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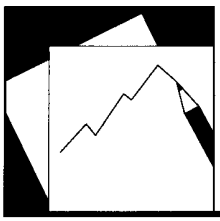

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Taxation and Corporate Debt: Are Banks any Different?

Jost Heckemeyer and Ruud de Mooij

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Taxation and Corporate Debt: Are Banks any Different?

Prepared by Jost Heckemeyer and Ruud de Mooij[1]

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Abstract

This paper explores whether corporate tax bias toward debt finance differs between banks and non-banks, using a large panel of micro data. On average, it finds that there is no significant difference. The marginal tax effect for both banks and non-banks is close to 0.2. However, the responsiveness differs considerably across the size distribution and the conditional leverage distribution. For non-banks, we find a U-shaped relationship between asset size and tax responsiveness, although this pattern does not hold universally across the conditional leverage distribution. For banks, in contrast, the tax responsiveness declines linearly in asset size. Quantile regressions show further that capital-tight banks are significantly less responsive than are capital-abundant banks; the same pattern holds for the largest non-banks. Still, even the largest banks with high conditional leverage ratios feature a significant, positive tax response.

JEL Classification Numbers: G21; G32; H25

Keywords: Corporate tax; debt bias; leverage; banks; non-financial firms; quantile regressions

Author's E-Mail Address: mheckemeyer@uni-mannheim.de; rdemooij@imf.org

[1] Jost Heckemeyer: University of Mannheim, Business School, Schloss, 68131 Mannheim, Germany. Ruud de Mooij: International Monetary Fund (IMF), 700 19th Street, N.W., Washington DC 20431, USA. The authors thank participants at the Annual Symposium of the Oxford University Centre for Business Taxation on June 24-26, 2013, and the IIPF Congress in Taormina on August 22-25 for useful discussions. We especially thank Martin Ruf, Davud Rostam Afschar, Hui Tong, Johannes Voget and Francois Laisney for their helpful comments.

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I. INTRODUCTION

Debt bias reflects a tax distortion for companies to use debt rather than equity to finance investment. It is caused by interest payments being deductible for the corporate income tax (CIT), while equity payments are not. By now, there is ample empirical evidence showing that the CIT indeed affects the capital structure of non-financial companies (Feld et al., 2013; De Mooij, 2011). On average, studies report that the marginal tax effect on the debt-asset ratio ranges between 0.2 and 0.3. Hence, a 10 percentage points higher CIT rate raises the debt-to-asset ratio of companies by somewhere between 2 and 3 percentage points.

However, the existing literature on debt bias has ignored the financial sector. This is surprising as debt bias can potentially be a far greater concern here than elsewhere in the economy due to externalities associated with systemic risk. Indeed, financial institutions may choose inefficiently high levels of debt, as they take no account of the external costs of their own failure on others. By increasing the probability of failure and, subsequently, increasing the risk of contagion through the financial system, high debt ratios in financial institutions can jeopardize the stability of the financial system as a whole. There is evidence that aggregate leverage of the financial sector positively affects the probability of financial crisis (Barrell et al. (2010); Kato, Kobayashi, and Saita (2010); De Mooij, Keen and Orihara (2013)). When tax bias exacerbates existing distortions in the financial system, its welfare loss can be much larger than is the case for debt bias in non-financial firms.

A key question is, therefore, whether banks empirically show the same response to taxes as what has been found for non-financial companies. Only recently, studies have started to explore debt bias in the financial sector empirically. Keen and de Mooij (2012) use a large cross-country panel of banks and find that the CIT significantly raises bank leverage ratios. On average, this effect is about as large as that found for non-banks. However, Keen and De Mooij (2012) also find important differences across different banks. For instance, the effects are much smaller for the largest banks, which generally account for the vast bulk of bank assets, and for banks featuring higher leverage ratios. Hemmelgarn and Teichmann (2013) find similar results, using a different specification and similar data as in Keen and De Mooij (2013). That the elasticity gets smaller with the size of banks is also found by De Mooij, Keen and Orihara (2013), who partition the sample used in De Mooij and Keen (2012) into a larger number of size groups. Finally, Gu, De Mooij and Poghosyan (2012) exploit a panel of subsidiaries of the 100 largest multinational banks. They report significant tax effects on leverage, including through multinational debt shifting across jurisdictions, again with effects that are of broadly similar size as those found for non-banks.

The underlying paper contributes to the empirical literature on debt bias in three important ways. First, we exploit the Worldscope database containing financial data for both banks and

non-banks. This allows us to formally test if there is a significant difference in the tax responsiveness between banks and non-banks.

Second, we explore in detail how firm size affects responsiveness to tax. For banks, Keen and De Mooij (2012) and De Mooij, Keen and Orihara (2013) explore the role of size, but by partitioning the sample into discrete size categories. For non-banks, Gordon and Lee (2001) is the only study that analyzes the importance of size for the tax responsiveness of firms. They use time series data from US tax returns. These data are not reflecting individual firms, but rather aggregate variables for a number of asset size categories. The authors include in their capital-structure regressions an interaction term of the tax variable with a polynomial of this assets size by category. Their results suggest a U-shaped pattern of the elasticity with asset size, suggesting that both very small and very large firms are relatively responsive to tax. This paper follows the approach of Gordon and Lee (2001), but uses micro data on asset size to measure its importance for the tax responsiveness, both of banks and non-banks.

Third, this paper uses quantile regressions to explore whether tax effects differ along the conditional leverage distribution, i.e. conditional on other characteristics of a firm that can affect its debt ratio. For instance, a high initial leverage ratio may reduce the flexibility of a firm to adjust it further due to high marginal costs. For a bank, moreover, a high leverage ratio means that it has a smaller buffer vis-à-vis the capital requirement and, therefore, possibly less room for maneuver in adjusting debt. However, high leverage may also signal easy access to credit and, therefore, may be associated with a high responsiveness to tax. The quantile regressions shed light on these issues for both banks and non-banks.

The rest of this paper is organized as follows. Section II discusses our methodology and data. Section III presents the regression results, including the quantile regressions. Section IV concludes.

II. METHODOLOGY

A. Specification and Estimation

Theoretical underpinnings of capital structure regressions usually originate in agency models or trade-off theories with bankruptcy costs. In those models, firms trade off some non-tax costs of debt finance, with the tax-benefit from debt associated with interest deductibility. The capital structure of banks might be governed by other factors than that of non-financial companies. For example, one might think that taxes matter less for banks than for non-banks because capital requirements restrict banks from having too high debt. However, banks may face similar tax incentives for debt finance as long as it is privately optimal for them to hold some buffer over regulatory requirements—and data suggest that most banks indeed hold such buffers (Keen and De Mooij, 2012). Moreover, bank capital structure regressions

suggest that bank choices of debt are actually very similar to those of non-financial firms (Gropp and Heider, 2010). The difference in the response to tax by banks and non-banks is therefore ambiguous and ultimately an empirical issue.

This paper uses a reduced-form specification that is commonly used in the empirical literature on capital structures, including for banks (Frank and Goyal, 2009; Gropp and Heider, 2010). The strategy is thus to estimate baseline regressions of the form:

$$(1) \qquad lev_{isct} = \beta_1 + \beta_2 \tau_{ct} + \beta_3 \boldsymbol{x}_{ict} + \delta_s + \theta_c + \mu_t + \epsilon_{it}$$

where the subscript i denotes each firm, s is a subscript for each industry, c denotes each country, and t is a subscript for each year. The dependent variable, *lev*, is the leverage-to-assets ratio, τ is the country-specific statutory CIT rate which the firms face, and $\boldsymbol{x}_{ict}$ is a vector of additional controls usually included in capital structure regressions. We also include full sets of time fixed effects μ_t, industry fixed effects δ_s (for the regression of non-banks) and country-fixed effects θ_c. Regarding the additional control variables, (1) includes first the book value of a firm's total assets (in logs) and, in some of the regressions, also its square to allow for size effects. Most studies find that firm size exerts a positive effect on leverage. Second, operating income over total assets is captured in (1) as a measure of profitability. Higher profits add to equity when retained within the firm and thus directly reduce the leverage ratio. Yet, profits may also signal good health of a firm and give them easier access to credit, thus raising the debt ratio. A priori, the effect is thus ambiguous. Third, we include a measure of collateral, namely the share of tangible assets in total assets. For non-banks, capital structure regressions typically find that collateral increases access to external funding and thus lead to higher leverage ratios. The nature of the banking sector and the impact of regulation may produce a different relationship for banks, however. Finally, we control for the growth rate of GDP and the rate of inflation to allow for country-specific variation in macro variables over time. High growth at the country level has no clear theoretical implications for debt ratios and might also control for factors correlated with high growth, such as credit growth. Inflation may lead to higher risk premiums (as it may reveal uncertainty about future price developments and thus unexpected inflation) and discourage debt supply. Yet, as nominal interest is deductible for the CIT, high inflation may also encourage debt finance as it lowers real borrowing costs. The net impact of inflation on leverage is therefore ambiguous.

We estimate our baseline specification (1) and all its modifications by OLS. Thereby, we consider three different samples of data: the sample of non-banks, the sample of banks, and a combined sample of all companies. In the latter, we use bank dummies to distinguish the effects between banks and non-banks. Standard errors are always robust to clustering at the firm level.

We pay special attention to the variation of marginal tax responses according to firm size. Following Gordon and Lee (2001), we add to (1) an interaction of the tax variable with a first or second-order polynomial of log assets. Size may have important implications for corporate governance and risk exposure and, therefore, for tax responsiveness. For example, small firms are more likely to be credit constrained because they suffer more from asymmetric information vis-à-vis lenders. This will not only reduce their leverage, but can also make them less flexible in adjusting leverage ratios at the margin. However, small firms also usually seek credit from insiders in the firm who can be particularly flexible and also more sensitive to tax. Large firms, on the other hand, can issue debt securities, i.e. commercial papers or corporate bonds, on the capital market. This leads to higher debt ratios and could also make them more responsive to tax at the margin. For large banks, moreover, their too-big-to-fail status may render corporate governance relations very different, leading them to choose higher debt ratios. This, by itself, can affect tax responsiveness at the margin of finance. Hence, the impact of firm size on the tax sensitivity of corporate debt is not a priori clear, neither for non-financial companies nor for banks.

Another issue we address is the role of the leverage distribution. If the non-tax cost of debt finance is convex, then profit-maximizing firms will set the linear tax advantage of debt equal to its marginal non-tax cost. The latter will depend on the convexity of the cost function, which may differ between firms. At the margin, the tax response may thus be smaller for companies that already feature high debt ratios, because the cost of debt rises more rapidly. The variation in marginal tax effects along the conditional leverage distribution will be examined by the use of quantile regressions (Koencker and Bassett, 1978; Koencker and Hallock, 2001). These approximate the conditional median or other quantiles, instead of the conditional mean of the dependent variable. On the one hand, this gives more robust estimates, especially if the response measurements are highly skewed (as is the case for banks in our sample). On the other hand, the quantile regression can be used to explore whether tax effects vary along the conditional distribution of leverage, i.e. conditional on all other features of a firm that determine its leverage. Especially financial institutions displaying very high and potentially inefficient leverage ratios can jeopardize the stability of the financial system. It is thus important to learn how tax incentives affect these highly levered banks, rather than only focusing on conditional mean responses. But also for non-banks, excessive levels of debt can add to the destabilization of the economy during times of downturn.

B. Data

Firm-level data are taken from Worldscope, compiled by Thomson Financial. The database contains financial information on public companies from a wide range of industries, countries and years. We use the years between 1996 and 2010. After excluding observations with missing values for required variables, the sample consists of 38,867 firms from

69 countries and totals 336,051 firm-year observations. There are 1,603 banks in the sample contributing 17,227 bank-year observations. Thus, the banks' share in the total number of firms is 4.1 percent and their share in the overall sample of observations is 5.1 percent. Appendix I gives more information about the sample by country.

The data reflect the consolidated accounts of firms. This may be problematic to the extent that the balance sheet and accounts of foreign branches or wholly-owned subsidiaries are included in the data, as the tax rate applying to the parent might not properly reflect the actual tax on the variables in the accounts. However, most countries tax branches on a worldwide basis (and US also taxes subsidiaries on a worldwide basis), so that ultimately the tax rate of the parent matters for the foreign source profit. Moreover, it is the consolidated statements that matter ultimately for the financial stability of a firm. This motivates the use of consolidated statements over unconsolidated ones.

Table 1. Descriptive Statistics

	Sample	Mean	SD	Median	Min	Max
Leverage Ratio	All firms	0.4863	0.2541	0.4924	0	1
	Banks	0.9006	0.0751	0.9130	0	0.9993
	Non-banks	0.4639	0.2408	0.4739	0	1
Corporate income tax rate	All firms	0.3325	0.0830	0.3399	0	0.5725
	Banks	0.3665	0.0723	0.4076	0	0.5725
	Non-banks	0.3307	0.0831	0.335	0	0.5725
Log total assets	All firms	18.7271	2.3667	18.6637	6.9078	29.1844
	Banks	21.4586	2.2345	21.0481	11.8914	29.1844
	Non-banks	18.5795	2.2823	18.5457	6.9078	28.363
Operating income over assets	All firms	0.00643	0.2283	0.0381	-2.5556	0.7459
	Banks	0.0095	0.0331	0.0110	-1.8278	0.5457
	Non-banks	0.0062	0.2342	0.0425	-2.5556	0.7459
Collateral	All firms	0.2920	0.2528	0.2399	0	1
	Banks	0.0189	0.0193	0.0158	0	0.9866
	Non-banks	0.3067	0.2512	0.2595	0	1
GPD growth rate	All firms	0.0599	0.0613	0.0546	-0.1143	0.4298
	Banks	0.0564	0.0544	0.0540	-0.1143	0.4298
	Non-banks	0.0601	0.0616	0.0546	-0.1143	0.4298
Inflation rate	All firms	0.0250	0.0307	0.0219	-0.0623	0.2586
	Banks	0.0278	0.0278	0.0244	-0.0623	0.2586
	Non-banks	0.0249	0.0309	0.0212	-0.0623	0.2586

Note: Number of observations is 336,051 for the full sample including all firms, 17,227 for the sample with banks and 318,824 for the sample with non-banks.

Table 1 presents summary statistics of all variables used in the analysis for the full sample, the subsample of banks, and the subsample of non-banks. There are large differences between banks and non-banks with regard to the average leverage ratio, defined as the ratio of total liabilities to total assets of the firm. The mean leverage ratio of banks is 90 percent,

while that of non-banks is less than 50 percent. Collateral, measured as the share of tangible assets in terms of total assets, is 1.9 percent for banks whereas it is over 30 percent for non-banks. A third important difference between banks and non-banks is the size distribution. Figures 1 and 2 show histograms, and the cumulative distributions of the logarithm of total assets of non-banks and banks, respectively.

Figure 1. Size Distribution of Non-banks
(log of total assets)

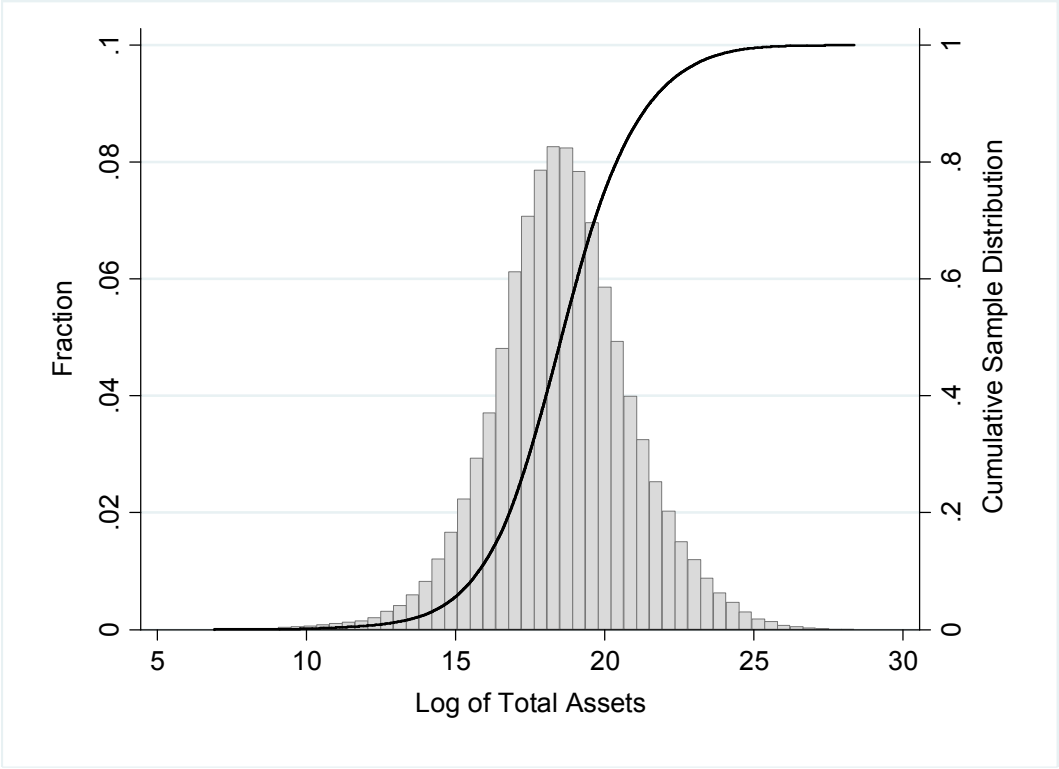
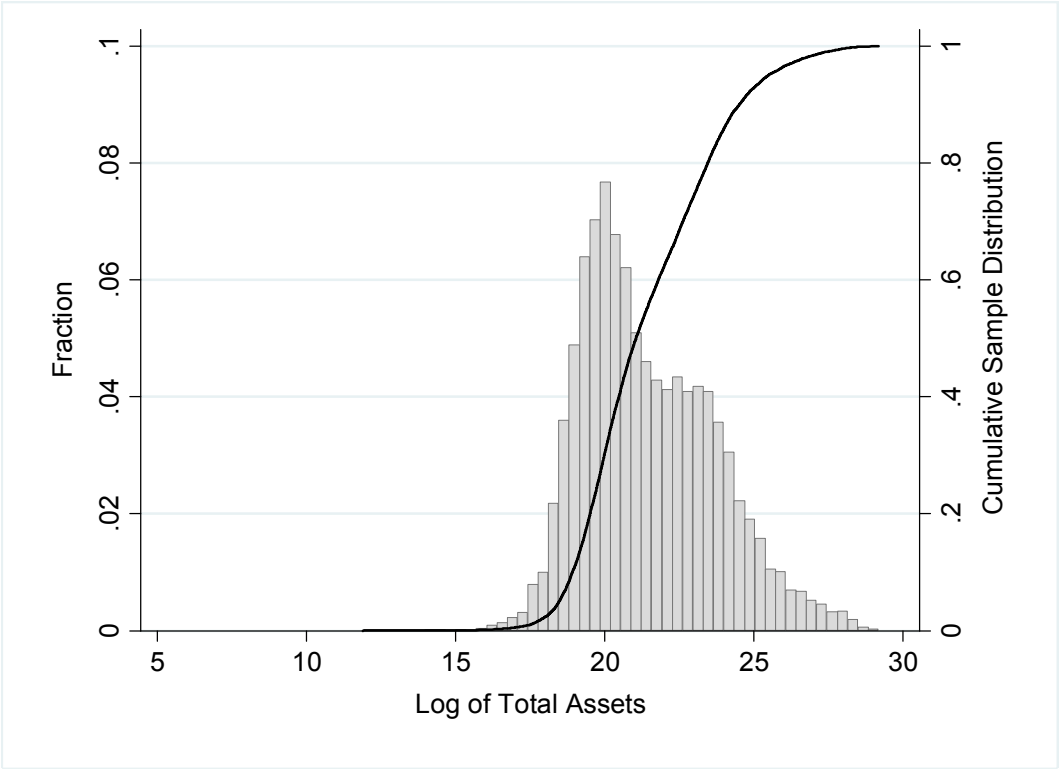


Figure 1 shows that the log of the size distribution of non-banks is close to standard normal. Values are symmetrically dispersed around the mean log of assets of 18.58 (US$ 117 million). Some 25 percent have a log of total assets below 17.16 (US$ 28 million) whereas the 75 percent quantile is at 20 (US$ 482 million). The 1 percent and 5 percent quantiles are, respectively, at 12.66 and 14.84 (US$ 316 thousand and US$ 2.8 million). The 95 percent and 99 percent quantiles are, respectively, at 22.47, and 24.29 (US$ 5.8 billion; and US$ 35.4 billion).

Banks are generally larger than non-banks. The mean log of assets of banks is 21.45 (US$ 2.1 billion). Moreover, Figure 2 shows a skewed size distribution for banks, with few small banks. The 1 percent and 5 percent quantiles are at, respectively, 17.5 and 18.47 (US$ 40 million; US$ 105 million). The right tail is rather long with numerous large

and very large banks in the sample. The 90 percent, 95 percent, and 99 percent quantiles are, respectively, 24.5, 25.48, and 27.37 (US$ 44 billion, US$ 116 billion, and US$ 771 billion).

Figure 2. Size Distribution of Banks
(log of total assets)



III. RESULTS

We now regress (1) on three samples: (i) non-banks; (ii) banks; and (iii) the overall sample. Subsequently, we present results from quantile regressions.

A. Non-banks

Regression results for the sample of non-banks are displayed in Table 2. Column (1) shows the estimated tax coefficient from a simple regression of the leverage ratio on statutory CIT rates, thereby excluding fixed effects. Column (2) augments this specification by time, country and industry fixed effects. Column (3) adds firm size (measured by the log of total assets) as explanatory variable. Column (4) adds operating income over total assets, and collateral, measured in terms of tangibility. Moreover, it includes an interaction of log assets with the CIT rate. Column (5) then adds the macroeconomic variables: GDP growth and inflation. Column (6) adds a quadratic polynomial of firm size to allow for nonlinear size effects, and also includes an interaction of that with the CIT rate.

All tax coefficients reported in columns (1) – (3) are statistically significant at the one percent level. The estimated marginal tax effect on the leverage ratio is between 0.34 in column (1) and 0.2 in column (3). The latter means that the leverage ratio rises by 2 percentage points if the CIT rate increases by 10 percentage points.

Table 2. Capital Structure Regressions for Non-banks

	(1)	(2)	(3)	(4)	(5)	(6)
CIT rate	0.3411***	0.2172***	0.1974***	-0.0428	-0.0354	2.9103***
	(26.6995)	(9.3032)	(8.7968)	(-0.4142)	(-0.3429)	(5.7188)
Log assets			0.0269***	0.0258***	0.0259***	0.1036***
			(58.2108)	(13.7773)	(13.7931)	(5.1685)
Log assets sq.						-0.0021***
						(-3.8456)
Log assets * CIT				0.0122**	0.0121**	-0.3050***
				(2.3015)	(2.2837)	(-5.5942)
Log assets sq * CIT						0.0084***
						(5.7757)
Profitability				-0.1110***	-0.1111***	-0.1010***
				(-34.0219)	(-34.0476)	(-30.5079)
Collateral				0.0629***	0.0628***	0.0643***
				(14.3610)	(14.3548)	(14.6414)
GDP growth					0.0324**	0.0307**
					(2.5546)	(2.4233)
Inflation					-0.0813***	-0.0828***
					(-3.7410)	(-3.8085)
Constant	0.3511***	0.4135***	-0.0811***	-0.0766**	-0.0797**	-0.8052***
	(84.1645)	(37.3479)	(-5.9958)	(-2.0668)	(-2.1491)	(-4.2965)
Tax effects (at sample mean size)	**0.3411*** (26.6995)**	**0.2172*** (9.3032)**	**0.1974*** (8.7968)**	**0.1845*** (8.25)**	**0.1901*** (8.43)**	**0.1469*** (6.21)**
Time dummies	No	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	Yes	Yes	Yes	Yes	Yes
No. of obs	318,824	318,824	318,824	318,824	318,824	318,824
Adj. R-squared	0.0139	0.171	0.222	0.234	0.234	0.236

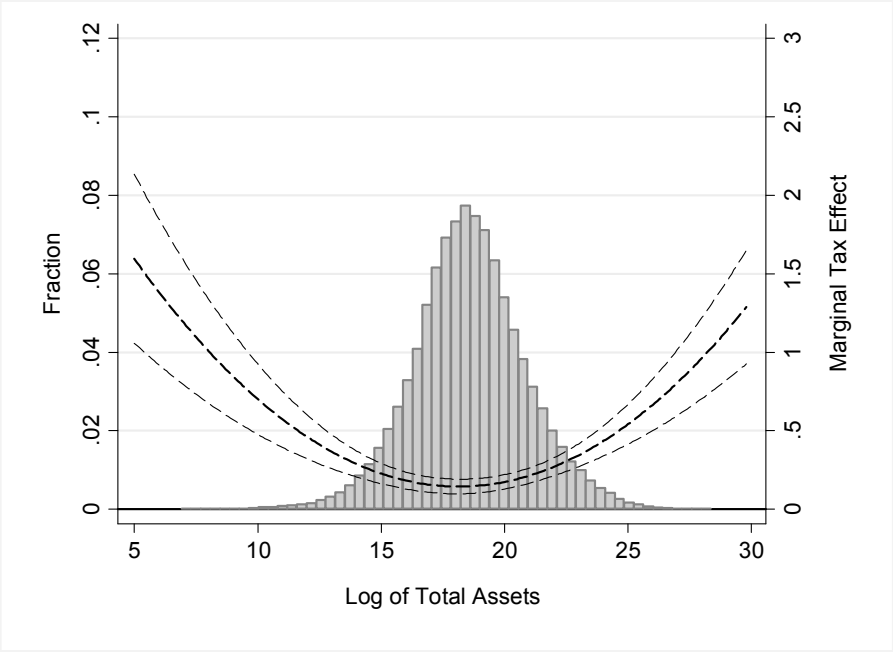
Columns (4) and (5) of Table 2 examine whether the responsiveness of corporate debt to tax varies with firm size. We see that the direct tax coefficient is negative, but the interaction of the CIT rate with log assets positive and significant at 5 percent. Hence, the debt ratio in larger firms tends to be more responsive to the CIT rate than in smaller firms. The estimated marginal tax effect evaluated at the sample mean of the log of total assets is 0.18 and 0.19 in

the two columns (t-values of 8.25 and 8.43, respectively), i.e., close to the marginal coefficient in column (3).

Column (6) shows results with an interaction of the tax rate and a quadratic polynomial of log assets. All tax terms are significant at 1 percent confidence. Using point estimates from column (6) and evaluating the outcome at the sample mean of log assets, the marginal tax effect is 0.15 and statistically significant (t-value: 6.21).

Using regression (6) of Table 2, Figure 3 shows how the point estimate of the marginal tax effect varies along the size distribution of firms. It also shows the 95 percent confidence interval. The positive coefficient for the quadratic interaction of size and the CIT rate implies a convex shape of this curve. Hence, both very small and very large firms feature relatively large tax responses, while intermediate firms features relatively small tax responses. Over the most relevant range of the size distribution, however, the tax response is always smaller than 0.5. Indeed, 99 percent of the firms feature a tax coefficient below 0.5. Only for firms with log assets below 11.62 (asset value of US$ 111 thousand) and those with log assets exceeding 24.68 (asset value of US$ 52.3 billion) we find a marginal tax response larger than 0.5. In terms of asset value, however, the very large firms with log assets exceeding 24.68 are important as they own approximately 45.8 percent of the total assets in our sample of non-banks.

Figure 3. Marginal Tax Effect on the Leverage Ratio along the Size Distribution of Non-banks



The increasing responsiveness of the very large firms may be due to their easy access to credit. The result is similar to that found by Gordon and Lee (2001), who use time series data

for the US. They, however, attribute their finding to possible erroneous measurement of the tax incentive for intermediate-sized firms, rather than to differential access to credit. In particular, the US applied differential CIT rates to firms and the measurement of the appropriate rate of CIT applying to intermediate sized firms might have been misspecified. In our sample, however, the large majority of firms is subject to a proportional CIT regime so that measurement error with respect to a firm's tax incentives, on average, is unlikely to vary with firm size. Consequently, it seems unlikely that the pattern observed in Figure 3 is caused by measurement error.

Looking at non-tax factors, firm size itself in columns (3) – (6) exerts a significant positive effect on leverage. Profitability in columns (4) – (6) always exerts a significant negative effect on leverage, reflecting the rise in equity as a result of higher retained earnings. Collateral in columns (4) – (6) appears with an expected positive coefficient, significant at 1 percent. In columns (5) and (6), GDP growth is associated with an increase in corporate debt, while the effect of inflation is negative.

B. Banks

Regression results for banks are displayed in Table 3. The sequence of specifications is the same as for non-banks in Table 2. The tax coefficients reported in columns (1) – (3) are statistically significant at the one percent level. The magnitude of the tax response is between 0.06 and 0.14, i.e. slightly lower than for non-banks in Table 2. The coefficient in column (3) means, for example, that the leverage ratio of banks rises by approximately 1.3 percentage points if the marginal tax rate increases by 10 percentage points.

Columns (4) and (5) add an interaction of tax and bank size. The significant negative coefficient of the interaction term (at 5 percent confidence) suggests that the marginal tax effect on banks' leverage ratio is a decreasing function of bank size. This is opposite from non-banks, where we find a positive relationship. It is, however, consistent with the results in Keen and De Mooij (2012). Evaluated at the sample mean of bank size, the estimated marginal tax effect on the leverage ratio is 0.20 in column (4) (t-value: 4.53) and 0.21 in column (5) (t-value: 4.66). This is larger than in columns (1) – (3) and very similar to the marginal impact that we find for an average non-bank.

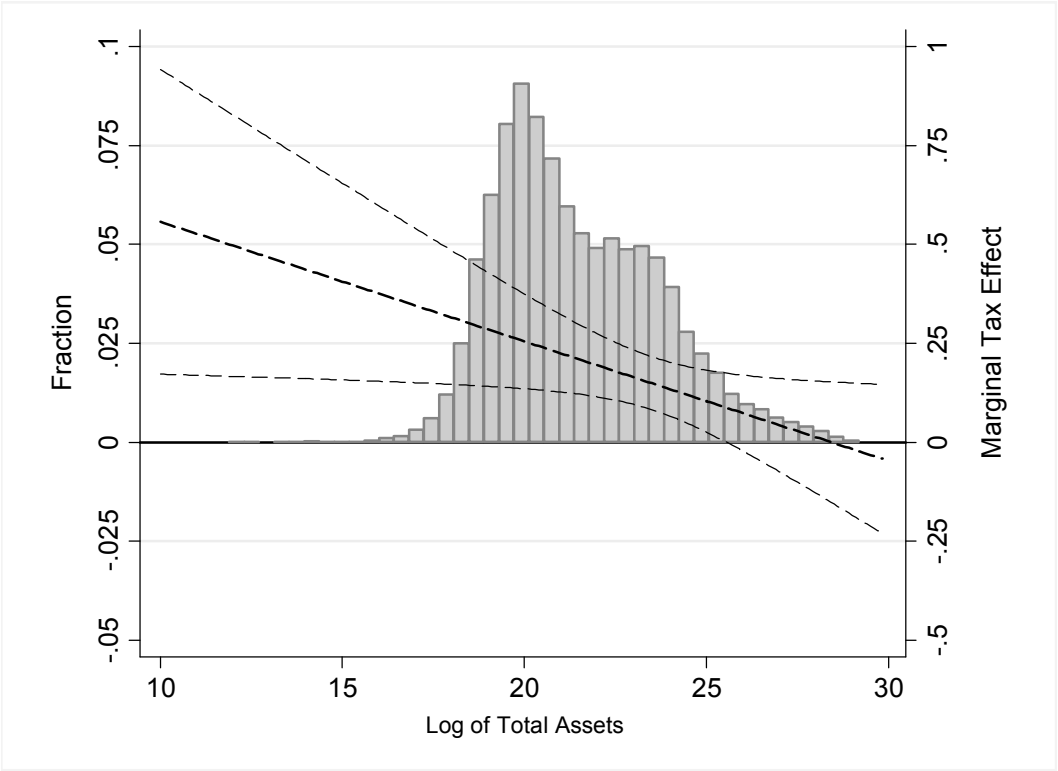
Column (6) of Table 3 shows the outcomes of a second-order polynomial of size, interacted with the tax rate. None of the individual tax coefficients are significant, including that for the interaction with the log of size squared. The combined tax effect of the three tax terms together, however, is significant over an important range. However, over the relevant range of the size distribution, the very small coefficient for the quadratic interaction terms suggests that the relationship between bank size and the tax effect is close to linear. For this reason, we prefer the linear interaction according to regression (5) to illustrate the relationship of bank size and tax responsiveness.

Table 3. Capital Structure Regressions for Banks

	(1)	(2)	(3)	(4)	(5)	(6)
CIT rate	0.0555***	0.1377***	0.1323***	0.8437**	0.8598**	1.6657
	(3.1480)	(3.5873)	(3.9370)	(2.5052)	(2.5406)	(0.7299)
Log assets			0.0157***	0.0254***	0.0255***	0.1840**
			(9.8095)	(4.4332)	(4.4447)	(2.4194)
Log assets sq.						-0.0032**
						(-1.9883)
Log assets * CIT				-0.0298**	-0.0302**	-0.0562
				(-2.0932)	(-2.1144)	(-0.2879)
Log assets sq * CIT						-0.0005
						(-0.1212)
Operating income				0.0485	0.0484	-0.0794
				(0.4232)	(0.4215)	(-0.7622)
Collateral				-0.3956***	-0.3945***	-0.2533*
				(-2.6888)	(-2.6817)	(-1.7958)
GDP growth					-0.0004	0.0253
					(-0.0152)	(0.9981)
Inflation					-0.0590	-0.0733*
					(-1.3865)	(-1.8346)
Constant	0.8803***	0.8358***	0.5247***	0.2918**	0.2873**	-1.6300*
	(128.5356)	(51.6186)	(13.1783)	(2.1548)	(2.1146)	(-1.8208)
Tax effects (at sample mean size)	**0.0555*** (3.1480)**	**0.1377*** (3.5873)**	**0.1323*** (3.9370)**	**0.2033*** (4.53)**	**0.2108*** (4.66)**	**0.2277*** (5.75)**
Time dummies	No	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	Yes	Yes	Yes	Yes	Yes
No. of obs	17,227	17,227	17,227	17,227	17,227	17,227
Adj. R-squared	0.00280	0.120	0.226	0.238	0.238	0.300

Figure 4 shows how the marginal tax effect varies with bank size according to regression (5). The negative coefficient for the interaction term implies a downward slope, i.e., the tax effect is largest for small banks, with a marginal impact close to 0.5. The effect gradually falls and becomes insignificant for banks with log assets of 25 (total assets of US$ 72 billion). This applies to the 7.1 percent largest banks. For them, Figure 4 shows that the point estimate becomes negative, but due to very large standard errors, the effect is insignificant. For the median bank (log assets 21.0), the marginal coefficient is 0.22 (t-value of 4.53).

Figure 4. Marginal Tax Effect on the Leverage Ratio along the Size Distribution of Banks
(based on interaction with 1st order polynomial of size)



According to regressions (3) – (6) in Table 3, non-tax factors affect the leverage ratio of banks differently than for non-banks. Size itself enters with a positive coefficient, as is the case for non-banks. Profitability, however, does not exert a significant effect on bank leverage. This contrasts with non-banks where profitability enters with a significant negative sign. Collateral has a different interpretation for banks than it has for non-banks, and its negative coefficient does not necessarily reflect the usual role collateral has for debt ratios for non-banks (where it enters positively). GDP growth and inflation arise with insignificant coefficients.

C. Banks and Non-Banks

Regressions on the sample of all firms, including banks and non-banks, are presented in Table 4. It only displays results for the tax variables and their interactions with size, not for the control variables (which are all included in the regression, but not shown).

Column (1) only includes the CIT rate variable and no interactions with size, nor does it include bank dummies. Since non-bank observations dominate the sample, the tax coefficient of 0.19 reported in column (1) is close to that in Table 3.

Column (2) introduces a bank dummy, which takes value one for banks and zero for non-banks. The bank dummy as well as (1 – bank dummy) is interacted with all control variables, so that the estimated coefficients are allowed to differ between banks and non-banks. The coefficient of the interaction of the tax variable with the bank dummy in column (2) is 0.07, reflecting the average response by banks. The interaction with (1 – bank dummy) is 0.19, which reflects the average response for non-banks. Hence, the response for banks is, on average, smaller than that for non-banks in this regression.

Column (3) adds a linear interaction of asset size and the tax variable, both for banks and non-banks. As before, we find a significant positive interaction for non-banks, i.e., larger firms are more responsive to tax than smaller firms. For banks, however, column (3) suggests a negative correlation, i.e. larger banks are less responsive to tax than smaller banks. Again, this is consistent with our findings in Tables 2 and 3. Column (4) adds an interaction of the tax with asset size in quadratic form, both for banks and non-banks. As before, we find that the interaction for non-banks is convex, due to the significant positive coefficient for the quadratic size term. For banks, the coefficient is insignificant and very small.
Column (5) only includes a non-linear size effect for non-banks, which is our preferred specification.

Table 4. Capital Structure Regressions for the Full Sample of Banks and Non-banks

	(1)	(2)	(3)	(4)	(5)
CIT rate	0.1873***				
	(8.7099)				
(1-Bank) * CIT		0.1933***	-0.0354	2.9103***	2.9103***
		(8.6134)	(-0.3429)	(5.7181)	(5.7182)
Bank * CIT		0.0695**	0.8598**	1.6657	0.8598**
		(2.2107)	(2.5466)	(0.7317)	(2.5466)
(1-Bank) * Log assets * CIT			0.0121**	-0.3050***	-0.3050***
			(2.2834)	(-5.5936)	(-5.5936)
Bank * Log assets * CIT			-0.0302**	-0.0562	-0.0302**
			(-2.1194)	(-0.2886)	(-2.1194)
(1-Bank) * Log assets sq * CIT				0.0084***	0.0084***
				(5.7750)	(5.7750)
Bank * Log ass. sq *CIT				-0.0005	
				(-0.1215)	

Notes: The table shows results from regressions of the leverage-to-assets ratio of banks and non-banks on firm and country variables. All regressions are from OLS estimation. T-values based on standard errors robust to clustering at the firm-level are in parentheses; ***, **, * denotes significance at the 1%, 5%, 10% level. Regressions control for operating income, collateral, GDP growth and inflation. All regressions include time dummies and industry fixed effects. Regressions in columns (2), (3), (4), and (5) include interactions between the bank dummy and the full set of capital structure determinants. The full regression results are given in Appendix II.

Table 5. Testing Equivalence of Tax Effects for Non-banks and Banks Across the Bank Size Distribution

Sample means	Mean non-bank log assets:18.58 ~US$ 117.4 million Mean bank log assets: 21.45 ~US$ 2.1 billion	Non-banks	0.1469*** (6.21)
		Banks	0.2108*** (4.67)
		F-Statistic Prob > F	1.57 (0.21)
Bank size Q10	Log assets: 18.91 ~ US$ 163.9 million (Non-bank size Q57)	Non-banks	0.1504*** (6.38)
		Banks	0.2878*** (3.88)
		F-Statistic Prob > F	3.11 (0.0778)
Bank size Q25	Log assets: 19.76 ~ US$ 379.9 million (Non-bank size Q71.9)	Non-banks	0.1674*** (7.13)
		Banks	0.2624*** (4.11)
		F-Statistic Prob > F	1.95 (0.1626)
Bank size Q50	Log assets: 21.05 ~ US$ 1.4 billion (Non-bank size Q86.9)	Non-banks	0.2167*** (8.65)
		Banks	0.2233*** (4.54)
		F-Statistic Prob > F	0.01 (0.9055)
Bank size Q75	Log assets: 23.04 ~ US$ 10.2 billion (Non-bank size Q96.9)	Non-banks	0.3479*** (9.25)
		Banks	0.1630*** (4.69)
		F-Statistic Prob > F	13.03 (0.0003)
Bank size Q90	Log assets: 24.51 ~ US$ 44.1 billion (Non-bank size Q99.3)	Non-banks	0.4872*** (8.58)
		Banks	0.1186*** (3.23)
		F-Statistic Prob > F	29.72 (0.0000)
Bank size Q95	Log assets: 25.48 ~ US$ 116.3 billion (Non-bank size Q99.8)	Non-banks	0.5991*** (8.14)
		Banks	0.0892** (2.03)
		F-Statistic Prob > F	35.39 (0.0000)

Notes: The table shows the joint marginal tax effects on the leverage-to-assets ratio from regression (5) of Table 4. Joint effects are computed as linear combinations of the estimated CIT coefficient and the coefficients of the interactions between tax and firm size, evaluated at different points of the sample distribution of firm size (log of total assets). Standard errors are calculated according to the delta method. T-values are given in parenthesis. ***, **, * denotes significance at the 1%, 5%, 10% level.

The regressions with the full sample allow for a series of F-tests to see whether the null of equal marginal tax effects between banks and non-banks is rejected or not. Table 5 shows the marginal impact evaluated at different points of the size distribution, based on our preferred regressions (5) in Table 4. It reports the F-test statistics and the associated p-values, reflecting the error probability of rejecting the null of equal marginal tax effects. The first row of Table 5 evaluates the joint tax effect at the respective sample means of banks and non-banks (i.e. log assets of 18.6 for non-banks, and 21.5 for banks). Here, the tax effect for banks is larger than for non-banks: 0.21 and 0.15, respectively. The p-value of the F-test on equality is 0.21, and thus cannot reject equality of coefficients between banks and non-banks.

The other rows in Table 5 evaluate the tax effects at six different quantiles of the size distribution of banks: Q10, Q25, Q50 (the median), Q75, Q90 and Q95 quantiles. For each quantile, we evaluate whether equally sized non-banks differ with respect to tax sensitivity. As the bank size distribution in our sample differs from the size distribution of non-banks, the left-hand column of Table 5 gives, for each bank-size quantile considered, information on the corresponding asset size of non-banks (in logs and levels) and on the relative position in the non-bank distribution. For example, Q10 of the bank size distribution has log assets of 18.9 (US$ 164 million), while non-banks of the same size find themselves at Q57 of the non-bank size distribution.[2]

Table 5 cannot reject the null of equivalence between banks and non-banks for quantiles Q10, Q25 and Q50. For the latter, the point estimates are in fact very similar: both 0.22 and significant. For larger firms, the response of non-banks starts to become larger than for banks, as the difference in tax sensitivity between banks and non-banks increases in size. Equivalence is rejected for firms as of Q75 of the bank-size distribution. At Q95 of the bank size distribution, the tax effect for an equally large non-bank is estimated at 0.6, compared to 0.09 (and still significant at the 5 percent level) for a bank.

D. Quantile Regressions

The OLS regressions estimate the conditional mean response of financial leverage to taxes. Tax responses might, however, vary significantly over the leverage distribution. For instance, Keen and De Mooij (2012) find that tax responses are much smaller for capital-tight banks than for capital-abundant banks. The conditional mean effect estimated by OLS may thus reflect a response that comes primarily from the capital-abundant banks. In particular, if policy implications are to be drawn from the empirical findings, it seems to make much sense to look at the tax effects on the debt policy of those firms, which tend to give debt financing a

[2] Note that small banks, e.g. at the 1% quantile of the bank size distribution, show log asset values which are as high as the 25% quantile of the size distribution of non-banks. This means that, compared to non-banks, even relatively small banks are at least medium-sized firms. It is therefore impossible to draw any conclusion on whether *small non-banks* are more or less responsive to tax than equally sized banks – because there a no comparably sized banks.

relatively high weight in their capital structures. To explore this for both banks and non-banks, this section uses quantile regressions. The aim is to estimate the conditional quantile responses, such as the conditional median (Q50) or other quantile responses.[3]

Tables 6 and 7 show the quantile regression results of the tax impact for both non-banks and banks. In Table 6 for non-banks, we use the regression whereby the interaction is with a second-order polynomial of size (our preferred model); in Table 7 for banks, we use the preferred regression with a linear size interaction. The quantiles of the conditional leverage distribution explored here are Q10, Q50, Q75 and Q90. Due to the importance of asset size, we evaluate each quantile regression at three quantiles of firm size of the sample for non-banks and banks, respectively: Q10, Q50 and Q90. Eventually, we obtain a matrix in which rows reflect size, and columns reflect quantiles of the conditional distribution of the leverage ratio.

Table 6. Tax Effects from Quantile Regression for Non-banks—Interaction of Tax and Second-order Polynomial of Size

Join tax effects evaluated at		**Quantiles of the conditional distribution of leverage ratio**				F-test of equality across quantiles of leverage
		Q10	**Q50**	**Q75**	**Q90**	Q10 = Q90
Non-bank size Q10 Log assets: 15.77 ~ US$ 7.1 million		0.0340 (1.48)	0.2103*** (7.43)	0.2898*** (9.66)	0.2791*** (11.03)	55.53 (0.0000)
Non-bank size Q50 Log assets: 18.55 ~ US$ 113.7 million		0.1031*** (4.28)	0.1410*** (6.05)	0.1855*** (7.96)	0.2133*** (9.74)	12.28 (0.0005)
Non-bank size Q90 Log assets: 21.50 ~ US$ 2.2 billion		0.2452*** (9.44)	0.2448*** (10.37)	0.1957*** (8.24)	0.1449*** (6.61)	9.85 (0.0017)
F-test of equality across quantiles of size	Q10 = Q90	175.71 (0.0000)	2.75 (0.0975)	14.65 (0.0001)	40.64 (0.0000)	

Notes: The marginal tax effects shown in this table are from quantile regressions for non-banks estimating the response of the conditional Q10, Q50, Q75, Q90 leverage-to-assets ratio to company and country level determinants, using interactions between the CIT rate and a second order polynomial of size. In addition, regressions control for operating income, collateral, GDP growth and inflation. All regressions include time dummies, country dummies and industry fixed effects. T-values based on bootstrapped cluster robust standard errors (100 replications) are in parenthesis. Results for F-tests of equality of tax effects across the 10% and 90% quantiles of, respectively, size or conditional leverage-to-assets show test statistics and associated p-values. The full regression results are given in Appendix III.

[3] OLS estimates the conditional expectation by minimizing the sum of squared residuals. Quantile regression minimizes the sum of (asymmetrically weighted) absolute residuals (Koencker and Bassett, 1978; Koencker and Hallock, 2001).

The quantile regressions reflect a response of the conditional leverage distribution. That is, given all characteristics of a firm that affect its leverage, there remains a distribution of firms along which we can evaluate the tax response. The quantiles refer to this conditional distribution, not an unconditional one.

In Table 6 for non-banks, we observe a fall and rise of values when we go down along the columns. For quantiles Q50, Q75 of the conditional leverage distribution (columns (3) and (4)), there is a convex relationship between asset size and the tax coefficient of non-banks, i.e. tax effects are smallest for Q50 of the size distribution. For Q10 of the conditional leverage distribution (column (2)), however, the relationship monotonically increases in asset size; for Q90 (column (5)), it monotonically decreases. Hence, the convex relationship observed in Figure 3 does not hold universally along the conditional leverage distribution. The F-test at the bottom of Table 6 rejects equivalence of tax effects between size Q10 and Q90 for all conditional quantiles, with significance at the 10 percent level. At 5 percent confidence, however, equivalence is not rejected for Q50 of the conditional leverage distribution.

Table 7. Tax Effects from Quantile Regression for Banks—Interaction of Tax and First-order Polynomial of Size

Join tax effects evaluated at		**Quantiles of the conditional distribution of leverage ratio**				F-test of equality across quantiles of leverage
		Q10	**Q50**	**Q75**	**Q90**	Q10 = Q90
Bank size Q10 Log assets: 18.91 ~ US$ 163.9 million (Non-bank size Q57)		0.3119*** (5.85)	0.1434*** (9.65)	0.1207*** (7.97)	0.0999*** (7.54)	15.65 (0.0001)
Bank size Q50 Log assets: 21.05 ~ US$ 1.4 billion (Non-bank size Q86.9)		0.2416*** (5.69)	0.1124*** (9.85)	0.0960*** (8.42)	0.0731*** (6.90)	15.41 (0.0001)
Bank size Q90 Log assets: 24.51 ~ US$ 44.1 billion (Non-bank size Q99.3)		0.1274*** (4.26)	0.062*** (6.64)	0.0559*** (6.66)	0.0297*** (2.81)	9.73 (0.0018)
F-test of equality across quantiles of size	Q10 = Q90	26.68 (0.0000)	39.34 (0.0000)	25.69 (0.0000)	29.77 (0.0000)	

The marginal tax effects shown in this table are from quantile regressions for banks estimating the response of the conditional Q10, Q50, Q75, Q90 leverage-to-assets ratio to bank and country level determinants, using interactions between the CIT rate and a first order polynomial of size. In addition, regressions control for operating income, collateral, GDP growth and inflation. All regressions include time dummies and country dummies. T-values based on bootstrapped cluster robust standard errors (100 replications) are in parenthesis. Results for F-tests of equality of tax effects across the 10% and 90% quantiles of, respectively, size or conditional leverage-to-assets show test statistics and associated p-values. The full regression results are given in Appendix III.

Next, look along the rows of Table 6. For a non-bank of median size, i.e., Q50, the tax response rises along the conditional leverage distribution, i.e., the conditionally more leveraged firms are more responsive to tax. This also holds for some range of the smaller firms at size Q10, although the firms with the highest conditional leverage ratio (Q90) are slightly less responsive than at Q75. For the large firms, however, the pattern is opposite: here, higher conditional leverage ratios reduce the firm's responsiveness to tax. The F-tests in the final column of Table 6 also rejects that the tax effects of Q10 and Q90 of the conditional leverage distribution are equivalent, which holds for all size groups.

Overall, these results in Table 6 suggest that the biggest tax responses are found for (i) large firms, but with a relatively low conditional leverage ratio; (ii) small firms, but with a relatively high conditional leverage ratio. The smallest tax responses are found for (i) small firms with a relatively low conditional leverage ratio; (ii) large firms with very high conditional leverage.

In Table 7, we see that the tax response for banks falls with asset size for all conditional leverage quantiles. This is due to the restriction that size is only interacted linearly with the tax rate (although we find the same outcome if we include a second-order polynomial for this interaction). Hence, the larger the bank, the smaller is the tax response. The F-test at the bottom of Table 7 rejects equivalence of the responses between size groups for all conditional quantiles of the leverage distribution.

Considering the rows of Table 7, we see a consistent pattern that the tax response declines with the conditional leverage ratio. Hence, banks are always less responsive to tax when they have high conditional leverage to start with, irrespective of whether they are small or large. The F-test in the final column suggests further that the difference between Q10 and Q90 of the conditional leverage distribution is always significant. For the largest banks with the highest conditional leverage ratio at Q90, we still find that the tax response is positive and significant: the marginal impact is 0.03 for these banks.

IV. CONCLUSIONS

This paper finds that tax bias toward debt finance induced by corporate tax systems matters for both banks and non-banks. Our preferred specification suggests that an average bank is equally responsive to tax incentives as an average non-bank.

Tax responses vary in different ways between banks and non-banks across the size distribution. For non-banks, OLS regressions find a U-shaped pattern between asset size and the responsiveness to tax. For banks, in contrast, we find a linearly declining relationship of

the tax response with asset size. Hence, while large firms are relatively responsive to tax, large banks are not.

Quantile regressions show further that capital-tight banks on the conditional leverage distribution are significantly less responsive than are capital-abundant banks. The result holds for banks of all sizes. Still, even the largest banks with high conditional leverage ratios feature a significant, positive tax response. For non-banks, patterns of tax responsiveness vary on the conditional leverage distribution, with the largest response found for small firms with high conditional leverage and large firms with low conditional leverage. Unlike small firms and banks, for large firms and banks the pattern of tax responsiveness along conditional leverage distribution is similar.

Appendix I. Data by Country

Table A-1 depicts the geographical distribution of all firms and associated firm-year observations in our sample. Moreover, the table indicates, for each country, the number of years with observations. For 42 of the 70 countries covered, there is data for all years from 1996 to 2010. In 28 countries, the number of years of data falls below the full sample period. With respect to the geographical distribution, the United States makes up more than 20 percent of all observations. Taken together the US, Japan, China, Canada, Taiwan and India account for more than 52 percent. Adding firm-years observed for Korea, Australia, UK, Hong Kong, Malaysia, Germany and France covers more than 76 percent of the observations.

Table A-1. Sample Composition by Countries

	Number of						Number of				
Country	Years	All firms	Banks	Firm-years	Bank-years	Country	years	All firms	Banks	Firm-years	Bank-years
Argentina	15	92	8	998	91	Lithuania	8	31	2	142	12
Australia	15	1,700	7	12,464	104	Luxembourg	15	35	1	305	15
Austria	15	88	7	1,012	99	Macedonia	5	30	4	139	19
Bahrain	2	44	14	87	28	Malaysia	15	928	10	9,195	147
Barbados	6	2		9		Malta	6	18	4	104	24
Belgium	15	142	4	1,588	43	Mauritius	6	36	2	197	11
Bermuda	2	1		2		Netherlands	15	124	1	1,562	12
Brazil	15	191	5	1,497	55	New Zealand	15	135		1,136	
Bulgaria	7	255	4	1,363	24	Norway	15	218	23	2,027	289
Canada	15	2795	11	17,478	143	Pakistan	8	279	21	1,677	142
Cayman	8	8		46		Peru	15	146	12	1,260	108
Chile	15	201	7	2,273	92	Philippines	15	230	13	2,389	183
China	14	2,241	17	17,700	136	Poland	15	440	16	2,943	186
Colombia	15	62	8	502	83	Portugal	15	56	4	668	60
Croatia	6	105	10	604	60	Romania	6	151	3	862	18
Cyprus	8	124	4	704	24	Russia	11	543	18	3,138	112
Czech Rep.	15	16	1	166	15	Saudi Arabia	8	148	11	707	66
Denmark	15	203	32	2,164	423	Serbia	3	101	12	300	36
Estonia	8	15		80		Singapore	15	724	3	6,493	45
Finland	15	121	3	1,573	41	Slovakia	15	25	4	172	34
France	15	788	21	8,602	274	Slovenia	10	53	2	307	12
Germany	15	997	11	9,791	141	South Africa	15	330	7	3,341	81
Greece	15	262	11	3,006	141	Spain	15	152	11	1,741	120
Hong Kong	15	1,254	8	11,839	110	Sri Lanka	15	219	14	1,381	122
Hungary	15	45	1	397	15	Sweden	15	455	4	4,026	60
Iceland	9	6		42		Switzerland	15	268	26	3,142	356
India	15	2,399	40	14,929	386	Taiwan	15	1,689	20	15,371	230
Indonesia	13	420	29	3,695	268	Thailand	15	517	11	5,440	150
Ireland	15	49	2	584	30	Turkey	7	335	17	2,079	119
Israel	15	471	10	3,097	113	UK	15	1,530	9	13,684	92
Italy	15	269	19	2,999	276	Ukraine	8	80	8	404	47
Japan	15	3,587	93	43,405	1,222	USA	15	8,369	878	67,209	9,579
Kazakhstan	6	35	12	198	66	Venezuela	7	38	10	213	52
Korea	15	1,695	15	14,237	150	Vietnam	8	720	8	3,014	35
Latvia	5	31		152							
						Total	**15**	**39,867**	**1,603**	**336,051**	**17,227**

Appendix II. Regressions on the Full Sample of Non-banks and Banks

Table A-2. Capital Structure Regressions for the Full Sample of Banks and Non-banks

	(1)	(2)	(3)	(4)	(5)
CIT rate	0.1873***				
	(8.7099)				
(1-Bank) * CIT		0.1933***	-0.0354	2.9103***	2.9103***
		(8.6134)	(-0.3429)	(5.7181)	(5.7182)
Bank * CIT		0.0695**	0.8598**	1.6657	0.8598**
		(2.2107)	(2.5466)	(0.7317)	(2.5466)
Log assets	0.0197***				
	(5.4182)				
(1-Bank) *Log assets		-0.0061	0.0259***	0.1036***	0.1036***
		(-1.4739)	(13.7915)	(5.1679)	(5.1679)
Bank * Log assets		0.1447***	0.0255***	0.1840**	0.0255***
		(8.8900)	(4.4553)	(2.4253)	(4.4553)
Log assets sq.	0.0002**				
	(2.4538)				
(1-Bank) *Log assets sq.		0.0010***		-0.0021***	-0.0021***
		(8.6538)		(-3.8451)	(-3.8451)
Bank * Log assets sq.		-0.0030***		-0.0032**	
		(-8.2326)		(-1.9931)	
Log assets * CIT					
(1-Bank) * Log assets * CIT			0.0121**	-0.3050***	-0.3050***
			(2.2834)	(-5.5936)	(-5.5936)
Bank * Log assets * CIT			-0.0302**	-0.0562	-0.0302**
			(-2.1194)	(-0.2886)	(-2.1194)
Log assets sq * CIT					
(1-Bank) * Log assets sq * CIT				0.0084***	0.0084***
				(5.7750)	(5.7750)
Bank * Log ass. sq *CIT				-0.0005	
				(-0.1215)	
Operating Income	-0.1012***				
	(-30.5968)				

Table A-2 (continued)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
(1-Bank) * Operating Income		-0.1009***	-0.1111***	-0.1010***	-0.1010***
		(-30.5312)	(-34.0437)	(-30.5043)	(-30.5044)
Bank * Operating Income		-0.0729	0.0484	-0.0794	0.0484
		(-0.6979)	(0.4225)	(-0.7640)	(0.4225)
Collateral	0.0651***				
	(14.8541)				
(1-Bank) * Collateral		0.0645***	0.0628***	0.0643***	0.0643***
		(14.6757)	(14.3532)	(14.6397)	(14.6397)
Bank * Collateral		-0.2952**	-0.3945***	-0.2533*	-0.3945***
		(-2.0447)	(-2.6881)	(-1.8001)	(-2.6881)
GDP growth	0.0303**				
	(2.4907)				
(1-Bank) * GDP growth		0.0312**	0.0324**	0.0307**	0.0307**
		(2.4621)	(2.5543)	(2.4230)	(2.4230)
Bank * GDP growth		0.0447*	-0.0004	0.0253	-0.0004
		(1.7624)	(-0.0152)	(1.0005)	(-0.0152)
Inflation	-0.0766***				
	(-3.6833)				
(1-Bank) * Inflation		-0.0836***	-0.0813***	-0.0828***	-0.0828***
		(-3.8402)	(-3.7406)	(-3.8081)	(-3.8081)
Bank * Inflation		-0.0556	-0.0590	-0.0733*	-0.0590
		(-1.4012)	(-1.3898)	(-1.8391)	(-1.3898)
Constant	-0.0393				
	(-1.1008)				
Time dummies	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
No. of obs	336,051	336,051	336,051	336,051	336,051
Adj. R-squared	0.341	0.345	0.344	0.345	0.345

Appendix III. Quantile Regressions

Table A-3. Quantile Regression for Non-banks—Interaction of Tax and Second-order Polynomial of Size

	(1)	(2)	(3)	(4)
	Q10	Q50	Q75	Q90
CIT rate	0.8622***	3.766***	3.045***	0.6832*
	(4.42)	(10.70)	(7.18)	(1.77)
Log assets	-0.0117	0.1650***	0.1309***	0.0074
	(-1.52)	(13.28)	(8.92)	(0.50)
Log assets sq.	0.0009***	-0.0036***	-0.0027***	0.0004
	(4.13)	(-11.26)	(-7.28)	(0.99)
Log assets * CIT	-0.1185***	-0.3952***	-0.2905***	-0.0269
	(-5.58)	(-11.15)	(-6.89)	(-0.69)
Log assets sq * CIT	0.0042***	0.0108***	0.0073***	0.0001
	(7.35)	(12.04)	(7.04)	(0.09)
Operating income	-0.0389***	-0.1089***	-0.1726***	-0.1863***
	(-20.33)	(-37.82)	(-43.47)	(-45.45)
Collateral	0.0909***	0.0623***	0.0148***	-0.0098***
	(42.92)	(23.35)	(5.22)	(-3.69)
GDP growth	0.0203	0.0762***	0.0292	0.0039
	(1.19)	(4.12)	(1.35)	(0.17)
Inflation	-0.1862***	-0.0727**	0.0196	0.0209
	(-6.60)	(-2.46)	(0.63)	(0.63)
Constant	0.0809	-1.4482***	-0.9817***	0.3996***
	(1.13)	(-11.64)	(-6.62)	(2.67)
Time dummies	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
No. of obs	318,824	318,824	318,824	318,824
(Pseudo) R-squared	0.1759	0.1577	0.1170	0.0914

Table A-4. Quantile Regression for Banks—Interaction of Tax and First-order Polynomial of Size

	(1)	(3)	(4)	(5)
	Q10	Q50	Q75	Q90
CIT rate	0.9358***	0.4185***	0.3397***	0.3371***
	(5.56)	(7.74)	(6.02)	(6.32)
Log assets	0.0237***	0.0094***	0.0073***	0.0070***
	(9.09)	(10.25)	(8.12)	(7.86)
Log assets * CIT	-0.0330***	-0.0145***	-0.0116	-0.0125***
	(-5.17)	(-6.27)	(-5.07)	(-5.46)
Operating income	0.0458	-0.5557***	-0.6892***	-0.7418***
	(0.31)	(-7.58)	(-13.51)	(-15.42)
Collateral	-0.4728***	-0.1837***	-0.1483***	-0.1476***
	(-3.31)	(-5.12)	(-4.89)	(-7.22)
GDP growth	0.0623*	0.0469***	0.0267***	0.0249**
	(1.81)	(3.96)	(3.09)	(2.44)
Inflation	-0.1480**	-0.1041***	-0.0401**	-0.0279*
	(-2.45)	(-6.09)	(-2.27)	(-1.71)
Constant	0.1830**	0.6764***	0.7397***	0.7683***
	(2.22)	(30.09)	(33.19)	(36.44)
Time dummies	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes
No. of obs	17,227	17,227	17,227	17,227
(Pseudo) R-squared	0.2030	0.2080	0.2559	0.2761

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