and financial structure. Therefore, I match multinational and domestic firms according to several firm-level characteristics. This strategy avoids biases through heterogeneous influences on accruals that result from other differences than international profit shifting opportunities. Multinational and domestic firms are matched according to the natural logarithms of sales, wages, fixed and total assets, and the industry code in 2006, the year prior to the incentive year 2007. The matching is based on the nearest neighbor propensity score, which results from a probit model. The exact one-on-one matching without replacement creates a sample of two groups, one with multinational firms and one with domestic firms, with the same number of firms in each group. Table 5.1 lists means of the matching variables

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[6]   The sample includes subsidiaries in the German legal form of an *Aktiengesellschaft, Gesellschaft mit beschränkter Haftung,* and *Kommanditgesellschaft auf Aktien* (*GmbH & Co. KGaA,* and *AG & Co. KGaA*), and other corporations.

Table 5.1: Matching Quality

This table gives an overview of the efficiency of the one-on-one propensity score matching without replacement. It presents the mean values of the matching criteria (logs of variables in thousand €) for multinational and domestic firms before and after the matching procedure for the year 2006. It also lists the t-statistics and the p-values of the significance of the difference between the groups.

Variable	Before Matching				After Matching			
	Mean		t	p	Mean		t	p
	MNE	Domestic			MNE	Domestic		
ln(Sales)	9.5855	7.6969	-60.16	0.00	9.7683	9.6268	-4.28	0.00
ln(Labor)	7.9444	6.6146	-54.76	0.00	8.0884	7.9785	-3.45	0.00
ln(Fixed)	6.8775	5.0470	-67.11	0.00	7.2754	7.2689	-0.13	0.90
ln(Total)	8.4849	6.6461	-87.12	0.00	9.3025	9.2191	-2.50	0.01

for both groups of firms for 2006 as well as t-statistics and p-values. While the matching strategy reduces the differences between the two groups, they are still significantly different for three of the four variables. However, considering the strong improvement through the matching, I am still confident that the resulting groups are comparable for my analysis. Moreover, I include the matching variables (in natural logarithms) as control variables in some specifications to account for remaining differences. Table 5.2 shows descriptive statistics for the variables. The dataset contains 4,193 firms (9,456 observations) for the period between 2007 and 2009. The variable for discretionary accrued expenses, $DiscrAccruedExpenses$, is scaled by the prior year's total assets, as resulting from the Modified Jones Model. About half of the observations show positive discretionary accrued expenses (negative discretionary accruals). I report absolute values for the control variables, since natural logarithms are hard to interpret, and Table 5.1 contains some descriptives for the variables in natural logarithms. For the years 2007 until 2009, firms show average sales of €63.0m, average wages of €13.2m, average fixed assets of €20.4m, and average total assets of €45.2m.

Table 5.2: Summary Statistics

This table presents summary statistics of the firm-level data used for the analysis. The panel consists of 4,193 firms, resulting in 9,456 observations between 2007 and 2009. Data source is Bureau van Dijk's *dafne*-database.

Variable	Description	Mean	p25	p50	p75
Dependent Variable					
Discr Accrued Expenses	Discretionary accrued expenses, scaled by the prior year's total assets	0.0039	-0.0539	0.0062	0.0768
Independent Variables					
Sales	Turnover in thousand €	63,096.61	19,344.06	38,110.61	71,996.42
Labor	Wages in thousand €	13,236.96	3,530.04	7,542.86	15,872.17
Fixed	Fixed assets in thousand €	20,447.68	1,710.28	7,167.79	24,143.59
Total	Total assets in thousand €	45,171.68	13,092.17	27,371.94	59,147.04

5.4   Results

5.4.1   Graphical Analysis

First, I analyze graphically if domestic and multinational firms engage differently in intertemporal profit shifting. Figure 5.1 plots discretionary accrued expenses divided by the prior year's total assets as resulting from the Modified Jones Model of multinational firms (solid line) and domestic firms (dashed line) between 2007 and 2009. The vertical dashed line separates the incentive year prior to the tax cut from the post-reform years. In 2007, relative discretionary accrued expenses of multinational firms are about 2 percentage points lower than discretionary accrued expenses of domestic firms. The difference is significant ($p < 0.01$). The high-tax year prior to the corporate tax cut provides an incentive to accumulate expenses and shift taxable profits to future periods where they are subject to a lower tax rate. The incentive for intertemporal profit shifting vanishes in the years 2008 and 2009 after the tax rate cut. Figure 5.1 shows that discretionary accrued expenses of both groups of firms converge in these years. They are not significantly different in 2008 and 2009. There is a general upward trend of accrued expenses visible in 2008 and 2009. This reflects the business cycle, anticipating effects of the financial crisis starting in 2008. The heterogeneous effect on intertemporal profit shifting, however, is reflected by the differences between the two lines.

Figure 5.2 depicts the difference in discretionary accrued expenses between multi-national and domestic firms. Compared to Figure 5.1, it allows tracking the difference between the groups independently from general cyclical effects. The difference in accrued expenses is only significantly different from zero in 2007. This is consistent with the assumption that there are heterogeneous incentives for intertemporal profit shifting in 2007. Figures 5.1 and 5.2 suggest that domestic firms react more strongly to the tax incentive by accumulating higher expenses. This would mean that their perceived effective tax cut is higher because they cannot take advantage of lower tax rates abroad. Multinational firms which engage in cross-border profit shifting react less. Their incentive for profit shifting across periods is lower since they reduce their effective tax rate by shifting taxable profits to low tax countries. Consequently, graphical evidence points towards a substitution effect of international profit shifting.

Figure 5.1: Average Discretionary Accrued Expenses of Multinational and Domestic Firms

This figure depicts the average discretionary accrued expenses divided by the prior year's total assets of multinational firms (solid line) and domestic firms (dashed line) as resulting from a Modified Jones Model. The dashed vertical line separates the high-tax period (incentive year) from the low-tax period.
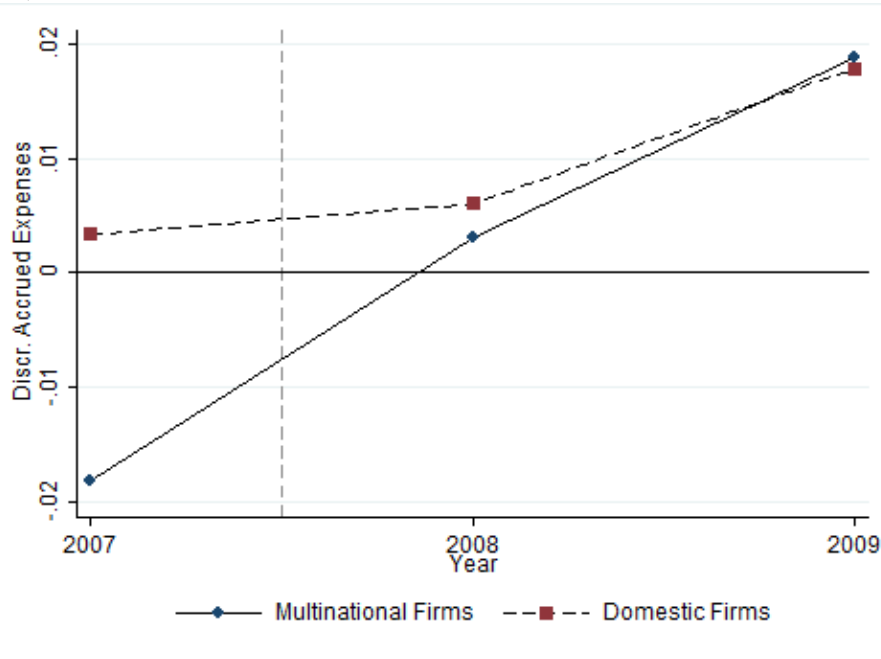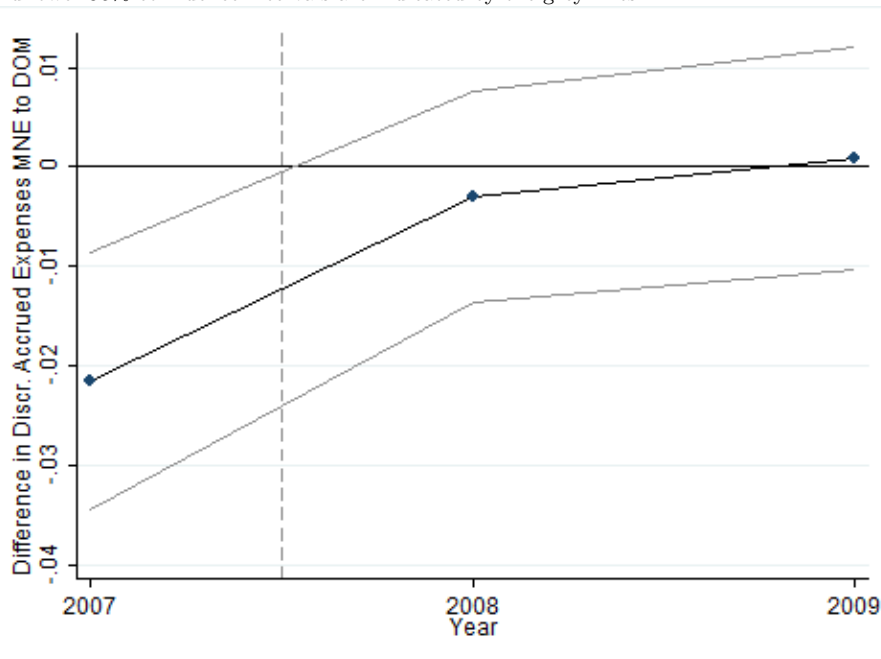

Figure 5.2: Difference in Average Discretionary Accrued Expenses between Multinational and Domestic Firms

This figure depicts the difference in average discretionary accrued expenses divided by the prior year's total assets between multinational and domestic firms (black line). The upper and lower 95% confidence intervals are indicated by the grey lines.

5.4.2   Cross-Sectional and Difference-in-Differences Approach

I test potential substitution effects between international and intertemporal profit shifting using a simple cross-section OLS regression as presented in Equation 5.3. The dummy variable MNE captures the difference in discretionary accrued expenses between multinational firms and domestic firms. If multinational firms engage differently in intertemporal shifting than domestic firms due to substitution effects from cross-border shifting, their discretionary accrued expenses should be lower than those of domestic firms.

Table 5.3 contains regression results without control variables to avoid potential endogeneity issues in Column (1), and with control variables in Column (2). The coefficient estimate for MNE is negative and significant ($p < 0.01$). Consequently, multinational firms accumulate 1.85 percentage points less discretionary accrued expenses relative to the prior year's total assets in 2007 than domestic firms. Relative to the average total assets in the sample, a 1.85% increase amounts to about €0.8m per firm. This is consistent with Hypothesis 1 that multinationals have lower incentives to engage in intertemporal profit shifting due to their involvement in cross-border shifting of income.

In addition, I use information on firms' accrued expenses until 2009 to compare the difference between the groups in 2007 to the difference in other years in a difference-in-differences approach as indicated in Equation 5.4. The coefficient estimates in Table 5.3, Columns (3) and (4), are negative and significant ($p < 0.01$) in both specifications. Relative discretionary accrued expenses of multinational firms are about 2.75 percentage points smaller than those of domestic firms compared to the difference between the groups in the other years. Consequently, multinationals reacted less strongly to the incentive for intertemporal shifting of income than domestic firms.

Table 5.3: OLS results: Substitution Effects between International and Intertemporal Profit Shifting

This table presents regression results on firm's discretionary accrued expenses for 2007 only (Columns (1) and (2)), and for the period 2007–2009 (Columns (3) and (4)). The variables are defined in Table 5.2. I include firm fixed effects and year fixed effects in all specifications. Standard errors, clustered at the firm level, are reported in parentheses. ***, **, and * refer to a significance level of 1%, 5%, and 10%, respectively.

	OLS 2007		DiD	
	(1)	(2)	(3)	(4)
MNE	-0.0212***	-0.0185***		
	(0.007)	(0.007)		
MNE×2007			-0.0255***	-0.0275***
			(0.008)	(0.008)
$\ln(\text{Sales}_t)$		0.0305***		0.0964***
		(0.005)		(0.032)
$\ln(\text{Labor}_t)$		0.0095**		0.0479**
		(0.004)		(0.022)
$\ln(\text{Fixed}_t)$		0.0308***		0.1012***
		(0.003)		(0.012)
$\ln(\text{Total}_t)$		-0.0605***		-0.4765***
		(0.006)		(0.038)
Industry		-0.0017**		
		(0.001)		
Firm FE	—	—	Yes	Yes
Year FE	—	—	Yes	Yes
Observations	3,571	3,571	9,456	9,456
R-squared	0.003	0.061	0.008	0.147

5.4.3   Robustness Test: Pseudo Reform Effects for 2008 and 2009

The difference-in-differences approach compares the difference in discretionary accrued expenses in 2007, the year of interest, to the average difference in other years. As a robustness test, I additionally include the interaction term for 2008 and 2009, respectively, in the regressions. This test analyzes if the significant difference between the groups is limited to 2007, or if it occurs in other years as well. This would indicate that the effect does not stem from the heterogeneous tax incentive for intertemporal profit shifting in 2007, but from other influences that induce heterogeneous firm reactions, and that my results are biased. Table 5.4 replicates Column (4) of Table 5.3, but additionally includes $MNE \times 2008$ in Column (1) and $MNE \times 2009$ in Column (2).

   Coefficient estimates for the interaction term $MNE \times 2007$ are negative and significant ($p < 0.01$). The results show that discretionary accrued expenses of multinationals are significantly lower for multinationals than for domestic firms in 2007 compared to 2008 and 2009 individually. There is no significant effect for the year 2008 and 2009, as shown by the inversely identical coefficient estimates for the interaction terms. I am therefore confident that the heterogeneous reactions in accrued expenses as identified in the baseline specification result from heterogeneous incentives for intertemporal profit shiting. Multinational firms react less due to substitution effects of international shifting activities on intertemporal profit shifting.

Table 5.4: Substitution   Effects—Pseudo   Reforms   in 2008 and 2009

This table replicates Column (4) of Table 5.3, but additionally includes interaction effects for 2008 in Column (1) and for 2009 in Columns (2). The variables are defined in Table 5.2. I include firm fixed effects and year ficed effects in all specifications. Standard errors, clustered at the firm level, are reported in parentheses. ***, **, and * refer to a significance level of 1%, 5%, and 10%, respectively.

	DiD	
	(1)	(2)
MNE×2007	-0.0321***	-0.0238***
	(0.010)	(0.009)
MNE×2008	-0.0083	
	(0.008)	
MNE×2009		0.0083
		(0.008)
Control Variables	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	9,456	9,456
R-squared	0.147	0.147

5.5 Conclusion

My study analyzes potential substitution effects between international and intertemporal profit shifting. If the engagement in cross-border income shifting mitigates the tax incentive for intertemporal profit shifting, multinational firms with more profit shifting opportunities should react differently to a tax incentive than domestic firms.

I compare intertemporal profit shifting of multinational and domestic German corporations in 2007, the year before the Business Tax Reform that reduced corporate taxes substantially, and therefore provided an incentive to shift taxable profits to years after the reform when they would be taxed at a lower rate. Intertemporal profit shifting is measured by the amount of discretionary accrued expenses in 2007 as resulting from a Modified Jones Model. I use both cross-sectional tests for 2007 and a difference-in-differences approach for the years 2007 to 2009. My empirical results show that multinational firms accumulate less discretionary accrued expenses in 2007 than domestic firms. This indicates that the engagement in cross-border income shifting reduces the incentive for a firm to additionally engage in intertemporal profit shifting. Consequently, international income shifting seems to have substitution effects on intertemporal profit shifting.

The results help understand interdependencies between profit shifting channels. So far, only Saunders-Scott (2015) analyzes substitution effects, but focuses on international shifting channels. Substitution effects can be critical information to evaluate the consequences of a tax reform, or any provision targeted at profit shifting, such as transfer pricing rules or thin-capitalization rules. Overall, my results provide important information to both policymakers and researchers to comprehensively evaluate firm reactions to tax regulations, and understand complex tax planning strategies.

Chapter 6

Summary and Conclusion

My dissertation sheds light on firm reactions to a corporate tax rate cut. Four studies analyze international and intertemporal profit shifting, and firm investment. The thesis particularly emphasizes the role of multinational firms, and differences in their behavior to companies that do not operate globally.

The studies exploit the German Corporate Tax Reform Act of 2008, which reduced the corporate tax rate by about 10 percentage points from 39% to 29%, as an exogenous shock. They are based primarily on financial data of German corporations with either international or only national affiliates.

Chapter 2, which contains the study *Do Corporate Tax Cuts Increase Investments?*, finds that firms increase investments after a corporate tax cut, but that the effect is heterogeneous across purely domestic firms and multinational firms with foreign parents. The analysis is based on the simple rationale that foreign-owned firms with more opportunities for cross-border profit shifting have lower effective tax rates than purely domestic firms that are less engaged in international profit shiftig. The corporate tax cut, and the reduction in costs to investments, is therefore larger for domestically owned firms. We identify a stronger investment response of domestic firms compared to multinational firms. Among domestic firms, the effect is stronger for firms that depend on internal financing, since they benefit from both lower costs of capital, and higher after-tax cash flows to fund investments. We also find higher labor investments of domestic firms, corresponding to the increase in capital investments, which suggests that firms maintain their relation of input factors. Eventually, domestic firms' sales growth is also higher than sales growth of foreign-owned firms.

I analyze whether multinational corporations reduce profit shifting to low-tax countries after a corporate tax cut in Chapter 3, *How Corporate Tax Cuts Affect International Profit Shifting Strategies.* If the tax rate difference to low-tax countries is the main incentive for cross-border shifting activities, multinationals should shift less taxable profits abroad after a tax rate reduction. I do not identify an immediate

adjustment of shifting activities, but rather an adjustment which is delayed by two to three years. The findings are consistent with the assumption that the adjustment of a shifting strategy induces additional adjustment costs. The incentives for international profit shifting may consequently be stable over time and it might be favorable to pursue an existing shifting strategy even after a tax rate change.

The study *Intertemporal Profit Shifting around a Large Tax Cut: The Case of Depreciations* in Chapter 4 identifies an accumulation of depreciations and write-offs for tax purposes in the year before the tax rate reduction. This results in the shifting of taxable profits to the post-reform period, where profits are taxed at a lower rate. We also find that the effect is heterogeneous across corporations. While we cannot confirm that non-tax costs mitigate the shifting incentive for highly levered corporations, we find that opportunities are a critical determinant for intertemporal profit shifting. Corporations with a high share of depreciable buildings shifted less expenses to 2007. We assume that depreciation rules for real estate allowed less discretion in assessing depreciation schedules and write-offs, leading to less shifting opportunities for firms with a high share of real estate in their fixed assets.

Eventually, results of the study *Does International Profit Shifting Substitute Intertemporal Profit Shifting?* suggest that the engagement in international profit shifting substitutes intertemporal profit shifting. More precisely, if a firm already engages in international profit shifting, the incentive to additionally engage in intertemporal profit shifting decreases. The rationale is similar to the investment effect analyzed in Chapter 2. Multinational firms decrease their effective tax rate through cross-border profit shifting, and thus perceive the tax rate cut as a smaller incentive for intertemporal profit shifting. My study shows that multinational firms with more opportunities for profit shifting to low-tax countries accumulate less discretionary accrued expenses in the year before a tax rate reduction than domestic firms.

My results help evaluate tax reforms, and elaborate future reform plans. The heterogeneity in reactions between firms with international affiliates and purely domestic firms is crucial information for economies. Depending on the share of internationally operating firms in a country, the consequences of a corporate tax cut might vary and potentially not satisfy policymakers' goals. Moreover, incentives for international profit shifting seem to persist even after a tax cut, and multinationals do not react immediately to changes in the tax rate. Understanding interdependencies across profit shifting channels is critical to grasp the full consequences from regulations. Substitution between profit shifting strategies indicates that an isolated analysis of shifting channels leads to a biased evaluation of firm reactions.

Appendix A

Zusammenfassung auf Deutsch

Die Dissertation untersucht, wie Unternehmen auf eine Senkung des Körperschaftsteuersatzes reagieren. Vier separate Studien analysieren mögliche Effekte in Bezug auf internationale Gewinnverlagerungen, zeitliche Gewinnverlagerungen und auf Investitionen. Die Untersuchungen basieren hauptsächlich auf Bilanzdaten deutscher Unternehmen im zeitlichen Umfeld der Unternehmensteuerreform 2008 in Deutschland, im Zuge derer der Unternehmensteuersatz von etwa 39% auf etwa 29% gesenkt wurde. Eine Steuersatzsenkung wird von den politischen Entscheidungsträgern mit diversen positiven Effekten verbunden, die die Kosten in Form des geringeren Steueraufkommens ausgleichen. Auf Grund immer niedrigerer Hürden für globale Unternehmenstätigkeit spielt der internationale Steuerwettbewerb zwischen Staaten eine zunehmende Rolle. Neben der Verbesserung der Standortattraktivität soll eine Steuersatzsenkung auch einen Abfluss steuerpflichtiger Gewinne in ein Niedrigsteuerland verhindern. Meine Studien deuten darauf hin, dass die Unternehmensreaktionen auf die Steuersatzsenkung nicht notwendigerweise so geradlinig ausfallen, wie von der Politik erhofft.

Wenngleich die Investitionen von Kapitalgesellschaften in Folge der niedrigeren Gewinnbesteuerung deutlich ansteigen, fällt der Effekt bei multinationalen Unternehmen kleiner aus. Multinationale Unternehmen senken ihren Effektivsteuersatz durch Gewinnverlagerung in Niedrigsteuerländer und nehmen daher effektiv nur eine geringere Steueränderung wahr als Unternehmen ohne Möglichkeiten zur Gewinnverlagerung. Dies führt zu einer unterschiedlichen Intensität der Reaktionen. Dieser Unterschied ist nicht nur bei Investitionen in das Anlagevermögen sondern auch beim Arbeitseinsatz erkennbar. Die höheren Investitionen von inländischen Unternehmen führen bei diesen auch zu einem höheren Umsatzwachstum als bei multinationalen Unternehmen.

Eine Änderung von Gewinnverlagerungsstrategien unmittelbar nach der Steuersatzsenkung konnte allerdings nicht identifiziert werden. Den Abfluss steuerpflichtiger

Gewinne in Niedrigsteuerländer zu verhindern galt als ein Hauptziel der Unternehmensteuerreform 2008. Neben der Einführung der Zinsschranke, die die steuerliche Abziehbarkeit von Fremdkapitalzinsen beschränkte, und strengerer Verrechnungspreisregelungen, sollte ein niedriger Unternehmensteuersatz den Anreiz vermindern, niedrigere ausländische Steuersätze in Anspruch zu nehmen. Die Ergebnisse deuten darauf hin, dass eine Anpassung der Verrechnungspreisstragie erst nach zwei bis drei Jahren nach der Steueränderung erfolgt. Diese Verzögerung könnte durch zusätzliche Kosten für die Änderung der Strategie verursacht werden.

Eine weitere Studie untersucht die zeitliche Verlagerung steuerpflichtiger Gewinne in steuerlich günstigere Veranlagungszeiträume. Gemäß der Ergebnisse nutzen Kapitalgesellschaften Spielräme zur Erhöhung von Abschreibungen vor der Steuersatzänderung, wo deren steuermindernder Effekt wertvoller ist, und verlagern steuerpflichtige Gewinne damit in die Zukunft, wo sie einem niedrigeren Steuersatz unterliegen. Voraussetzung für eine Gewinnverlagerung sind allerdings entsprechende Gelegenheiten. Die Abschreibung von Gebäuden ist im deutschen Steuerrecht strikt geregelt und bietet wenig Spielraum für Auslegung. Außerdem unterliegen Gebäude weniger wirtschaftlichen Schwankungen, was die Abschreibung auf einen entsprechend niedrigeren Wert unwahrscheinlicher macht. Entsprechend zeigen die Ergebnisse der Studie, dass Unternehmen mit einem höheren Anteil an Gebäuden im Anlagevermögen weniger Gewinne zeitlich verlagern. Dies deutet darauf hin, dass Gelegenheiten eine wichtige Rolle für zeitliche Gewinnverlagerungen spielen. Der Einfluss der Finanzkrise, die sich mit dem Untersuchungszeitraum überschneidet, insbesondere auf Gebäude könnte unsere Ergebnisse allerdings verzerren. Hier besteht Raum für künftige Forschung.

Allerdings wird auch der Anreiz für zeitliche Gewinnverlagerungen bei multinationalen Unternehmen durch deren Ausnutzen niedriger Steuersätze im Ausland abgeschwächt. Die Idee ist ähnlich der des Investitionseffekts. Durch Gewinnverlagerung ins Ausland senken multinationale Unternehmen ihren Effektivsteuersatz und nehmen auch eine Steuersatzsenkung weniger wahr. Zwischen internationaler und intertemporaler Gewinnverlagerung besteht demnach ein Substitutionseffekt. Kapitalgesellschaften, die bereits steuerliche Gewinne in Niedrigsteuerländer verlagern, betreiben weniger zeitliche Gewinnverlagerung. Dieser Zusammenhang ist essentiell um Auswirkungen von Steuerreformen ganzheitlich und nicht nur isoliert im Hinblick auf Einzelreaktionen zu verstehen.

Die Studien liefern wichtige Erkenntnisse für die Bewertung von Steuerreformen sowie für die Konzeption neuer Reformpläne und helfen, die Auswirkungen des internationalen Steuerwettbewerbs zu beurteilen.

Appendix B

Curriculum Vitae

Der Lebenslauf ist in der Online-Version aus Gründen des Datenschutzes nicht enthalten.

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Affidavit

Ehrenwörtliche Erklärung

- Ich versichere, dass die vorliegende Dissertation nicht Gegenstand eines früheren Promotionsverfahrens war.

- Das Papier *Do Corporate Tax Cuts Increase Investments?* wurde von einem Language Editor auf sprachliche Richtigkeit geprüft.

- Alle Personen und Tagungen, von deren Beiträgen die Papiere dieser Dissertation profitiert haben, sind zu Beginn des jeweiligen Kapitels aufgelistet.

- Ich habe die Dissertation selbständig verfasst.