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## Personal Taxation of Capital Income and the Financial Leverage of Firms

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# Personal taxation of capital income and the financial leverage of firms<sup>\*</sup>

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## Abstract:

Tax competition for capital has led to a trend where many countries levy lower taxes on interest income, often introducing differential taxation between interest and business income. This study analyzes the effect on firm debt usage. We exploit Germany's 2009 tax reform, which introduced a final withholding tax on interest income with a flat rate 18 percentage points below the unchanged tax rate on income from unincorporated businesses, as a quasi-experiment. The results, based on firm level panel data, indicate that firms increase their leverage when the tax rate on interest income decreases, albeit to a small degree.

**Keywords:** Income taxation, capital taxation, financial structure, leverage, matching

**JEL Classification:** H25, H24, G32

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# I. Introduction

Various countries have introduced flat rate taxes on capital income recently, typically with a tax rate that is low in comparison to the progressive tax schedule applied to labor income and other personal income sources. One reason for this trend may be international tax competition that accompanies increasing global economic integration. This integration encourages individual countries to tax the transnationally mobile factor capital more lightly than more immobile factors such as labor (e.g. Devereux et al., 2008). We observe two general approaches of how countries introduce low flat rate taxes on capital income. The first approach is the Dual Income Tax (DIT), along with its variants, as introduced primarily by Nordic countries (e.g. Sørensen, 1994). The DIT is intended to treat all capital income the same, regardless of whether it accrues from equity or credit capital. Thus, although the DIT departs from comprehensive income taxation, it preserves neutral taxation of capital income. However, the DIT runs into a practical problem, as it is difficult to determine what part of the income of a firm's owner-manager is capital income, which is supposed to be taxed at the lower capital income tax rate, and what part is labor income, as labor is supposed to be taxed at the higher labor income tax rate; usually, a normal return on capital is assumed.

The second approach is the introduction of final withholding taxes on capital income with the distinguishing feature that they do not apply to business income generated by unincorporated firms, as in Germany in 2009.<sup>1</sup> This leads to a large gap (in Germany about 18 percentage points) between the tax rate on business income, which is taxed at the higher personal income tax (PIT) rate for sole proprietors and

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<sup>1</sup> Similarly, Spain introduced a flat tax of 18% on interest income from instruments with a maturity of less than one year in 2007, and France implemented an optional flat tax on interest income with a rate of 18% in 2008. Other countries with this type of capital income taxes include Austria, the Czech Republic, and Portugal (OECD 2013). Note that a DIT can also be implemented as a withholding tax; the distinction here depends on the treatment of normal returns to unincorporated business capital.

personal partners, and interest income, which is subject to the lower final withholding tax.<sup>2</sup> This type of a final withholding tax avoids the DIT's practical problem of distinguishing between the capital and labor income of entrepreneurs, which may be the reason why the German government did not follow the advice of the German Council of Economic Experts (2006), which had suggested introducing a DIT in Germany. However, this approach comes at the cost of introducing differential taxation between business income and interest income.

Positive tax rate differentials between equity income and interest income are widespread internationally. Figure 1 compares the top marginal tax rates levied on equity income and interest income from the perspective of a personal investor in various OECD countries, ordered from left to right by the difference between the two tax rates.<sup>3</sup> The figure shows that the tax rate differentials are substantial in many countries and violate the often postulated neutrality of taxation with respect to the financing decision. Therefore it is important to ask how taxpayers adjust their behavior when facing this departure from the comprehensive income taxation paradigm, which states that income, regardless of source, should be taxed at the same rate.

When interest income is taxed at a lower rate than business income, we expect firms to exploit this tax rate differential by increasing their debt ratios, i.e. total liabilities over total assets. For example, an entrepreneur has an incentive to reduce her equity stake in her business in order to avoid the high tax on business income and invest her funds in the banking system instead, where returns are taxed at the low tax

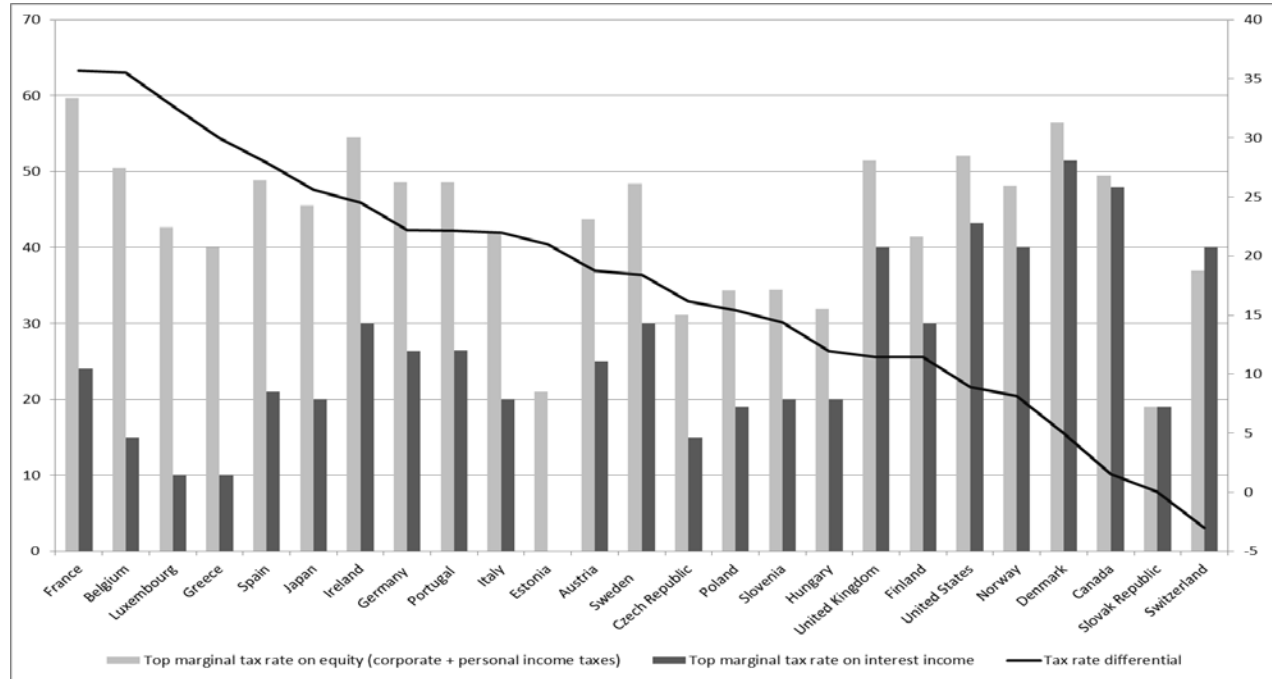
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<sup>2</sup> For the purpose of this article, we define business income as income from an unincorporated business, and equity income as the broader category of income which in addition includes dividends from shares in corporations. Effectively, all equity income is taxed at a significantly higher rate than interest income. The tax on dividend income cumulates to a high rate that is similar to the tax rate on business income from unincorporated firms, because the corporate tax and the local business tax are not credited against the final withholding tax (see section II.A.).

<sup>3</sup> For this international comparison, we consider equity investments in corporations, because of the more important role of corporations in most countries; whereas the high relevance of unincorporated businesses in Germany is rather special (see section IV). However, the effective tax rate on equity invested in unincorporated firms or corporations is very similar in Germany (see footnote 2).

rate on interest income. Her business is then financed by the banking system in turn. We should thus observe a higher debt ratio in the firm's balance sheet.<sup>4</sup>

**Figure 1: Top marginal tax rate differences between equity and interest income in selected OECD countries in 2012**



*Notes:* The bars indicate the top marginal tax rates on equity (invested in a corporation, taking into account the corporate and personal taxes) and interest income from the perspective of a personal investor in various OECD countries. The line shows the difference between these two tax rates. The left scale refers to the tax rates, the right scale to the difference between the tax rates. The tax rates on equity are calculated by assuming full distribution (cf. “old view” of dividend taxation). In Norway, we assume that the rate of return exceeds the rate of return allowance. For further details on single countries, see OECD (2013).

*Sources:* Authors' illustration based on OECD (2013) and German Federal Ministry of Finance (2013).

This paper therefore analyzes whether and, if so, how much firms adjust their financial structures in reaction to differential taxation between business and interest income. Our hypothesis is that a lower tax rate on interest income, relative to business income, increases the debt ratio.

To identify the effect, we exploit the January 2009 introduction of the final withholding tax in Germany as a quasi-experiment. As the tax gap between business and interest income of 18 percentage

<sup>4</sup> For a formal treatment, see Kiesewetter and Lachmund (2004). Two other potential effects of the reform that may come to mind, the installation of holding companies or the replacement of domestic by international shareholders, are discussed in section II.B.

points only opened up for *personal* partners, proprietors, and shareholders, but not *corporate* partners and shareholders, who are always taxed at the corporate tax rate regardless of their type of income, the degree that this policy change affects a firm depends on the fraction of personal partners and shareholders in the ownership structure. This heterogeneity in exposure to the treatment between firms allows us to identify the effect of the tax rate differential on the debt ratio chosen by firms.

We apply a regression adjusted difference-in-differences matching strategy based on firm level panel data in order to identify the effect of the differential taxation. This approach accounts for a potential selection on observables as well as on time-invariant unobservables and avoids functional form assumptions. In addition, we use an IV approach, where the debt ratio is modeled as a function of the effective tax rate differential, which depends on the ownership structure, and other factors. This allows generalizing the results and facilitates comparing them to extant literature. We use the instrumental variable (IV) technique to account for potential endogeneity of the ownership structure. As an additional source of variation, we exploit local business tax rates, which differ across the more than 10,000 German municipalities.

The results from the two approaches consistently indicate that a positive tax rate differential between business income (high PIT rate) and interest income (low final withholding tax rate) increases the debt ratio of unincorporated partnership firms, albeit to a small degree. A cut in the tax rate on interest income by 10 percentage points increases the debt ratio by 0.45 percentage points. Specifically, the introduction of the final withholding tax on capital income in Germany in 2009 on average increased the debt ratio by about 1.7% relative to the average debt ratio. We show that effects are stronger for smaller firms, firms that invest, firms not carrying forward a loss from the previous year, and firms that do not appear to be constrained on the credit market.

Our analysis of the effect of personal taxes on leverage is distinct from the large literature on the effect of corporate income taxes (CIT) on the use of debt financing as a tax shield. The latter effect results from the fact that interest expenses can be deducted from the tax base, whereas opportunity costs of equity cannot be in most countries, including Germany and the US (see Auerbach, 2002, Graham, 2003, and Feld

et al., 2013, for surveys, and Gordon and Lee, 2001, and Dwenger and Steiner, 2014, for microdata studies). The research question on how the CIT rate affects the use of debt financing differs from our research question on how a *personal tax rate differential* between business income and interest income affects the capital structure.

Our hypothesis, which states that a decrease in the personal tax rate on interest income increases debt usage by firms when the personal tax rate on business income remains constant, is consistent with Farrar and Selwyn (1967), Miller (1977, section III), Fuest et al. (2002), and Graham (2003, p. 1080). Miller (1977) argues that the personal tax cost of interest income, which was, at that time, high relative to the personal tax cost of equity income in the USA (see also Gordon, 2004), could explain why firms did not use more debt despite the tax benefits of interest deduction. The German tax reform under consideration led to lower personal taxes imposed on interest income than on equity income (like in most countries currently, including the US, as demonstrated in Figure 1), and therefore made debt financing even more attractive for personal partners and shareholders.

The observation that most countries currently levy lower personal taxes on interest income than on equity income implies that the personal tax penalty of debt, in the sense of Miller (1977), alone cannot explain why firms do not use 100% debt financing despite the tax benefits. Capital structure theories elaborate a number of non-tax costs and benefits of debt that determine optimal leverage (e.g., Kraus and Litzenberger, 1973; Scott, 1976; DeAngelo and Masulis, 1980; Bradley et al., 1984; Harris and Raviv, 1991; Rajan and Zingales, 1995; Hovakimian et al., 2001). Gordon (2010) summarizes that firms may borrow in order to benefit from tax advantages until these are just offset by extra costs resulting from a higher bankruptcy risk (taxes versus bankruptcy-costs model). Another potential non-tax cost of debt that may be involved in this trade-off is that outside investors may perceive borrowing as a signal of poor future prospects of the firm (lemons model). In addition, banks charge higher interest rates on loans than

they pay for deposits. This may increase the costs of debt financing and counteract the tax advantages of debt.<sup>5</sup>

Keeping non-tax costs and benefits of debt constant, increasing tax incentives for debt usage for personal partners and shareholders should increase their firms' optimal leverage from a theoretical perspective. For our empirical analysis, this means that our identification strategy must carefully establish a *ceteris paribus* condition, which we elaborate on in section III.

Empirical evidence on the effect of differential personal taxation on the financial structure of companies is scarce (see e.g. the survey of Graham, 2003, section 1.4). Gordon and MacKie-Mason (1990) find that the average debt ratio, based on a sample of 996 firms from the Compustat database, grew in response to the US Tax Reform Act of 1986, which increased the tax advantage of debt when taking the personal tax into consideration. Graham (1999) and Alworth and Arachi (2001) use heterogeneity between firms with respect to their payout policies to identify the effect of personal taxation on the use of debt. They find a significant, positive effect of differential taxation (defined as the difference between the tax rates on equity returns minus the tax rate on interest income) on the ratio of debt/market value (Graham, 1999)<sup>6</sup> and on the change of the debt ratio (Alworth and Arachi, 2001). Studies that find that payout policies themselves react to changes in taxation (Chetty and Saez, 2006; Jacob and Jacob, 2013) cast doubt on the use of the payout ratio as identification strategy, however. Furthermore, firms that pay dividends clearly differ from firms that do not, e.g. with respect to the (unobservable) degree of financial constraints they face (Fazzari, Hubbard and Peterson, 1988, 2000). Using international firm level data, Overesch and Voeller (2010) exploit variation in taxation between European countries and find a significant negative effect of the tax rate on interest income on the debt ratio of firms. Fuest and Weichenrieder (2002) use

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<sup>5</sup> For a comparison of interest rates, we refer to the return of corporate bonds instead of deposits because of their comparable level of risk. Figure A.1 in the Appendix shows the distribution of interest rates paid by companies in the sample used in this analysis and the average corporate bond yields for the years 2006 to 2010. The interest rate paid by the median firm is similar to corporate bond yields in 2008 and 2009, the period of our main analysis, which suggests that the interest rate spread for firms is not very large in Germany.

<sup>6</sup> In Graham (1999), the estimated coefficient is negative, because the tax rate differential is defined as the tax rate on interest income minus the tax rate on equity returns.



aggregated country data and similarly report that lower taxes on personal interest income versus corporate income decrease the share of corporate savings in total private savings. It remains an open question, however, if the differences in firms' debt policies found between the countries can be interpreted as causal effects of taxation or at least partly stem from other differences between the countries that cannot be completely controlled for. In contrast, we use individual firm variation within a single country. We compare our results with those from the literature in section V.C. and Table A 4.

This paper is structured as follows. In section II we describe how we exploit the 2009 tax policy change in Germany to identify the effect of differential taxation on the debt ratio. Section III details the empirical methodology, and section IV introduces the individual firm panel data that we use. In section V we present the results, while section VI concludes the analysis.

## **II. Institutional background in Germany**

### **A. Flat-rate tax reform as a quasi-experiment**

To identify the effect of a tax rate differential between business income and interest income on the debt ratio, we exploit the introduction of the flat final withholding tax in Germany in January 2009 as a quasi-experiment. This reform substantially reduced the tax rate on interest income for personal taxpayers in the highest PIT bracket from 44.3% PIT in 2008 to 26.4% final withholding tax in 2009. In contrast, the top marginal tax rate on income from unincorporated businesses remained unchanged at about 44% at the level of the personal partner or proprietor. Thus, the tax policy change in 2009 led to a large gap of about 18 percentage points between the unchanged top marginal tax rate on business income and the new low flat tax rate on interest income.<sup>7</sup>

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<sup>7</sup> A saver's tax allowance applies for capital income, which we do not consider to be relevant for marginal decisions of most business owners because it is quite low: The tax-exempt amount of annual interest and dividend income and capital gains (before 2009, capital gains were taxable only if a security was held for less than one year) was €750 per person in 2007 and 2008 and €801 since 2009; the allowance doubles for married joint filers.

The introduction of the final withholding tax was part of a business tax reform that was implemented in two steps in 2008 and 2009.<sup>8</sup> On January 1, 2008, the CIT rate was reduced from 25% to 15%, which was partly offset by accompanying tax base broadening measures such as new thin capitalization rules (see below), and some changes were simultaneously made to the local business tax (see Fossen and Bach, 2008, for details). The only change between 2008 and 2009 was the introduction of the final withholding tax. The reduction of the CIT rate may also have triggered changes in leverage of affected firms due to reduced incentives to use debt as a tax shield. The intention of this paper is to estimate the isolated effect of the introduction of the final withholding tax in 2009, which created the tax rate differential between business and interest income. Therefore, in the main estimations we use the years 2008 and 2009 only, both of which are after the January 2008 CIT rate cut. Furthermore, we do not base our analysis on corporations, which are subject to the CIT, but rather on partnership businesses, where profits are passed through to the partners and taxed at the level of the partners. In supplementary estimations using longer time periods, we carefully control for changes in the combined business tax rate at the partner level. We will return to these important methodological issues in sections III and IV.

Similar to the top marginal tax rate on income from unincorporated businesses, the top marginal tax rate (including corporate and personal level taxation) on *dividends* also did not change much at the shareholder level between 2007 and 2009.<sup>9</sup> Thus, the taxation of equity returns remained largely constant in this time period, regardless of whether they accrued from unincorporated businesses (business income) or corporations (dividend income).

Importantly, the large tax gap between business and interest income emerges only for firms with personal shareholders or with personal partners in the case of partnership businesses that we analyze,

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<sup>8</sup> The coalition agreement for the newly forming grand coalition government signed in November 2005 stated the general intention to implement a business tax reform, which was then discussed in broad terms during 2006. A first draft bill was presented in February 2007 and, in July 2007, the law passed the two legislative bodies *Bundestag* and *Bundesrat*.

<sup>9</sup> Before 2009, the tax rate on dividends was calculated as corporate tax + solidarity surcharge + local business tax + 50% dividend taxation rule for the PIT (shareholder-relief system); the last summand was replaced by the final withholding tax on the full dividend in 2009, which yields a similar tax rate for shareholders in the top PIT bracket.

because only these personal shareholders and partners are subject to the PIT. Firms with only corporations as shareholders or partners are unaffected by the introduction of the final withholding tax because corporate shareholders or partners are always taxed at the tax rate for corporations of about 30%, regardless of whether they derive interest income or income from equity holdings. Therefore, the degree the introduction of the final withholding tax affects a partnership firm depends on the fraction of personal partners in the ownership structure. The larger the fraction of personal partners as opposed to corporate partners, the greater the potential benefit from the reform. This heterogeneity in exposure to the treatment allows us to identify the effect of the tax rate differential on the debt level chosen by firms. Table 1 summarizes the tax rates on business and interest income for personal and corporate partners of an unincorporated partnership business before (2008) and after (2009) the introduction of the final withholding tax, which we will exploit as the quasi-experiment. For information, the tax rates in 2007 (before the CIT rate cut) and the tax rates on dividends from corporations are also shown, although they are not used for identification in this analysis. The table notes explain in detail how the combined tax rates are calculated.

**Table 1: Tax rates (in %) on business and interest income in Germany**

	2008	2009	Difference between 2008 and 2009	For information: 2007
<b>Personal partners (top PIT bracket without “rich tax”)</b>				
Income from unincorporated businesses	~ 44 <sup>a</sup>	~ 44	0	~ 46
Interest income	44 <sup>b</sup>	26 <sup>c</sup>	-18	44
Difference between business income and interest income	~ 0	~ 18		~ 1
<b>Corporate partners</b>				
Income from unincorporated businesses	~ 30 <sup>d</sup>	~ 30	0	~ 39
Interest income	~ 30	~ 30	0	~ 39
Difference between business income and interest income	0	0		0
For information: Dividend income from corporations				
Personal partners <sup>e</sup>	~ 48	~ 48	0	~ 52
Corporate partners	~ 30	~ 30	0	~ 39

*Notes:* The table shows marginal tax rates calculated as the combined statutory tax rates of the various relevant taxes. Tax rates marked with ~ depend on the local business tax rate set by the municipality; here, we assume a multiplier of 400, which is close to the averages in the three years.

<sup>a</sup> This rate refers to the PIT and solidarity surcharge rate of 44.3%, as explained in table note b below, plus the local business tax, which is largely credited against the PIT.

<sup>b</sup> The rate of 44.3% refers to the marginal PIT rate of 42%, which was applicable for taxable income in the bracket between €2,152 (about US\$ 73,000 on 1/1/2009) and €250,000 (US\$ 351,000) in 2007-2008 and between €2,552 and €250,400 in 2009 for single tax filers (or double these amounts for married joint filers), plus the mandatory so-called solidarity surcharge. In 2007, a new top PIT bracket, the so called “rich tax”, above this bracket was introduced with a marginal PIT rate of 45% (47.5% including the solidarity surcharge). It became effective for business income one year later in January 2008. In this analysis, we assume that most partners of partnership businesses fall into the former top income tax bracket, but not into the new “rich tax” bracket, so we will use the marginal tax rate of 44.3% in our calculations.

<sup>c</sup> The rate of 26.4% refers to 25% final withholding tax plus solidarity surcharge.

<sup>d</sup> The combined tax for corporations is calculated as corporate tax (rate 15% since January 1, 2008) + solidarity surcharge + local business tax. Depending on the local business tax rate set by the municipality, the combined tax rate for corporations is about 30% on average.

<sup>e</sup> Acknowledging that dividends are distributed in the year after the profits accrue, in this row the combined tax rate reported for year  $t$  depends on the CIT rate in  $t$  and the PIT or final withholding tax rate in  $t+1$ .

Apart from the ownership structure, another independent source of variation we use to identify the effects of the reform is the local business tax. Local business tax rates vary not just across the more than 10,000 municipalities in Germany, but also over time, because municipalities are entitled to determine

their own multipliers (local business tax rate =  $0.035 * multiplier/100$ ) and change them at any time.<sup>10</sup> For personal partners and proprietors of unincorporated businesses, the local business tax is largely credited against the PIT. The marginal local business tax burden that remains after crediting is calculated as

$$\theta = [multiplier/100 - \min(3.8; multiplier/100) * 1.055] * 0.035. \quad (1)$$

Thus, if the multiplier equals  $380 * 1.055 = 400.9$ , the local business tax is fully credited against the PIT (if the PIT liability is sufficiently high); if it is higher, a positive tax burden remains; and if it is lower, there is partial overcompensation (due to the solidarity surcharge that introduces the factor 1.055). In our sample, the distribution of the local business tax burden  $\theta$  for income from unincorporated businesses with exclusively personal partners has a mean of 0.13% and a standard deviation of 1.04; the minimum is -0.73% and the maximum 3.11%. For the identification of the effect of the tax rate differential between business income and interest income on the debt ratio, the important point is that the higher the local business tax rate, the higher the combined tax rate on business income for personal partners (which is 44% on average), and thus the larger the tax rate differential introduced by the 2009 reform.

## **B. Further tax policy changes and other possible effects**

Two specific aspects of the business tax reform are worth closer consideration, even though they were implemented on January 2008 and not in January 2009, when the tax rate differential analyzed here was introduced. The first measure is the introduction of the option of a preferential tax treatment for retained profits for partnership businesses with personal partners. The intention of the rule is to level the playing field with regard to retained profits between corporations, who benefit from the reduction in the CIT rate, and partnerships. Retained profits of partnerships that choose the new option (by application) are taxed

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<sup>10</sup> The uniform basic tax rate was reduced from 0.05 to 0.035 on January 1, 2008, along with other changes that partly offset this tax rate reduction. The local business tax is mostly a tax on profits, although some additions and reductions apply, e.g. financing expenses are partly added back to the local business tax base. The firm's location, not the owners' location of residence, is relevant to determine the tax rate. For companies operating in multiple municipalities, the total tax base is distributed according to an apportionment formula, and each municipality applies its multiplier to its allocated share. As we can only observe a company's registered office, we can only use the multiplier associated with this location.

with a reduced combined tax rate of about 30% in a first step. When such profits are withdrawn later, an additional distribution tax rate of 26% is applied, leading to a total rate of 49%. In comparison to the default immediate taxation with the personal PIT rate, this can be attractive for partners in or near the top PIT bracket if profits are retained for a long time, which allows the deferral of parts of the tax payment. After partners choose this option, the firm's debt ratio is expected to shrink gradually over time as retained earnings accumulate.

According to the law, any profits withdrawn after opting for this tax regime are assumed to be profits retained after switching to the regime, if such profits are present, and are therefore subject to the distributional tax. This leads to a penalty tax for withdrawing money if there are also business profits available that were retained before switching to the new regime and that are, therefore, already fully taxed. After switching to the new regime, profits, retained before opting for the new rule, can only be withdrawn without being subject to the distributional tax if all profits, retained after switching, have been withdrawn. To avoid prior retained earnings in the business being trapped, practitioners recommend withdrawing as much as possible *before* switching to the new regime. This would lead to an increase in the debt ratio in the year before switching. It is likely that firms that benefit from the new option switched as soon as it became available, so we would expect to see their leverage increase in 2007. Between 2008 and 2009, the period of our main analysis, we would rather expect a decrease in the debt ratios of firms that have opted for the rule, which might lead to an underestimation of the increase in the debt ratio as a reaction to the fall in the tax rate on interest income that we are interested in. We do not think that the new taxation option affects our analysis notably, however, because the tax option is attractive only for a small number of highly profitable firms with partners in or near the top income tax bracket who intend to retain their profits for a long time. According to a survey of tax advisors by Kessler et al. (2011), 71% of those advisers who

have eligible clients report that less than 10% of these are opting for the preferential treatment of retained earnings.<sup>11</sup>

Noteworthy, there is a legal rule that may prevent partnership firms from a large and fast increase in their debt ratio, which may be desired before switching to the preferential tax regime or to benefit from the new low tax rate on interest income. This rule applies if the partner of an unincorporated business withdraws funds from the business exceeding the sum of the accumulated and not yet withdrawn profits and deposits (so-called “over-withdrawal”). In this case the amount of deductible debt interest is reduced by 6% of the over-withdrawn amount. The idea is to prevent entrepreneurs from financing private consumption through their business. With respect to the incentive studied, the low tax on interest income, this means that firms for which this rule is relevant will rather more gradually adjust their leverage by withdrawing profits and by debt financing new investments.

The second relevant aspect of the business tax reform was the introduction of new thin capitalization rules in January 2008 (cf. Buslei and Simmler, 2012). According to the basic rule, interest expenses are no longer deductible if net interest expenses (interest expenses minus interest income) exceed 30% of EBITDA. Several escape clauses apply, however. For our analysis, it is important that stand-alone companies that do not belong to a group and do not rely on significant shareholder loans are exempted from the interest barrier; this applies to most partnership firms. Moreover, as long as net interest expenses are below an exemption limit, they are fully deductible. The original law had set this exemption limit to one million euro, but it was increased to three million euro in spring 2009, taking retroactive effect for 2008. To avoid potential distorting effects from this interest barrier on our analysis of the effects of the tax rate differential, we exclude firms with liabilities above €20 million (about US\$ 28 million on 1/1/2009) from our sample (information on net interest expenses are often missing in our data). Assuming an interest

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<sup>11</sup> In an e-mail on November 7, 2014, Frank Hechtner at Freie Universität Berlin reported that less than half a percent of all partners of partnership firms (without liberal professionals) in Germany made use of the preferential tax rules for retained earnings in 2008, according to the official personal income tax statistics for 2008, which are provided by the Statistical Offices. The share among the liberal professionals (e.g., law firms) is even smaller by an order of magnitude, according to the same source.

rate of 5%, firms with smaller liabilities are not affected by the interest barrier even if they have no interest income, and even if we consider the initially announced lower exemption limit of one million euro. As a sensitivity check we repeat our main estimations without dropping these firms and find that the results change only marginally.

One may think of other effects the introduction of the tax rate differential between business and interest income might have. First, one may ask if partnership firms can benefit from the low final withholding tax introduced in 2009 simply by converting equity held by a partner into a credit liability lent by the same person (shareholder loan). However, the German income tax code rules this out by explicitly treating interest income from shareholder loans the same as business income, i.e. such interest income is subject to the PIT of the partner and not the final withholding tax. If partnerships want to benefit from the reform by adjusting their leverage, they therefore have to involve financial intermediaries who are different from the partners (and the partners may invest their funds elsewhere in the banking system).

Second, one may wonder if instead of replacing equity with debt, partnership businesses might replace equity owned by personal partners with equity held by corporate partners as a reaction to the reform. Then the personal partner could invest the replaced funds in the banking system to benefit from the low tax rate on interest income, and the banks could finance the corporation's acquisition instead of directly financing the partnership firm. We do not consider this option to be practically relevant as personal partners are reluctant to pass ownership rights and excess profits to corporate partners for tax purposes. Shifting equity to a corporation is not even attractive if the owner of the unincorporated business also owns the corporation – i.e., a holding company. While in this case the owner neither loses control nor profits, the overall tax rate on business income passed through the holding and distributed to the owner would amount to 48% in 2009 and would thus be higher than the rate on business income of personal partners. Furthermore, hidden reserves would become subject to capital gains taxes, which makes this option even more unattractive.

The third possible doubt is related to the globalization of the capital market: Once German personal partners remove equity from German businesses to invest their funds in the banking system or bond



market in order to benefit from the lower tax rate on interest income, investors from abroad could step in, given that the German tax policy change does not affect them in most cases (depending on bilateral tax agreements), and considering that capital is transnationally mobile, especially within the Euro zone. In this case, international partners would substitute German partners, but leverage of the German firm would not change. However, again this would imply that partners of the partnership firms in our sample would give away ownership rights. Moreover, a home bias may apply (e.g., Gordon and Gaspar, 2001). More specifically, we expect that the partners of the partnerships are not fully globalized, given that these firms are typically small or mid-sized (see Figure A.2 in the Appendix), which is likely to imply that information about them is better observable locally. Concerning possible replacements of German personal partners with corporate or foreign partners, the data confirm that almost no changes in ownership structures occurred. We observe that the equity share held by German personal partners changed in only 442 of the 46,285 partnership firms in our sample between 2007 and 2009.

### **III. Methodology**

#### **A. Regression-adjusted difference-in-differences matching strategy**

To analyze how the differential taxation of business and interest income affects the debt ratio of firms, we use two different methodologies. The first approach is derived from the evaluation literature; specifically, we implement a regression-adjusted difference-in-differences matching strategy similar to Heckman et al. (1997). The second approach is more comparable to the extant empirical literature on taxes and corporate finance. It consists of regressing the debt ratio on the tax rate differential and control variables (in first differences and accounting for the endogeneity of the tax rate differential). In this section, we first describe the matching approach, and proceed with the second approach in section B.

The main advantages of the difference-in-differences matching technique are the following. The panel difference-in-differences approach accounts for potential selection of the firms into the treatment and control group based on time-invariant unobservable characteristics. However, if many firms in the

treatment and control groups differ markedly based on time-varying observed characteristics such as firm size, the standard regression-adjusted difference-in-differences estimator relies on the correct functional form specification for the control variables. In contrast, combining the method with the matching approach ensures that only firms that are sufficiently similar to each other are compared, so extrapolation along the control variables becomes unnecessary.

As explained above, we base our identification strategy on the share of personal partners in a firm's ownership structure.<sup>12</sup> We define treatment and control groups for matching as follows. As the introduction of the final withholding tax in Germany in 2009 reduced the tax rate on interest income for personal partners, but not for corporations as partners, firms belong to the treatment group when more than half of their equity is held by personal partners. The control group consists of firms with more than half of their equity held by corporations. We consider the cut-off point of 50% reasonable because the majority of the partners in terms of equity held are likely to dominate the financing decisions of the firm. However, the results are not sensitive to different choices of this threshold.<sup>13</sup>

The idea of the matching method is to compare treated and control companies that are sufficiently similar to derive the causal effect of the treatment (i.e. the reduction of the tax rate on interest income on January 1, 2009). If we used standard matching, the conditional mean independence assumption would be that the expectation of the outcome (i.e. the debt ratio) after the tax policy change would be identical for the treatment and control groups in the absence of this change, conditional on the matching variables  $X$ .

As we have access to panel data, we are able to apply difference-in-differences matching instead, which relies on the considerably less restrictive assumption that the expected *change* in the debt ratio between before and after the tax change would be the same for the treatment and control observations without the policy change, conditional on  $X$ . This accounts for potential unobserved time-invariant differences between treatment and control groups, which might be correlated both with treatment

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<sup>12</sup> The variation in local business tax rates is used in the second approach only.

<sup>13</sup> In fact, 42,361 of the 46,285 partnership firms in our sample observed in 2008 have a personal ownership share of more than 99%, and 2,718 are almost exclusively owned by corporations.

assignment and the debt ratio. Unexplained differences in the level of the debt ratio between firms with different ownership structures, perhaps due to differences in non-tax costs and benefits of debt, thus do not bias the results from difference-in-differences matching. In the main estimations, we consider the change in the debt ratio between 2008 and 2009, and in robustness checks, the change between 2008 and 2010 in order to account for a potentially longer adjustment period.

A crucial requirement is that all relevant variables affecting treatment assignment and the outcome are included in  $X$  for matching. Based on the literature of organizational choice, we include the debt ratio (total liabilities/total book assets), log firm size (balance sheet total in thousand euro), tangibility (ratio tangible assets/total assets), log firm age (in years), the local business tax rate, as well as fifteen dummy variables capturing industry classification, to capture differences in diversifiable risk, interest rates and financial constraints.<sup>14</sup> For matching, in the main specifications we use the 2008 values of these variables, i.e. the values before the introduction of the final withholding tax. In robustness checks, we match on 2007 and even 2006 values of the variables to avoid earlier announcement effects.

In additional specifications, we further include in  $X$  the ratio of EBITDA (earnings before interests, taxes, depreciation, and amortization) over total assets, as a measure of profitability, and the cash flow over total assets. Unfortunately, a large number of firms only provide balance sheet information and the income statements required for profitability and cash flow measures are not available, so the additional estimations including these variables have to rely on a subsample.

We apply propensity score matching (with replacement) and use the linear propensity score as the distance measure between observations (Rosenbaum and Rubin, 1985). The propensity score is the probability of receiving treatment, i.e. the probability of being a firm with more than half of its equity held by personal partners, conditional on  $X$ . To each treated firm, we assign a kernel-weighted outcome average

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<sup>14</sup> To improve the matching quality further, we add squared and cubed terms as well as interaction terms of some variables (see Table A 1 in the Appendix).

of the control group observations depending on distance (Epanechnikov kernel matching).<sup>15</sup> To assess the robustness of our matching strategy, we also apply 5-to-1 nearest neighbor matching with a caliper of 0.25 standard deviations of the estimated linear propensity score as proposed by Rosenbaum and Rubin (1985). We restrict the analysis to the region of common support, i.e. we drop treatment observations with a linear propensity score exceeding the maximum or falling below the minimum linear propensity score of the control group.<sup>16</sup>

Since matching estimators can be rewritten as weighted regressions, additional control variables can be included (regression adjustment). Although this is not necessary for consistency if the propensity score is modeled appropriately, it improves the efficiency of the regression. Moreover, Bang and Robbins (2005) show that regression-adjusted matching estimators remain consistent if either the propensity score model *or* the regression model is specified correctly. Thus, regression-adjusted matching can be considered double-robust. As the difference-in-difference matching procedure accounts for any time-invariant differences between the treatment and control groups such as industry classification, we include time-varying control variables in the regression adjustment.

The dependent variable in the regression adjustment is the outcome variable, i.e. the change in the debt ratio between 2008 and 2009 (or between 2008 and 2010). The regressor of main interest is the binary treatment indicator that equals one for firms with more than half of their equity held by persons, and zero otherwise. Additional covariates, all in first differences, are log firm size, tangibility, log firm age, EBITDA/total assets, and the cash flow/total assets (the latter two in some specifications only because of missing values). Since tangibility and firm size might be affected by changes in the financial structure, we include lagged values of these control variables, i.e. their changes between 2007 and 2008.<sup>17</sup> We use

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<sup>15</sup> As bandwidth parameter, we follow Heckman et al. (1997) and choose 0.06.

<sup>16</sup> This removes 292 of the 46,285 observations in the sample used in the main specifications.

<sup>17</sup> The results do not change when we use an IV approach instead, where we include the potentially endogenous changes of these two control variables between 2008 and 2009 and use the twice-lagged levels as their IVs. In the specifications including the change in the ratio EBITDA/total assets, we also use its twice lagged level as its IV, as it might be endogenous as well.

Huber-White heteroscedasticity robust standard errors in our analysis, not least because estimated propensity scores are employed for the weighting of the regression. This is conservative, because a robustness check reveals that bootstrapped standard errors are generally smaller in this application.

## B. Instrumental variable approach

Our second approach has the advantage of being more directly comparable to the extant empirical literature on taxation and finance because we estimate a coefficient of a tax rate differential that may be compared across time and location contexts. Considering a continuous tax rate differential instead of a binary treatment indicator also implies that we use more information. Furthermore, in this approach we exploit additional variation through the local business tax rate. The disadvantage in comparison to the matching approach is the necessity of a functional form assumption about the relationship between taxes and debt.

We estimate linear approximations of the relationship between the debt ratio and the tax rate differential of the form

$$\left( \frac{\text{total debt}}{\text{total assets}} \right)_{it} = \alpha + \beta \tau_{it}^{diff} + \Gamma X_{it} + \eta_i + \delta_t + \varepsilon_{it}, \quad (2)$$

where the dependent variable is the debt ratio of company  $i$  in year  $t$ ,  $\tau_{it}^{diff}$  is the tax rate differential between the tax rates on business income and interest income effective for  $i$  in  $t$  (with coefficient  $\beta$ ),  $X_{it}$  is a vector of control variables (with coefficient vector  $\Gamma$ ),  $\eta_i$  and  $\delta_t$  are unobserved firm- and time-specific effects,  $\varepsilon_{it}$  is an idiosyncratic error term, and  $\alpha$  is a constant.  $\eta_i$  could capture unobserved firm-specific costs and benefits of debt usage, for example, and  $\delta_t$  reflects the influence of the business cycle, which is especially relevant in the period under consideration because of the world-wide financial and economic crisis (although the effects were not as severe in Germany as in other countries).

The firm and period specific tax rate differential is calculated as a weighted difference between the tax rates on business and interest income:

$$\tau_{it}^{diff} = \sum_{j=1}^{J_{it}} \alpha_{jit} (\tau_{jit}^{business} - \tau_{jt}^{interest}), \quad (3)$$

where  $J_{it}$  is the number of partners and  $\alpha_{jit}$  is the equity share of partner  $j$  in firm  $i$  in year  $t$ . The combined statutory tax rates on business income  $\tau_{jit}^{business}$  and interest income  $\tau_{jt}^{interest}$  depend both on the type of partner  $j$  and the year  $t$ ; most importantly,  $\tau_{jt}^{interest}$  was decreased in 2009 for personal, but not corporate partners, as explained in section II.A.<sup>18</sup> Furthermore,  $\tau_{jit}^{business}$  depends on the local business tax rate levied in the municipality where firm  $i$  is located (section II.B.).

As control variables, in  $X_{it}$ , we include non-tax determinants of the debt ratio, i.e. lagged log firm size and its square, lagged tangibility and log firm age. In some specifications, we additionally include the ratio EBITDA/total assets, as a profitability measure, and the cash flow/total assets, excluding firms with missing income statements from the sample. To eliminate the unobserved firm-specific effects  $\eta_i$ , we estimate equation (2) in first differences based on the years 2008 and 2009 (or 2008 and 2010 in an alternative specification allowing for a longer adjustment time after the tax reform). In additional estimations based on more than two years, we also include time dummy variables to control for the business cycle effects  $\delta_t$ .

A firm's ownership structure, which is captured by the weights  $\alpha_{jit}$ , may itself be affected by taxes, which could lead to endogeneity of the tax rate differential (3). This effect could arise, for example, if the tax reform in 2009 changed incentives to own a partnership through a holding company instead of owning it directly as an individual (see also section II.B.). We account for this potential endogeneity with an IV approach. To construct the instrument, we simulate the tax rate differentials in 2008, 2009 and 2010 that would have prevailed had the ownership structure remained unchanged since 2007; in other words, we use  $\alpha_{ji,2007}$  in the calculation of  $\tau_{i,2008}^{diff,iv}$ ,  $\tau_{i,2009}^{diff,iv}$  and  $\tau_{i,2010}^{diff,iv}$  to avoid introducing the potentially

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<sup>18</sup> Since we do not observe total income of partners, we follow Rajan and Zingales (1995) as well as Overesch and Voeller (2010) and assume for the calculation of the tax rate differential that personal partners are in the highest PIT bracket (without the "rich tax", see note b to Table 1).

endogenous weights  $\alpha_{ji,2009}$  or  $\alpha_{ji,2010}$  that may have been affected by the tax reform (to be sure, we also avoid  $\alpha_{ji,2008}$  which might partly anticipate the tax reform). We then use the difference  $\tau_{i,2009}^{diff,iv} - \tau_{i,2008}^{diff,iv}$  ( $\tau_{i,2010}^{diff,iv} - \tau_{i,2008}^{diff,iv}$ ) as the IV for the first differenced tax rate differential  $\tau_{i,2009}^{diff} - \tau_{i,2008}^{diff}$  ( $\tau_{i,2010}^{diff} - \tau_{i,2008}^{diff}$ , respectively). This purges the tax rate differentials from any effects of the tax reform on the ownership structure. There is no endogeneity of tax rates with respect to other firm characteristics such as a firm's profits because we use combined statutory tax rates, which provide sufficient variation.

As mentioned before, in our main estimations we use the years immediately prior to and after the reform only, i.e. 2008 and 2009 (or 2008 and 2010). In further estimations, we use an extended period with annual observations from 2004 to 2010.<sup>19</sup> In these latter estimations, we additionally control for the combined tax rate on business income effective for firm  $i$  in year  $t$ . As our estimation sample is comprised of partnership businesses that divide their income among and pass it through to the partners, the effective tax rate on business income again depends on the ownership structure:

$$\tilde{\tau}_{it}^{business} = \sum_{j=1}^{J_{it}} \alpha_{jit} \tau_{jit}^{business} \quad (4)$$

The identifiers in this weighted sum are defined as above. This control variable is important when including years both before and after 2008, because the statutory CIT rate was decreased from 25% to 15% on January 1, 2008, which decreased  $\tau_{jit}^{business}$  when partner  $j$  is a corporation (section II.B.). This control variable thus accounts for the effect of the business income tax rate on the use of debt financing as a tax shield because of the deductibility of interest expenses from the tax base. To avoid potential endogeneity due to changing ownership structures, we instrument  $\tilde{\tau}_{it}^{business}$  with a simulated business tax rate  $\tilde{\tau}_{it}^{business,iv}$  using the twice-lagged ownership structure, completely analogous to our instrument for the tax rate differential. When we base our estimations on 2008 and 2009 only, it is not necessary to

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<sup>19</sup> The instrument for the change in the tax rate differential is calculated the same way in all the years, analogous to what we describe above for the change between 2008 (period  $t-1$ ) and 2009 (period  $t$ ), i.e. we use the twice lagged shareholder structure ( $\alpha_{ji,t-2}$ ) to simulate the first differenced tax rate differentials  $\tau_{it}^{diff,iv} - \tau_{i,t-1}^{diff,iv}$  that we use as IV.

separately control for the tax rate on business income, as it did not change between these years and is thus included in the firm specific fixed effects  $\eta_i$ , which are eliminated by first differencing the data.

## IV. Individual firm panel data

The database for our study is the comprehensive financial statements collection Dafne, which is provided by Bureau van Dijk. The panel data contain individual balance sheets, income statements and ownership information for German firms. Ownership information includes the name, the type, the county of residence and the equity share of each direct partner or shareholder. The main source for this database is the official registrar of companies in Germany. Since 2006 the database has covered nearly all companies in Germany that are publishing their balance sheets; these are firms with limited liability (incorporated or unincorporated), as they have to obey legal publication requirements.<sup>20</sup> Before, primarily only larger companies were included in Dafne. As previously noted, we use the years immediately prior to and after the introduction of the final withholding tax, i.e. 2008 and 2009 (or 2008 and 2010), in our baseline estimations. In additional estimations, we use an extended time frame spanning 2004 to 2010. We merge local business tax rates provided by the Statistical Offices (2004-2010) to the database by using the firms' postal codes, as provided in Dafne.

As mentioned in section II.A., in this study we focus on partnership businesses, primarily because for corporations it is more difficult to disentangle potential delayed effects of the corporate tax rate reduction on January 1, 2008, from the effects of the introduction of the final withholding tax a year later.<sup>21</sup> In Germany, unlike other countries, partnerships represent a widespread and very important legal form. In

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<sup>20</sup> Corporations have to publish their financial statements according to §325 German Commercial Code. The same publication requirements apply also to unincorporated firms with limited liability such as the legal form *GmbH & Co. KG*, which is explained further below.

<sup>21</sup> The introduction of the final withholding tax in 2009 was also somewhat more complicated for corporations than for partnerships. First, the shareholder relief system for dividends was replaced with the final withholding tax (although this did not change the effective tax burden for shareholders in the highest PIT bracket, see footnote 9). Second, capital gains, which before 2009 were tax exempt when the equity was held for more than a year, became subject to the new final withholding tax if the equity was acquired on or after January 1, 2009.



2009, partnerships (without sole proprietorships) accounted for 28% of aggregate taxable turnover in Germany (Federal Statistical Office, 2011). As in other countries, partnerships in Germany are not legal entities and therefore not subject to the CIT. Instead, profits of partnerships are passed through to the partners and are subject to their PIT according to the tax transparency principle (as opposed to the deferral principle for corporations). In addition, partnerships are subject to the local business tax at the firm level; the local business tax is largely credited against the PIT of personal partners, however, as explained in section II.A.

Changes in the taxation of incorporated and unincorporated businesses could influence organizational choice, as suggested by the literature, which is mostly based on US data (Gordon and MacKie-Mason 1994; Goolsbee, 1998, 2004).<sup>22</sup> However, in the original total sample of 307,821 incorporated *and* unincorporated firms, we observe only 67 changes of the legal form from unincorporated to incorporated businesses and 137 changes from incorporated to unincorporated businesses between 2007 and 2009, so this adjustment channel does not seem to be relevant for our study. High costs involved in changing legal forms in Germany may explain why we do not observe more changes. Moreover, reorganization is often accompanied by the disclosure of hidden assets, which firms may want to avoid.

We base our analyses on a specific legal form of partnership firms with limited liability called *GmbH & Co. KG*. These are partnerships (*KG*) with limited liability as a consequence of their construction with a limited liability company as a general partner (the *GmbH*). They accounted for 20% of aggregate taxable turnover in Germany in 2009 (Federal Statistical Office, 2011) and for more than half the contribution of all partnerships and sole proprietorships. With respect to their limited liability, these limited partnerships are similar to corporations, but their tax treatment is that of any other unincorporated business. In contrast to other partnerships and sole proprietorships, since 2006 we observe almost the entire population of these

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<sup>22</sup> Using time series data for 1900 to 1939, Goolsbee (1998) finds only small effects of taxes on the organizational form, whereas in Goolsbee (2004) he reports much larger effects based on cross-sectional data. Thoresen and Alstadsaetter (2008) find that the introduction of a Dual Income Tax increases the probability of incorporation for an active owner of a human capital intensive business.

limited partnerships in our data, because due to the limited liability strict publication requirements apply for them that are very similar to those of corporations.

From all limited partnership businesses observed we exclude firms without corporate or personal partners because of the different taxation rules for banks and trusts; where less than 75% of the partners are domestic; or where less than 75% of the ownership structure is observed.<sup>23</sup> Financial and holding companies are dropped from the sample as well because of their different determinants of the debt ratio. As mentioned in section II.B., we exclude firms with liabilities exceeding €20 million in order to avoid distortions from the thin capitalization rule. The final estimation sample used in our main specifications comprises 92,570 firm-years in 2008 and 2009 (i.e. 46,285 firms) and 182,239 firm-years over the larger time frame between 2004 and 2010.

The outcome variable, the debt ratio of the firms, is calculated as the ratio of total liabilities/total book assets.<sup>24</sup> In our estimations of the effect of differential taxation on the debt ratio, we follow the extant literature and consider the following control variables to account for changes in non-tax costs and benefits of debt (all monetary variables are deflated using the Consumer Price Index):

*Firm size:* The firm size may indirectly influence the financial structure as it might be a proxy for the quality of information available to outside investors, for instance because publication requirements are linked to size criteria (Chan et al., 2005). Lower uncertainty due to better information could increase the equity share since issuing equity is sensitive to information. Hence, we control for firm size and measure it as the natural logarithm of the real book value of total assets and its square.

*Age of the firm:* According to the life cycle hypothesis (e.g. DeAngelo et al., 2006), older firms are likely to have greater free cash flow. They may thus accumulate larger amounts of retained earnings,

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<sup>23</sup> In two robustness checks, we require that 60% (90%, resp.) of the shareholders structure be observed. The results do not change significantly.

<sup>24</sup> In the robustness section, we alternatively explore three different indicators of debt usage, i) the ratio of long term liabilities/total assets; ii) log total liabilities; and iii) interest expenses. Our notion of debt does not include pension commitments, which play a minor role in Germany because of the statutory pension insurance system. It does contain non-interest bearing liabilities such as trade payables.

which would decrease the debt ratio. On the other hand, older firms may be better known by investors, which may increase the availability and usage of loans. We use the logarithm of the firm age in years to control for such potential effects.

*Tangibility:* The extant literature suggests two opposing possible effects of tangibility on the use of debt. Harris and Raviv (1991) as well as Almeida and Campello (2007) find a positive correlation between a company's liquidation value (which is increasing in the tangibility of a firm's assets) and the optimal debt level since a higher liquidation value reduces costs for debt holders in comparison to equity holders. Tangible assets can also be used as collateral and therefore facilitate borrowing. On the other hand, DeAngelo and Masulis (1980) argue that firms with a high share of tangible assets have higher depreciation allowances and thus benefit from this non-debt tax shield, which reduces incentives to use debt as a tax shield. We measure tangibility as the ratio tangible assets/total book assets.

*Profitability:* As common in the literature (e.g. Rajan and Zingales, 1995; Graham, 1999; Kraemer, 2012), we control for a company's profitability in some specifications. Profitable firms dispose of internal finance, which may decrease their debt usage; on the other hand, they may have lower costs of financial distress and increase leverage. Controlling for profitability may be especially relevant because our period of analysis coincides with the financial and economic crisis, which led to significant drops in profits for many firms. Our measure of profitability is the ratio EBITDA/total book assets. We also consider the ratio cash flow/total assets as a measure of liquidity. As income statements are necessary to calculate these variables, which are missing for most firms, we only include them in additional specifications.

*Loss in the previous year:* A company that is carrying forward a loss can offset current profits against these former losses and thus has lower incentives to make use of the preferential taxation of interest income (Overesch and Voeller, 2010). In the estimations using information from income statements we include a dummy variable that equals one if a firm reported a loss in the previous year and zero otherwise.

Descriptive statistics for the dependent and control variables are presented in Table 2. The average partnership business in our sample has a debt ratio of 63%, is 14 years old and has a ratio of EBITDA/total assets of about 18% (note the significantly lower number of observations for this variable as indicated

below). There are 43,134 firms with personal partners holding a majority equity stake (the treatment group in the matching approach) and 3,151 with mainly corporate partners (the control group) in the sample. On average, the firms with mainly personal partners have significantly higher debt ratios and are significantly smaller than firms with mainly corporate partners (see Figure A.2 in the Appendix for the size distribution of the firms in the sample). This heterogeneity is one of the main reasons why matching can play its virtues in this application.

**Table 2: Firm characteristics by ownership structure**

Variable	Full sample		More than 50% of equity held by...		t-test of equal means
	Mean	Std dev.	Corporations Mean	Persons Mean	p-value
debt ratio	0.63	0.29	0.57	0.63	0.00
debt ratio 2009	0.63	0.29	0.56	0.63	0.00
firm size (thd. €)	2,468	4,769	5,837	2,227	0.00
firm age	14.40	18.70	14.82	14.37	0.20
tangibility	0.49	0.31	0.48	0.50	0.00
Share of personal partners	0.93	0.25	0.04	0.99	0.00
<b>Industries (shares):</b>					
Manufacturing	0.16	0.37	0.25	0.16	0.00
Trade	0.17	0.38	0.17	0.17	0.50
Services	0.11	0.32	0.08	0.12	0.00
<b>Observations</b>	46,285		3,151	43,134	
loss previous year	0.18	0.38	0.17	0.18	0.61
Observations	7,929		968	6,961	
EBITDA/total assets	0.18	0.13	0.17	0.18	0.14
cash flow/total assets	0.14	0.12	0.14	0.14	0.59
Observations	3,385		661	2,724	

*Notes:* Statistics are for 2008 except for the “debt ratio 2009”. The dummy variable indicating a loss in the previous year and the ratios of EBITDA and cash flow to total assets are observed in sub-samples only; the respective numbers of observations are indicated below the corresponding statistics. Sample and variables as described in section IV.

*Source:* Own calculations based on the financial accounts database Dafne 2008 and 2009.

Between 2008 and 2009, the mean debt ratio decreases slightly for partnerships where corporations have the majority equity stake, but remains constant for partnerships where personal partners have the majority equity stake. The difference in the mean change is significant at the 1% level. The distribution of the change in the debt ratio is depicted in more detail in Figure A.3 in the Appendix. These histograms show that more of the firms mainly owned by corporate partners decreased their debt ratio, while more of those firms mainly owned by personal partners kept their debt ratio almost constant. The descriptive

evidence may indicate that while there was a general trend toward a lower debt ratio in this time period, presumably due to tighter credit conditions during the financial crisis, the firms in the treatment group did not follow this trend and thus increased their debt ratio relative to the control group. This is the expected direction of relative change in the debt ratios due to the introduction of the final withholding tax. The econometric analysis in the following section identifies a causal effect.

The histograms in Figure A.3 also show that the mean difference in the change in the debt ratio between the two groups of partnership firms is not dominated by a group of partnerships held by personal partners that massively increased their debt ratio.<sup>25</sup> This would be expected if the effect was driven by firms with personal partners withdrawing as much equity as possible before opting for the preferential tax treatment of retained earnings, as discussed in section II.B. This finding increases confidence that we are measuring the effect of the introduction of the differential tax rate in 2009 and not a delayed effect of the introduction of the preferential tax treatment for retained earnings in 2008.

## **V. Empirical results**

### **A. Difference-in-differences matching results**

Before we report the results with respect to our research question, we first provide information on the propensity score estimation and the matching quality. The results from the logistic regression used to estimate the propensity score (see Table A 1 in the Appendix) reflect the differences between firms with predominantly persons or corporations as partners, as this distinction defines treatment and control groups. The significant differences suggest that matching is important in this application to ensure that treatment and control groups are sufficiently similar.

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<sup>25</sup> While the histograms only show the range between -0.2 and 0.2, we inspected the complete distribution. There are no more peaks or major differences between the two groups of firms outside of this range.

After having estimated the propensity score, we apply kernel matching to identify suitable control observations for every firm in the treatment group. To evaluate the matching quality, we report the standardized bias before and after kernel matching in Table 3. After matching the standardized bias is acceptable for all variables, in particular it is strongly reduced for the debt ratio and the firm size, which exhibited large biases before matching. The mean absolute standardized bias over all variables after matching is 2.8% (see Table 4, below columns M1 and M2); a value below 5% indicates high matching quality (Caliendo and Kopeinig, 2008).

**Table 3: Standardized bias before and after matching**

Variable	Treatment group	Control group		Standardized bias in %	
	Mean	Mean		Before	After
		Before matching	After matching	matching	matching
local business tax rate	382%	385%	380%	-6.11	3.91
debt ratio	0.63	0.57	0.65	20.69	-5.83
log firms size	6.81	7.80	6.84	-70.92	-2.58
log firm age	2.13	2.21	2.13	-8.17	-0.49
tangibility	0.49	0.48	0.51	5.94	4.58
<b>Industries (shares):</b>					
Manufacturing	0.16	0.25	0.15	-22.43	1.80
Trade	0.17	0.17	0.17	-0.40	1.52
Service	0.11	0.08	0.14	13.31	-8.08

*Note:* Statistics are for 2008. The standardized bias for each variable in  $X$  is calculated as the difference between the mean characteristic of the treated and matched control firms, standardized by the square root of the average of the variances in the two groups (Rosenbaum and Rubin, 1985). Sample and variables as described in section IV.

*Source:* Own calculations based on the financial accounts database Dafne 2008.

The results from the difference-in-differences matching approach are presented in Table 4. The weighted regressions use the weights for the control observations obtained from matching. The first specification without control variables (A1) represents difference-in-differences matching; in specification (A2), which is preferred, we additionally employ regression adjustment.

In both specifications, the point estimate of the coefficient of the treatment variable is 0.011, and it is statistically significant at the 1% level. This indicates that firms where persons are the majority partners increased their debt ratio by 1.1 percentage point due to the introduction of the flat final withholding tax. This corresponds to an increase of 1.7% relative to the mean debt ratio in the treatment group of 63%. The direction of the effect is consistent with our hypothesis. After the introduction of the final withholding tax

on interest income, personal partners can save taxes when investing in interest-bearing assets instead of their own businesses, so they have an additional incentive to finance their businesses with debt instead of equity. We discuss the effect size further in section C.

**Table 4: Difference-in-differences matching estimates (outcome: change in the debt ratio)**

Specification	(A1)	(A2)	(A3)	(A4)	(A5)	(A6)
	DiD matching	Regression adjustment	Matching with EBITDA/total assets		Regression adjustment	Matching with EBITDA/ta & cash flow/ta
Treatment	0.011*** (0.003)	0.011*** (0.003)	0.010** (0.004)	0.010** (0.004)	0.008** (0.004)	0.007* (0.004)
$\Delta$ L. log firm size		-0.004 (0.004)		-0.023* (0.012)	-0.022** (0.011)	-0.021* (0.011)
$\Delta$ L. tangibility		0.056*** (0.022)		0.077*** (0.025)	0.092*** (0.023)	0.087*** (0.023)
$\Delta$ log firm age		0.007** (0.003)		0.002 (0.004)	0.001 (0.003)	0.000 (0.003)
$\Delta$ EBITDA/total assets					-0.196* (0.100)	-0.021* (0.011)
$\Delta$ cash flow/total assets					-0.061 (0.111)	-0.105 (0.099)
Constant	-0.013*** (0.003)	-0.014*** (0.003)	-0.016*** (0.004)	-0.017*** (0.004)	-0.020*** (0.004)	-0.019*** (0.004)
Observations	45,993	45,993	3,355	3,355	3,355	3,355
Off com. support (in %)	0.631	0.631	1.142	1.142	1.142	1.142
Mean standardized bias	2.835	2.835	3.480	3.480	3.480	3.666

*Notes:* The dependent variable is the change in the ratio total debt/total assets. This table shows results from difference-in-differences matching considering differences between 2009 and 2008. The matching method is kernel matching based on 2008 values of the matching variables. In specifications (A1) and (A2), 292 out of the 46,285 observations in the sample are not used because they fall outside the common support interval. L indicates lagged control variables. Heteroscedasticity robust standard errors in parentheses. Stars (\*\*\*/\*\*/\*) indicate significance at the 1%/5%/10% levels. Sample and variables as described in section IV.

*Source:* Own calculations based on the financial accounts database Dafne 2008 and 2009.

Specifications (A3) through (A6) provide robustness checks: we include the EBITDA/total assets ratio, which captures profitability, as an additional variable in the set of matching variables  $X$ , plus cash flow / total assets in (A6). This reduces the sample size significantly, as profit and loss accounts are not reported for most firms (as mentioned before). Specification (A3) is again DiD matching without regression adjustment, in (A4) we include the controls as in (A2), and in (A5) and (A6), we additionally use normalized EBITDA and cash flow in the regression adjustment. In the four estimations, the point estimate and significance of the coefficient of the treatment indicator remains similar compared to the baseline specification (A2) (the point estimates lie within each other's 95% confidence intervals).

Table A 2 in the Appendix provides further sensitivity checks based on matching by varying the baseline specification (A2). In specification (A7) we employ 1 to 5 nearest-neighbor caliper matching instead of kernel matching. In (A8), we consider the difference between 2008 and 2010 to account for a potentially longer adjustment period. Here, the sample size is smaller, because for many firms data for 2010 are not yet available. In (A9) and (A10), we again look at the difference between 2008 and 2009, but use observations of the variables  $X$  in 2007 or even back in 2006, respectively, for matching. Thus, here matching is based on firm characteristics observed not only before the introduction of the final withholding tax in 2009, but also before the corporate tax rate cut in 2008, and we also largely avoid a potential influence of an anticipation of the tax change on matching. In the first three robustness checks reported in the table, the estimated effects are very similar to the baseline estimate from (A2) and significant. In (A10), the point estimate becomes smaller, but remains significant, and the confidence intervals still overlap. Note that we lose about 10,000 observations when only firms already observed in 2006 can be used, which could imply a selectivity issue.

We also conduct placebo tests where we implement the same estimation approach and definition of the treatment and control groups as in specifications (A1) and (A2), but act as if the reform had taken place in 2006 instead of 2009, using the sample 2005-2006 instead of 2008-2009. We choose 2006 for the placebo test because there were no other potentially relevant tax reforms in that year, whereas 2007 and 2008 saw the introduction of the rich tax (see table note b of Table 1) and the CIT rate cut mentioned in section II.A. The coefficient of the placebo treatment dummy variable is not significantly different from zero in both specifications (with and without regression adjustment), which is reassuring as it indicates that there was no differential time trend between the treatment and control groups.

## **B. Instrumental variable approach**

Table 5 shows the results from estimating equation (2) in first differences, which includes the change in the tax rate differential between business income and interest income as the key explanatory variable; the dependent variable is the change in the debt ratio. Specification (B1) uses data from 2008 and 2009, i.e.



the variables describe the differences between one year after and before the tax reform. Specification (B2) uses the two-year difference between 2010 and 2008 instead, allowing for a longer adjustment period, based on a smaller sample, as mentioned in the previous section. Specification (B3) employs year-to-year differenced data covering the longer estimation period of 2004-2010. We prefer specification (B1), as the wider time periods might potentially take in more distortions from other events that the controls might not completely capture.

**Table 5: Results from IV estimations in first differences (dep. var.: change in the debt ratio)**

Specification	(B1)	(B2)	(B3)
Estimation period	2008, 2009	2008, 2010	2004-2010
$\Delta$ tax rate differential	0.045*** (0.011)	0.053*** (0.020)	0.040*** (0.012)
$\Delta$ L. tangibility	0.030*** (0.006)	0.030*** (0.010)	0.028*** (0.004)
$\Delta$ L. log firm size	0.007 (0.007)	-0.002 (0.003)	0.004 (0.005)
$\Delta$ L. log firm size squared	-0.001 (0.001)	-0.001 (0.001)	-0.001** (0.000)
$\Delta$ log firm age	0.003*** (0.001)	0.005*** (0.001)	0.002*** (0.000)
$\Delta$ business income tax rate			0.068** (0.032)
year 2006			-0.006*** (0.002)
year 2007			0.010*** (0.001)
year 2008			0.006*** (0.001)
year 2009			-0.007*** (0.002)
Constant	-0.010*** (0.002)	-0.014*** (0.004)	-0.002*** (0.001)
Observations	46,285	17,667	131,559
1 <sup>st</sup> stage $F$ statistic ( $\Delta$ tax rate differential)	261,652	6,859	114,257
Shea's Partial $R^2$ ( $\Delta$ tax rate differential)	0.934	0.908	0.879
1 <sup>st</sup> stage $F$ stat. ( $\Delta$ business income tax rate)			9,079
Shea's Partial $R^2$ ( $\Delta$ business income tax rate)			0.574

*Notes:* The dependent variable is the year-to-year change (B1 and B3) or the two-year difference (B2) in the ratio total debt/total assets.  $\Delta$ tax rate differential is the respective difference in the tax rate differential between business and interest income. It is treated as endogenous; the simulated 1<sup>st</sup> differenced tax rate differential based on the twice-lagged ownership structure is used as the excluded instrument.  $\Delta$ business income tax rate is treated analogously. The lagged control variables labeled with  $\Delta$ L. enter as the differences between 2007 and 2008 in both specifications, (B1) and (B2). Heteroscedasticity robust standard errors in parentheses. Stars (\*\*\*/\*\*/\*) indicate significance at the 1%/5%/10% levels. Sample and variables as described in section IV.

*Source:* Own calculations based on the financial accounts database Dafne 2004-2010.

We instrument the change in the tax rate differential with the change we would observe if there had not been any modifications in the ownership structure between 2007 and 2010 (see section III.B). As there are only few changes in the ownership structure in the data, the instrument is very strong, as indicated by the very large first stage  $F$ -statistics of the excluded instrument and Shea's Partial  $R^2$  reported at the bottom of the table. In specification (B3), we additionally control for the change in the combined business income tax rate to account for the business tax reform of January 1, 2008, as mentioned before. The first stage statistics show that the instrument for this control variable (which is analogous to the one just described) is very strong as well.

The results from all estimations show that a higher differential between the tax rate on business income and the tax rate on interest income has a positive and significant effect on firms' debt ratios. In specification (B1), using only one year before and after the reform, the point estimate is 0.045. Using the two-year difference in (B2), the point estimate increases to 0.053, which tentatively indicates that some of the effect of the final withholding tax does not occur before the second year after its introduction; however, the two point estimates are not significantly different from one another. The point estimate in (B3) is somewhat smaller, but not significantly different either. The result from the preferred specification (B1) indicates that a reduction of the tax rate on interest income by 20 percentage points, while leaving the tax rate on business income unchanged (which is similar to the introduction of the flat final withholding tax in 2009), increases the debt ratio by  $20 \times 0.045 = 0.9$  percentage points for firms with exclusively personal partners, or 1.4% relative to the mean debt ratio of 63% in the sample (the effect size is further discussed below).<sup>26</sup>

The positive and significant coefficient of the tax rate on business income in specification (B3) indicates that higher business income taxes increase the debt ratio, as expected. This confirms that debt is used as a tax shield. Decreasing the business income tax rate by 10 percentage points (which is similar to

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<sup>26</sup> It is unlikely that the local treatment effect identified in our IV estimation differs from the global effect because of the few changes in the shareholder structure.

the business tax reform of January 2008) increases the debt ratio by 0.68 percentage points. Thus, we separately identify a positive effect of business taxes and a negative effect of personal taxes on interest income on debt usage.

The share of tangible assets in total assets (tangibility) has a positive and significant coefficient in all specifications. A higher liquidation value of a firm and more tangible assets as potential collateral seem to support the use of debt, presumably due to better credit conditions; this effect seems to outweigh the effect of higher depreciation allowances, which should reduce the incentive to use debt as a tax shield.

We conduct various robustness checks in Table A 3 in the Appendix. First, we address the possible concern that our estimated effect of the tax rate differential might be biased due to our inability to control for the preferential tax treatment for retained earnings, as discussed in section II.B. Firms opting for this special tax regime are expected not to distribute earnings after switching to this regime. In specification (B4), we therefore exclude all partnerships that do not distribute earnings in 2010 from the 2008-2009 estimation sample, which likely eliminates these firms from the sample, among others. The point estimate we obtain becomes larger, but the confidence interval overlaps with that from the baseline estimation (B1), indicating that the estimated effect is not driven by the special tax regime for retained earnings.

The second set of robustness checks concerns the potential endogeneity of control variables. In the three specifications in Table 5, tangibility and firm size enter equation (2) in lagged form. Since the first differences of these lagged variables may still be endogenous in the first differenced equation, specification (B5) includes the twice-lagged levels of the two variables. The point estimate of the tax rate differential based on the 2008-2009 data is smaller than the point estimate from the baseline estimation (B1), but not significantly different from it. In specification (B6), we include three additional control variables to account for differences in profitability: the twice lagged levels of the ratios of EBITDA and cash flow to total assets, and the first difference of a dummy variable indicating if a firm reported a loss in the previous year. Here our samples size shrinks significantly due to missing income statements. In

specification (B7), we include the first difference of EBITDA/total assets instead, but treat it as endogenous and use its twice lagged level as instrument.<sup>27</sup> In the two specifications controlling for profitability, the point estimate of the tax rate differential increases in comparison to the baseline estimate, but again is not significantly different.

In the last set of estimations, we assess if the results are sensitive to the choice of the leverage measure. In specification (B8), otherwise identical to the baseline estimation (B1), we use the ratio of long term debt over total assets as the dependent variable (the mean of which is 42%) in the sub-sample where this more detailed information is available. From the estimation, again in first differences, we obtain a significant point estimate which is larger, but not significantly different from the result in (B1). In (B9), we use the log of total liabilities instead of the debt ratio, i.e. we do not scale by total book assets. This way we can rule out that the changes in the debt ratio are driven by changes in the denominator, for example, because losses reduce the balance sheet total. We exclude outliers with more than 25% growth in liabilities between 2008 and 2009. The point estimate of 0.037 indicates that total liabilities increase by 0.74% when the tax rate differential increases by 20 percentage points, which is smaller than the relative effect of 1.4% obtained from (B1), but the 95% confidence intervals overlap. Finally, in (B10), we use log interest expenses as the dependent variable as an indicator of debt usage, which is only available in a sub-sample, and after excluding observations with more than 25% growth in interest expenses.<sup>28</sup> The point estimate of 0.13 implies that a reduction of the tax rate on interest income by 20 percentage points triggers an increase in interest expenses (and accordingly an increase in interest-bearing liabilities) by 2.6%. This is consistent with the baseline result which shows that the total debt ratio increases by 1.4%, considering

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<sup>27</sup> It is not feasible to additionally include the endogenous first difference of the cash flow, instrumented with its second lag, because the instruments become very weak, presumably due to the high correlation between EBITDA and the cash flow.

<sup>28</sup> Both, in specifications (B9) and (B10), the estimated coefficient of the tax rate differential increases when we choose higher thresholds to cut off outliers. Thus, by choosing 25% growth as the cut-off level, we are being conservative.

that total debt includes non-interest bearing liabilities like supplier credit, which are not expected to be significantly affected by the tax reform.

### **C. Discussion of the effect size**

To assess if the results from the IV approach are consistent with those from the difference-in-differences matching approach, we compare the estimated average effects of the introduction of the flat tax on capital income in Germany in 2009. In the matching model, the change in the debt ratio for the treated firms is given by the estimated coefficient, which represents the average treatment effect on the treated (1.1 percentage points in the baseline estimations), while for the control observations it is zero. To obtain the mean change in the debt ratio over all firms, we weight these effects by the shares of both groups in the sample and obtain a weighted average increase in the debt ratio of 1.04 percentage points (standard error: 0.29).

For the IV approach, the mean change in the debt ratio is calculated by multiplying the estimated coefficient of the tax rate differential, i.e. 0.045 in the baseline specification, with the mean change in this differential due to the introduction of the flat withholding tax, which is 16.66%. This change is smaller than the nominal reduction of the tax rate on interest income because of the weights  $\alpha_{jit}$  in equation (3), which reflect that only personal partners benefit from the tax reform. Thus, the mean increase in the debt ratio in the sample due to the reform amounts to 0.75 percentage points based on this approach (standard error: 0.19).

We conclude that both the matching and the IV approaches provide consistent results, as they are included in each other's 95% confidence intervals. A methodological implication beyond this application is that we validate the model of equation (2) with a semi-parametric event study: If the model were misspecified, the estimate would be expected to be biased, while the matching estimate would still be consistent; in this case, we would expect a significant difference between the two estimates.

Our estimate from the IV model can be compared with results from the literature to some extent. Table A 4 in the Appendix compares the estimated effects of a change in the personal interest income tax

rate on firm leverage between this study (first row) and those mentioned in the introduction and some additional papers. The signs of the coefficients of the tax variables of interest sometimes differ because of different definitions of the tax variables, as described in the table, but the interpretations of the effects in the rightmost column show that they always go in the same direction. Most papers obtain larger point estimates of the effect than our study, but the standard errors are large in most of those papers as well. For example, the 95% confidence intervals around the very large point estimates reported by Overesch and Voeller (2010) as well as Fuest and Weichenrieder (2002) still include our smaller and much more precise estimate.

Another reason for the diverging results might be the differences in the identification strategies. In the original argument by Miller (1977), a change in interest income taxation affects supply in the capital market and should thus affect the debt ratio of all firms in the same way. As argued in this paper (and similarly by Graham, 1999, and Alworth and Arachi, 2001), interest income taxation might further affect the debt ratios of different firms in different ways; here we argue that the effect depends on the ownership structure. This assumes that a partner has a sufficiently large non-tax benefit of owning the firm and that a change in the opportunity costs of holding equity therefore does not affect the ownership structure but the debt / equity decision of the firm, as confirmed by our data. While within-country studies identify this opportunity cost effect, cross-country studies are likely to additionally pick up the general effects of changing capital supply in countries that change interest taxation, and are therefore likely to find larger effects; however, the results of cross-country studies are also likely to be sensitive to the time period of the analysis as capital markets across borders are more and more integrating.

Still, our estimated increase in the debt ratio by 1.7% in relative terms due the introduction of the final withholding tax (based on the matching approach) may seem quite small, given the strong incentives. A possible explanation for the small reaction could be that some firms are financially constrained. As mentioned, even before the tax reform, debt finance was tax favored (like in most other countries), as it can be used as a tax shield due to the deduction of interest expenses from the tax base. Firms may thus have exploited this opportunity by increasing their debt ratios as much as possible prior to and

independent of the reform being implemented. If their optimization led them into a corner solution before the reform, i.e. they could not increase their debt further due to finance constraints, they could not react to the additional incentive to use debt introduced with the final withholding tax. This explanation seems especially plausible as the tax reform was implemented during the financial crisis when firms may have had problems obtaining additional debt finance. On the other hand, there is some evidence that no credit crunch occurred in Germany (Schmidt and Zwick, 2012) or that only those large firms mainly negotiating credits with state-owned landesbanks experienced a reduced willingness of banks to grant credit (Rottmann and Wollmershäuser, 2013), but our sample consists of small and medium-sized partnership businesses. Furthermore, it is possible that the long-term effects will be larger, as firms may not adjust their capital structure immediately. If adjustment of the finance structure takes more than two years of time, we are not capturing the full long-term effects even in the specifications based on the longer time period.

#### **D. Heterogeneous effects**

We use variants of the baseline specification (B1) to investigate differences in the responsiveness of the debt ratio to the tax rate differential by different types of firms (see Table A 5 in the Appendix). In specification (C1), we are interested in effect heterogeneity between industry classes. To analyze these differences we include interaction terms of the tax rate differential with seven industry dummy variables.<sup>29</sup> For the manufacturing sector (the base category), the estimated coefficient of the tax rate differential is 0.055 and significant; this is a larger point estimate than that from the pooled estimation (0.045). Firms active in utilities and trade exhibit significantly weaker responses than manufacturing firms; perhaps for these industries, non-tax determinants of the debt ratio are relatively more important. For the highly

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<sup>29</sup> As the change in the tax rate differential is treated as endogenous in the IV estimation, changes in its interaction terms are also endogenous. Therefore, the changes in the interactions of the IV for the tax rate differential are used as additional instruments. First stage statistics for the changes in the industry dummy interactions are satisfactory (available from the authors on request). First stage statistics for the other specifications are provided at the bottom of the table.

regulated and oligopolistic utilities industry, the effect even goes in the other direction. There is no significantly different effect for the real estate and renting industries, where partnerships in Germany are often used as investment vehicles.

In specification (C2), we investigate whether firms with higher tangibility – and thus higher depreciation allowances and a higher non-debt tax shield – respond less to the tax rate differential. The results confirm this hypothesis, as the estimated coefficient of the interaction term between the tax rate differential and the mean-adjusted firms' tangibility is negative and significant.

In (C3) we analyze whether the size of the firm matters for the debt adjustment. *A priori* we had no clear expectation of the sign of the interaction term. On the one hand, larger firms could react more strongly as adjusting the finance structure might involve some fix costs, e.g. bank negotiations, such that only for large firms does the tax benefit exceeds the fixed adjustment costs. On the other hand, it is also possible that smaller firms are more responsive, since personal partners, who benefit from the tax reform, may have more influence on the finance structure of smaller firms due to their smaller number and closer relationship to the firm. The estimated negative coefficient between the mean-adjusted log firm size and the tax rate differential suggests that the latter mechanism dominates (the interaction with the squared log firm size term is not significant).

It is possible that firms adjust their debt ratio primarily when they invest by financing the investment predominantly by debt or equity. In (C4) we test this hypothesis by including the investment quota (defined as the ratio of the change in tangible book assets/beginning-of-period stock of tangible book assets) and its interaction with the tax rate differential. The results confirm the hypothesis that firms investing more also adjust their capital structure to a stronger extent. As the investment quota is mean-adjusted, a firm with the mean investment quota (which is 10% in our sample) has a coefficient of the tax rate differential of 0.051. If a firm's investment quota is ten percentage points higher, the effect of the tax rate differential is  $0.1 * 0.207 = 0.0207$  higher and thus amounts in total to 0.072 percentage points. This may suggest that the long-term effect of the introduction of the final withholding tax will be larger than



the effect estimated here, as firms subsequently invest over time and then may simultaneously adjust their debt ratios.<sup>30</sup>

In (C5) we analyze whether firms that are carrying forward a loss respond less to a change in the tax rate differential, as one would expect as these firms have reduced tax incentives. The estimated coefficient of the interaction term between the dummy variable indicating a loss in the previous year and the tax rate differential is significantly negative indeed and amounts to -0.054. Consistently, the point estimate for the tax rate differential's coefficient for the remaining firms increases to 0.078. Thus firms that are carrying forward a loss do not respond much to the incentive created by the tax rate differential.

In the last specification (C6) we check whether financially unconstrained firms react more strongly. Similarly to van Binsbergen et al. (2010), we classify those firms as financially unconstrained if the debt issuance or debt reduction scaled by total assets exceeds the 66<sup>th</sup> percentile or if the equity issuance or reduction exceeds the 66<sup>th</sup> percentile, as this demonstrates flexibility of the capital structure that one would not expect in the presence of financial constraints. The estimated coefficient of the interaction term between the dummy variable indicating a financially unconstrained firm and the tax rate differential is 0.068 and significant. Thus, for unconstrained firms the effect of the tax rate differential adds up to 0.079 ( $0.068 + 0.011$ ), which is almost double the size of the baseline estimate. This suggests that financially unconstrained firms indeed adjust their debt ratios much more after tax changes than constrained firms, and that the small size of the average effect is partly due to constrained firms, which cannot further increase their debt ratios.

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<sup>30</sup> Since investment might be endogenous, we additionally use an IV approach to assess robustness. As the excluded instrument for an individual firm's investment quota, we use the average investment quota of all firms within the same 3-digit industry in the same year (without the firm's own investment quota). The coefficient of the interaction term is positive and significant again (1.10 with a standard error of 0.332). We report the OLS results in the table because the first stage statistics do not sufficiently support the strength of the instrument for investment.

## VI. Conclusion

Various countries have implemented, or are considering implementing, flat rate taxes on interest income. Typically the tax rate on interest income is low in comparison to marginal tax rates on income generated by unincorporated businesses, as the latter type of income is subject to a progressive personal income tax. The resulting tax rate differential creates additional incentives to increase leverage, as business owners save taxes if they finance their business with debt rather than equity and invest their funds in bonded capital instead, e.g. in the banking system, where returns are taxed at the low tax rate on interest income. To estimate how much firms adjust their behavior by increasing their debt usage due to these personal tax incentives, we exploit the introduction of a flat final withholding tax in Germany in 2009 as a quasi-experiment. This policy reform reduced the tax rate on interest income by 18 percentage points for persons in the top PIT bracket. We use individual firm level panel data on partnerships to identify the effect on the debt ratio.

In line with the hypothesis, the results from a difference-in-differences matching approach indicate that partnership firms, where personal partners hold a majority equity stake, increased their debt ratios (total liabilities/total assets) by 1.7% due to the introduction of the final withholding tax. As our analysis shows, this finding is consistent with the results from an IV approach where the debt ratio is modeled as a function of the tax rate differential. The coefficient of the tax rate differential implies that a reduction of the tax rate on interest income by 10 percentage points increases the debt ratio by 0.45 percentage points. We find larger effects for smaller firms, firms that invest, firms not carrying forward a loss from the previous year, and firms that do not appear to be financially constrained.

The rather small reaction of firms' debt usage suggests that even a significant differential between the tax rates on business and interest income does not seem to cause large distortions through behavioral adjustment. Therefore, a simple flat tax on interest income, usually implemented as a final withholding tax, may be a viable alternative to a Dual Income Tax, which may be conceptually more appealing due to

the equal treatment of equity and debt, but which entails the practical problem of defining a normal return to equity.

We estimate effects within up to two years after the implementation of the tax reform. It is possible that long-term effects are larger, as firms may not completely adjust their financial structure immediately, but rather gradually when they decide how to finance new investment, and as during the financial crisis credit may have been hard to obtain. Subsequent research should therefore be directed toward estimating long-term effects.

Another important avenue for future research is to investigate how taxes on interest income affect investment behavior. It is possible that even if firms react to the introduction of the tax rate differential by adjusting their leverage position, there are no effects on real investment, because the same investments are undertaken and simply financed by a larger share of debt. On the other hand, if entrepreneurs react by investing funds in the banking system instead of their own businesses, as argued here, and banks do not lend the same amount of funds to enterprises, but keep part of the additional money within the banking system, real investment may shrink, which would have consequences for economic growth.

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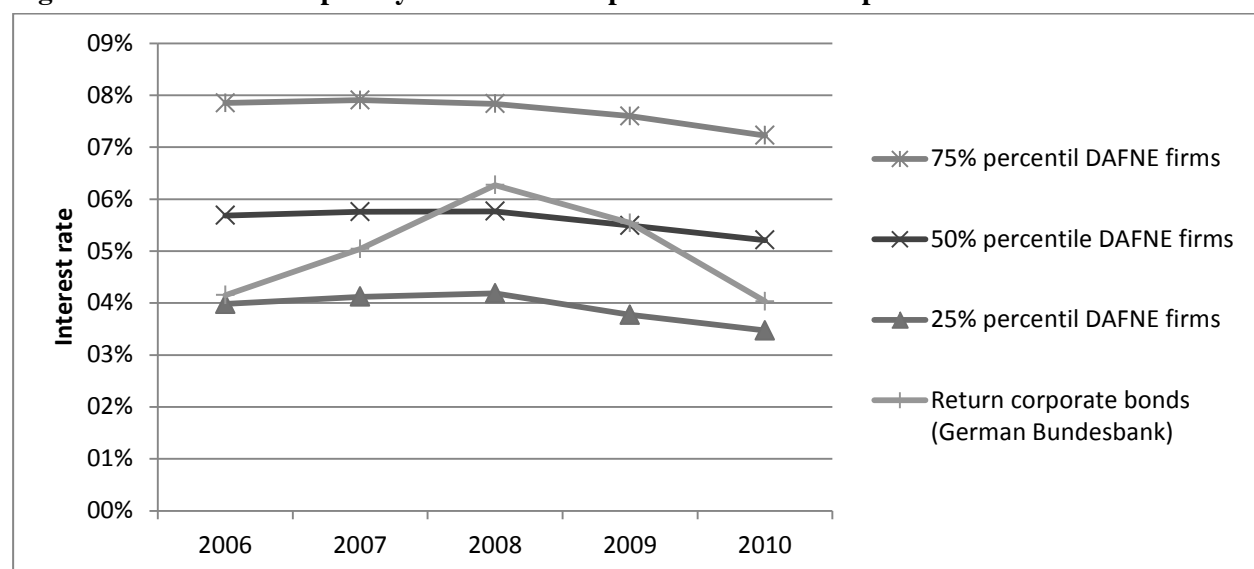
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## Appendix: Supplementary results

**Figure A.1: Interest rates paid by firms in the sample and return on corporate bonds.**

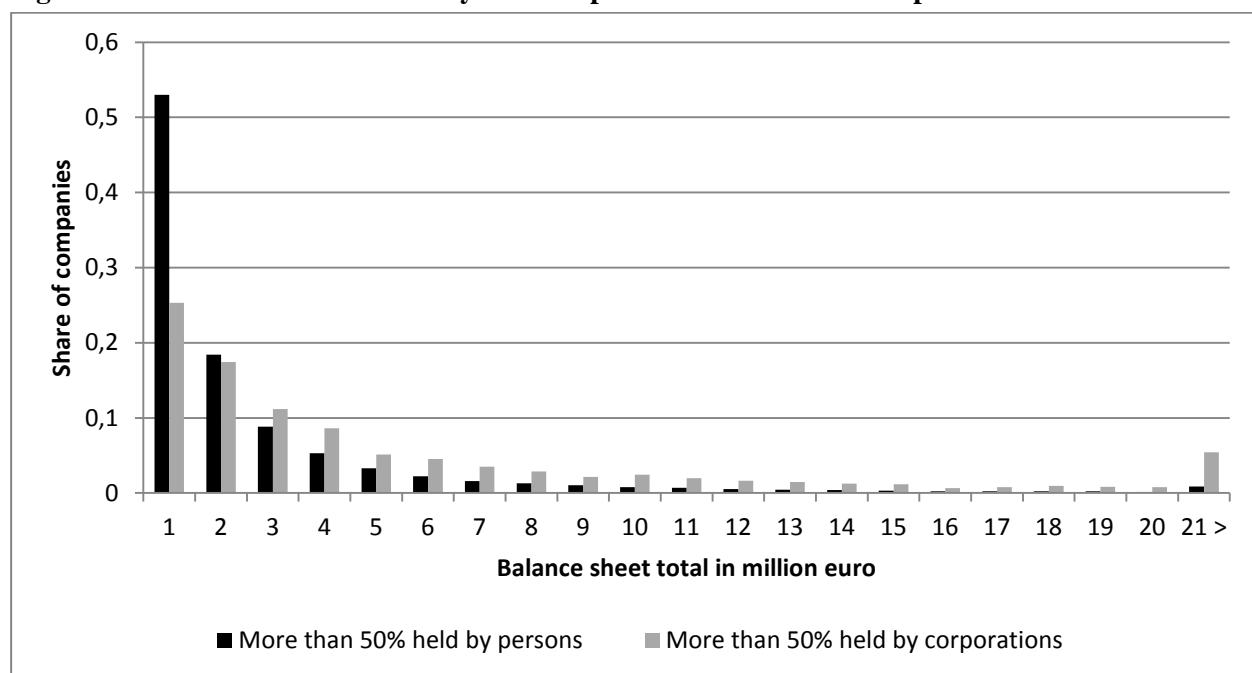


Notes: The graphs indicate the interest rate paid by firms respectively received for an investment in corporate bonds. The sample includes all firms used in the analysis for which interest payments are available. The interest rate is calculated as interest payments divided by interest-bearing liabilities. The return on corporate bonds is the yearly average.

Source: Own calculations based on the financial accounts database DAFNE 2006 to 2010 and Bundesbank (2014)



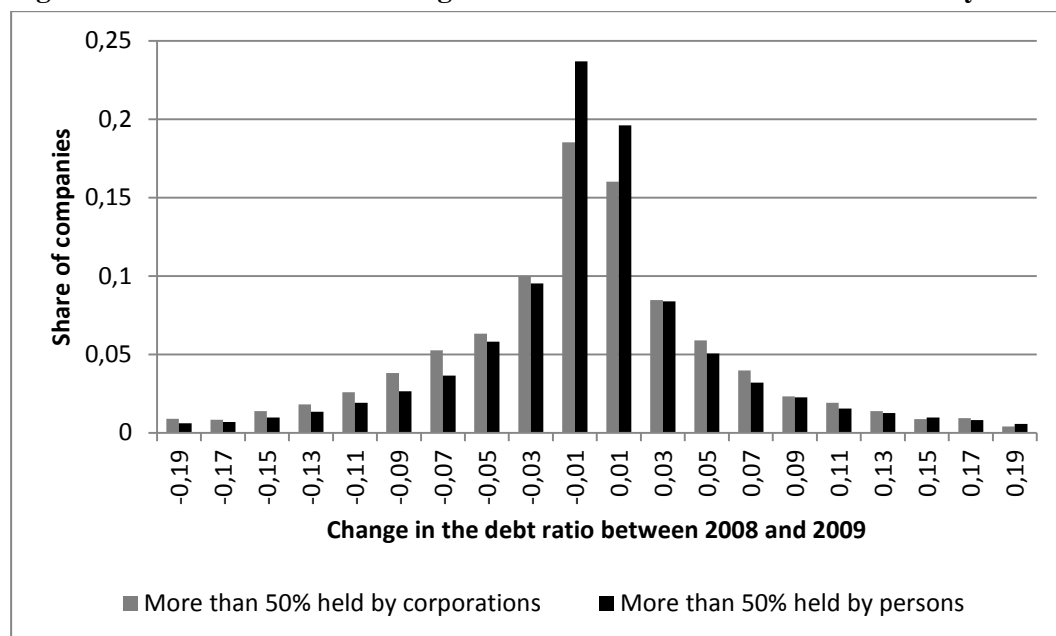
**Figure A.2: Distribution of firm size by ownership structure in the 2008 sample**



*Notes:* The bars indicate the share of firms within a size class in 2008. Sample of limited partnership firms as described in section IV.

*Source:* Own calculations based on the financial accounts database Dafne 2008.

**Figure A.3: Distribution of the change in the debt ratio between 2008 and 2009 by ownership structure**



*Notes:* The bars indicate the share of firms within a bin of the change of the debt ratio between 2008 and 2009. Sample of limited partnership firms as described in section IV.

*Source:* Own calculations based on the financial accounts database Dafne 2008.

**Table A 1: Logistic regression of the propensity score (2008 data)**

	Logit coefficient	Std error
local business tax rate	-0.172***	(0.038)
debt ratio * non-service industry	-0.823***	(0.303)
debt ratio squared * non-service industry	1.923***	(0.234)
debt ratio * service industry	-2.005**	(0.897)
debt ratio squared * service industry	1.283	(0.847)
log firm size	1.415***	(0.399)
log firm size, squared	-0.253***	(0.057)
log firm size, cubed	0.010***	(0.003)
log firm age	0.137***	(0.020)
tangibility	1.258***	(0.299)
tangibility squared	-0.973***	(0.282)
<b>Industry dummy variables</b> (base category: uncategorized firms):		
agriculture, forestry and fishing	0.934	(0.684)
mining and quarrying	-0.737	(0.659)
manufacturing	0.500	(0.639)
electricity and gas supply	0.072	(0.643)
water supply	-0.739	(0.652)
construction	1.276**	(0.643)
wholesale and retail trade	0.723	(0.639)
transportation and storage	0.221	(0.641)
accommodation and food service activities	0.654	(0.655)
information and communication	-0.252	(0.651)
real estate activities	1.588**	(0.640)
professional, scientific and technical activities	2.287***	(0.671)
administrative and support service activities	0.648	(0.645)
public administration and defense	1.975	(1.209)
human health and social work activities	-0.125	(0.661)
Constant	0.658	(1.122)
Observations	46,285	
Pseudo $R^2$	0.118	

*Notes:* The dependent variable is the treatment indicator. It equals one for firms with more than half of their equity held by personal partners and zero otherwise. The dummy variable “service industry” in the interactions is short for the dummy indicating professional, scientific and technical activities, and “non-service industry” marks the remaining firms. Stars (\*\*\*/\*\*/\*) indicate significance at the 1%/5%/10% levels. Sample and variables as described in section IV.

*Source:* Own calculations based on the financial accounts database Dafne 2008.

**Table A 2: Additional robustness checks for regression-adjusted DiD matching estimates**

Specification	(A7)	(A8)	(A9)	(A10)
Difference between:	2009-2008	2010-2008	2009-2008	2009-2008
Matching method:	Nearest neighbor	Kernel matching	Kernel matching	Kernel matching
Matching based on:	2008	2008	2007	2006
Treatment	0.011*** (0.003)	0.009* (0.005)	0.010*** (0.003)	0.005* (0.003)
$\Delta L.$ log firm size	-0.002 (0.004)	-0.000 (0.005)	-0.003 (0.003)	-0.009** (0.004)
$\Delta L.$ tangibility	0.051*** (0.018)	0.023 (0.032)	0.045*** (0.014)	0.069*** (0.022)
$\Delta$ log firm age	0.005* (0.003)	0.005* (0.003)	0.007** (0.003)	0.007 (0.003)
Constant	-0.013*** (0.004)	-0.014*** (0.005)	-0.012*** (0.003)	-0.007** (0.003)
Observations	46,260	17,653	46,163	36,017
Off com. support (in %)	0.061	2.083	0.213	0.842
Mean standardized bias	2.785	4.501	3.465	2.967

*Notes:* The dependent variable is the change in the ratio total debt/total assets. This table shows results from regression-adjusted difference-in-differences matching specifications. The lagged control variables labeled with  $\Delta L.$  enter as the differences between 2007 and 2008 in all specifications.  $\Delta$  log firm age is the difference between 2010 and 2008 in (A8) and between 2009 and 2008 otherwise. Heteroscedasticity robust standard errors in parentheses. Stars (\*\*\*/\*\*/\*) indicate significance at the 1%/5%/10% levels. Sample and variables as described in section IV.

*Source:* Own calculations based on the financial accounts database Dafne 2008-2010.

**Table A 3: Additional robustness checks for IV estimations in first differences (2008, 2009)**

Specification	(B4)	(B5)	(B6)	(B7)	(B8)	(B9)	(B10)
					Different dependent variables		
	Firms distribu- ting in 2010	Twice lagged levels as controls	Incl. profita- bility and cash flow	Incl. profita- bility (with IV)	$\Delta$ long term debt ratio	$\Delta$ log(total liabilities)	$\Delta$ log (interest expenses)
$\Delta$ tax rate differential	0.089*** (0.017)	0.035*** (0.012)	0.056** (0.022)	0.056*** (0.020)	0.052** (0.020)	0.037** (0.015)	0.130*** (0.044)
$\Delta$ L. tangibility	0.026** (0.011)			0.090*** (0.018)	0.047*** (0.016)	0.022*** (0.007)	0.163*** (0.037)
$\Delta$ L. log firm size	0.017* (0.009)			0.044 (0.064)	0.023 (0.017)	-0.017* (0.010)	-0.031 (0.064)
$\Delta$ L. log firm size squared	-0.002** (0.001)			-0.004 (0.004)	-0.001 (0.001)	0.002** (0.001)	0.009** (0.004)
$\Delta$ log firm age	0.009*** (0.002)	0.003*** (0.001)	0.003 (0.002)	0.003 (0.002)	0.001 (0.002)	0.003 (0.002)	0.008* (0.004)
L2. tangibility		-0.003** (0.001)	-0.004 (0.006)				
L2. log firm size		-0.008*** (0.003)	-0.007 (0.015)				
L2. log firm size. sqrt		0.000** (0.000)	0.000 (0.001)				
L2. EBITDA/total assets			0.031 (0.048)				
L2. Cashflow/total assets			0.015 (0.054)				
$\Delta$ EBITDA/total assets				-0.251*** (0.052)			
$\Delta$ loss previous year			0.007 (0.004)	0.015*** (0.005)			
Constant	-0.006** (0.003)	0.027*** (0.009)	0.005 (0.065)	-0.022*** (0.004)	-0.007** (0.003)	-0.047*** (0.010)	-0.058*** (0.007)
Observations	15,836	46,285	3,385	3,385	5,932	32,518	2,213
1 <sup>st</sup> stage $F$ stat. ( $\Delta$ tax diff.)	118120	231,716	69,204	42,313	175,289	159,836	36,392
Shea's $P$ . $R^2$ ( $\Delta$ tax diff.)	0.934	0.930	0.940	0.942	0.952	0.933	0.918
1 <sup>st</sup> st. $F$ stat. ( $\Delta$ EBITDA)				62			
Shea's $P$ . $R^2$ ( $\Delta$ EBITDA)				0.064			

*Notes:* The dependent variable is the year-to-year change in the ratio total debt/total assets.  $\Delta$ tax rate differential is the year-to-year difference in the tax rate differential between business and interest income. It is treated as endogenous; the simulated 1<sup>st</sup> differenced tax rate differential based on the twice-lagged ownership structure is used as the excluded instrument.  $\Delta$ business income tax rate is treated analogously. In specification (B7),  $\Delta$ EBITDA/total assets is instrumented with the twice lagged level. Heteroscedasticity robust standard errors in parentheses. Stars (\*\*\*/\*\*/\*) indicate significance at the 1%/5%/10% levels. Sample and variables as described in section IV.

*Source:* Own calculations based on the financial accounts database Dafne 2008-2009.

**Table A 4: Empirical literature on personal tax effects on leverage**

Study	Specifi- cation	Country	Data	Sample	Dependent variable	Tax variable of interest	Method	Source of variation	Coef- ficient	Std err.	Effect size
This paper	Table 5 (B1)	Germany	Dafne 2008- 2009 (panel of accounting data)	46,285 partnership businesses (mostly SME)	Debt / book assets	Diff. business tax rate - interest tax rate	IV in first differences	Ownership structure; Local business tax rates; Tax reform	0.045	0.011	Decrease in the tax rate on interest income by 10 %-point increases debt ratio by 0.45 %- points.
Kraemer (2012)	Table 4 (1.1)	40 European countries	Amadeus 1993- 2009 (panel of accounting data)	N/a (1,957,511 firm-year observations), mostly large companies	Debt / book assets	Tax rate on interest income	Fixed effects	Country and time differences in statutory tax rates	-0.17	<0.01	Decrease in the tax rate on interest income by 10 %-point increases debt ratio by 1.7 %- points.
Overesch & Voeller (2010)	Table 4 (4)	23 European countries	Amadeus 1999- 2005 (panel of accounting data)	814,112 mostly large companies	Debt / book assets	Combined tax rate on interest income	Fixed effects	Country and time differences in statutory tax rates	-0.56	0.268	Decrease in the tax rate on interest income by 10 %-point increases debt ratio by 5.6 %- points.
Fuest & Weichen- rieder (2002)	Table 1 (2)	13 OECD countries	Country level data 1985-1997	13 countries	Corporate savings / total private savings	Diff. tax rate on interest income - corporate tax rate	Fixed effects	Country and time differences in statutory tax rates	0.023	0.011	Decrease in the tax rate on interest income by 10 %-point decreases the share of corporate in total private savings by 23 %-points.
Alworth & Arachi (2001)	Table 8 (col. 3)	Italy	Centrale die Bilanci 1983- 1994 (panel of accounting data)	1,054 mostly large manufacturing companies	Annual change in debt / lagged book assets	Net-of-tax rate on interest income / net-of- tax rate on equity income	Fixed effects	Dividend payout ratio; Loss carry- forward and backward; Tax reforms	0.033	0.008	Increase in the personal tax advantage of debt ratio by 0.1 increases the debt ratio by 0.33 %-points every year.
Graham (1999)	Table 6 (panel A)	USA	Compustat 1994 (cross- section of accounting data)	5,121 mostly large corporations	Debt / market value	Personal tax penalty	OLS	Dividend payout ratio; Simulated corporate tax rates	-0.219	0.058	Decrease in the tax rate on interest income by 10 %-point increases debt ratio by 2.19 %- points.
Gordon & MacKie- Mason (1990)	Tables 1 and 4	USA	Compustat 1985-1988 (accounting data)	996 mostly large corporations	Debt / market value	Diff. equity tax rate - interest tax rate	Mean comparison	Aggregate time series before and after the Tax Reform Act of 1986 in the US			Between 1986 and 1988, the tax rate diff. increased by 2.5 %-points due to TRA86, and between 1985 and 1988, the average ratio debt/market value increased by 4.1 %-points.

*Notes:* This table compares estimates of the effect of personal taxes on interest income on firm leverage from the literature, ordered by publication date. From each paper we choose the specification most suitable for a comparison. The coefficient is the point estimate of the coefficient of the tax variable of interest on the dependent variable in the specification indicated. Sample and variables as described in section IV.

**Table A 5: Effect heterogeneity (dep. var.: change in the debt ratio)**

Specification	(C1)	(C2)	(C3)	(C4)	(C5)	(C6)
$\Delta$ tax rate differential	0.055***	0.045***	0.043***	0.051***	0.078***	0.011*
(base for (C1): manufacturing)	(0.013)	(0.011)	(0.011)	(0.011)	(0.020)	(0.006)
$\Delta$ L. tangibility	0.029***	0.032***	0.030***	0.019*	0.020	0.030***
	(0.006)	(0.006)	(0.006)	(0.010)	(0.015)	(0.006)
$\Delta$ L. log firm size	0.008	0.007	0.008	-0.007	0.076***	0.007
	(0.007)	(0.007)	(0.007)	(0.014)	(0.028)	(0.007)
$\Delta$ L. log firm size squared	-0.001	-0.001	-0.001	-0.001	-0.005***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
$\Delta$ log firm age	0.004***	0.004***	0.003**	0.003***	0.002	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
$\Delta$ (tax rate diff. * agriculture/mining)	0.012					
$\Delta$ (tax rate diff. * utilities)	-0.113***					
$\Delta$ (tax rate diff. * construction)	0.016					
$\Delta$ (tax rate diff. * trade)	-0.046***					
$\Delta$ (tax rate diff. * transport./inform.)	0.011					
$\Delta$ (tax rate diff. * real estate/renting)	-0.003					
$\Delta$ (tax rate diff. * services)	-0.006					
$\Delta$ (tax rate diff. * L. tangibility)		-0.022***				
		(0.008)				
$\Delta$ (tax rate diff. * L. log firm size)			-0.015***			
			(0.002)			
$\Delta$ (tax rate diff. * L. log firm size sqr)			0.002			
			(0.001)			
$\Delta$ investment quota				-0.003		
				(0.002)		
$\Delta$ (tax rate diff. * investment quota)				0.207***		
				(0.020)		
$\Delta$ loss previous year					0.003	
					(0.004)	
$\Delta$ (tax rate diff. * loss prev. year)					-0.054**	
					(0.021)	
$\Delta$ financially unconstrained						-0.017***
						(0.004)
$\Delta$ (tax rate diff. * fin. unconstr.)						0.068***
						(0.024)
Constant	-0.010***	-0.010***	-0.010***	-0.010***	-0.014***	-0.002*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.001)
Observations	46,285	46,285	46,285	46,285	7,929	46,285
1 <sup>st</sup> stage $F$ stat. ( $\Delta$ tax rate diff.)	33,370	130,733	87,442	129,461	89,460	133,771
Shea's Partial $R^2$ ( $\Delta$ tax rate diff.)	0.938	0.934	0.936	0.933	0.948	0.943
1 <sup>st</sup> stage $F$ stat. ( $\Delta$ interaction term)		1,001,396	267,657	3,055	8,940	54,112
Shea's Part. $R^2$ ( $\Delta$ interaction term)		0.976	0.977	0.880	0.914	0.932
1 <sup>st</sup> stage $F$ stat. ( $\Delta$ 2 <sup>nd</sup> interact. term)			232,903			
Shea's Part. $R^2$ ( $\Delta$ 2 <sup>nd</sup> interact. term)			0.945			

*Notes:* The dependent variable is the year-to-year change in the ratio total debt/total assets.  $\Delta$ tax rate differential is the year-to-year difference in the tax rate differential between business and interest income. It is treated as endogenous; the simulated 1<sup>st</sup> differenced tax rate differential based on the twice-lagged ownership structure is used as the excluded instrument. The 1<sup>st</sup> differenced interactions of this simulated exogenous tax rate differential are used as instruments for the 1<sup>st</sup> differenced interactions of the endogenous tax rate differential.  $\Delta$ L. tangibility,  $\Delta$ L. log firm size and  $\Delta$ log firm age are mean-adjusted here to facilitate interpretation of the coefficients. Heteroscedasticity robust standard errors in parentheses, except for the interactions with the industry dummies for brevity. Stars (\*\*\*/\*\*/\*) indicate significance at the 1%/5%/10% levels. Sample and variables as described in section IV.

*Source:* Own calculations based on the financial accounts database Dafne 2008-2009.