Government Debt and Capital Structure Decisions: International Evidence

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Abstract

Our paper investigates the impact of government debt on corporate financing decisions. An increase in government debt supply might reduce corporate debt if investors prefer to maintain a relatively stable proportion of debt and equity securities. Using data on 40 countries between 1990-2014, we document a negative relation between government debt and corporate leverage. This relation holds for both levels and changes of debt, and after controlling for country and year fixed effects as well as country-level controls. Our firm-level analysis shows that the effect is more prominent when it is easier for corporations to adjust their capital structure, for example, for larger and more profitable firms. In order to address potential endogeneity issues, we use the introduction of the Euro currency as a quasi-natural experiment that changes the demand for local government bonds in countries adopting the Euro currency. Our findings suggest that government debt crowds out corporate debt.

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1 Introduction

Increasing government budget deficits and debt levels have obtained significant attention during the recent financial crisis. However, the impact of government debt on the economy and on the corporate sector has not been explored much in the financial economics literature. Our paper investigates whether changes in government debt affect the financing choices of corporations.

Government debt can crowd out corporate debt if investors in financial markets prefer to maintain a relatively stable proportion of debt and equity securities in their portfolios. An increase in government debt will increase the overall supply of debt in the economy. Households will only be willing to absorb the additional supply if debt securities offer higher expected returns. To the extent that it is not too costly for firms to deviate from their target capital structure, they will substitute some of the debt financing using equity to reduce overall financing costs. Thus, government debt could crowd out corporate debt.

We present a simple model where households can save using equity and debt securities. Households require a higher return for equity securities, but treat government and corporate debt as substitutes. Firms finance their projects by issuing both debt and equity securities, whereas the government is constrained to issue debt securities. The model shows that an increase in government debt issuances increases the required returns on debt securities relative to equity securities, and thereby crowds out corporate debt financing. We also discuss the conditions that lead to differential crowding out effects across countries facing different institutional structures and across firms with different abilities to adjust their capital structures.

We empirically test the predictions of our theoretical model using a data set that covers 40 countries between 1990 and 2014. We find that higher levels of government debt are associated with lower leverage levels. The results are robust including country and year fixed effects, using alternative specifications based on changes in leverage levels, and after controlling various time-varying macroeconomic variables. We also obtain consistent results using a panel of disaggregated firm-level data.

We investigate whether the relation between corporate debt and government debt depends on whether the government debt is financed domestically or internationally. We hypothesize that the crowding out effect is more pronounced for government debt purchased by local investors. Consistent with our hypothesis, we find an insignificant relation between external government debt and local corporate debt. On the other hand, the coefficient estimates for internal government debt are about twice the estimates for the total government debt found in our baseline model.

Our international setting also allows us to study the impact of country characteristics on crowding out effects. We hypothesize that the cost of switching from debt to equity securities is smaller for firms operating in countries with more developed equity markets and in countries where bank financing accounts for a small portion of total debt financing. Our results indicate that a change in government debt only has a significant impact on corporate debt in countries with relatively large equity markets and in countries where companies are less dependent on bank financing.

The impact of government debt on capital structure might also differ across firms within a country for several reasons. First, the debt of some firms (such as large firms and profitable firms) tends to be less risky and more liquid, so that those securities might be perceived as closer substitutes for government debt. Second, firms with more financial flexibility might incur lower costs of switching between debt and equity financing. These firms might be in a better position to adjust their capital structure in response to shocks in the supply of government securities. Consistent with our priors, we find that the crowding out effect is stronger for larger firms and for more profitable firms.

An important concern about the crowding out effect of government debt is that government debt is endogenous. Firms might adjust their capital structure in response to economic conditions, which are correlated with the supply of government debt.[2] We address this endogeneity concern in multiple ways. As mentioned previously, our specifications include year fixed effects that capture the impact of the global business cycle and additionally control for several country-level macroeconomic variables that capture

[2]The leverage dynamics of the business cycle is discussed by Hackbarth, Miao, and Morellec (2006), Bharma, Kuehn, and Strebulaev (2010), and Halling, Yu, and Zechner (2015)

the local business environment. Furthermore, we only find a crowding out effect for the portion of government debt that is financed domestically, confirming the postulated segmentation of debt markets. Finally, we use the introduction of the Euro currency as a quasi-natural experiment to address potential endogeneity concerns. The European Monetary Union (EMU) facilitated the integration of financial markets in member countries. Companies and governments in EMU countries gained access to financing from a substantially broader market and became less dependent on domestic financing sources after the monetary unification. We find that the sensitivity of corporate leverage to local government debt decreased significantly for companies incorporated in one of the EMU countries after the integration, whereas the corresponding sensitivity did not change for non-EMU countries.

In the corporate finance literature, a significant amount of research is devoted to understanding how firms make their financing decisions. Many of the empirical studies focus on the firm-specific determinants of capital structure. For instance, Titman and Wessels (1988) investigate the empirical validity of theoretical determinants of capital structure such as asset structure, non-debt tax shields, growth, uniqueness, industry classification, size, earnings volatility, and profitability. Besides these firm-specific determinants, empirical studies show that there are also factors outside the firm, such as industry average leverage (Welch, 2004 and Frank and Goyal, 2007) and peer firms' capital structure (Leary and Roberts, 2014) that shape firms' capital structure policy. There is also a growing literature using the variation in the institutional environment across countries in order to explore the importance of country-specific factors.[3] Fan, Titman and Twite (2012) provide the most extensive analysis of the impact of various institutional factors such as legal environment, tax policies, and the types of capital providers in the economy on capital structure. They find that a firm's capital structure is affected more by the country in which it is located than by its industry affiliation. Our study contributes to the literature on country-level determinants of firms' financing decisions by focusing

[3]See Booth, Aivazian, Demirguc-Kunt, and Maksimovic (2001), Claessens, Djankov, and Nenova (2001), Demirguc-Kunt and Maksimovic (1996, 1998, 1999), Giannetti (2003), and De Jong, Kabir, and Nguyen (2008).

attention on government debt.

Greenwood, Hanson, and Stein (2010) develop a model that investigates the impact of government debt maturity on corporate debt maturity. When the supply of long-term Treasuries increases relative to the supply of short-term Treasuries, the expected return on long-term Treasuries increases. Firms absorb this supply shock by issuing short-term debt to the extent that the expected return differential between long-term and short-term debt is eliminated. They test the implications of their model using U.S. data and find a negative relation between corporate debt and government debt maturity. In a related study, Badoer and James (2015) argue that this gap filling is a more important determinant of very long-term corporate borrowing than shorter-term borrowing. Using firm-level corporate debt issuance data, they find that highly rated firms' issuance of long-term bonds is inversely related to the proportion of outstanding long-term Treasury bonds. However, they find little evidence that issuances of short-term corporate bonds are related to changes in the supply of Treasury bonds. Foley-Fisher, Ramcharan, and Yu (2014) examine the impact of the Federal Reserve's Maturity Extension Program (MEP) on the firm financial constraints. The MEP was intended to put downward pressure on long-term interest rates, to lower borrowing costs, and to increase the amount of credit available to firms and households. They find that firms that rely on long-term debt issued more long-term debt during the MEP's implementation. Furthermore, such firms enjoyed increases in investment and employment during the MEP relative to other periods, suggesting that the MEP affected real economic activity.

Krishnamurthy and Vissing-Jorgensen (2012) argue that similar to money, Treasury securities also have liquidity and safety attributes, and an increase in the supply of government securities decreases the relative value of those attributes in the market. Consistent with this hypothesis, they find that a one standard deviation decrease in the Treasury supply reduces Baa-Treasury spreads by 79 basis points. Furthermore, by studying pairs of assets with similar liquidity but different safety or with similar safety but different liquidity, they show that changes in Treasury supply affect both the safety and liquidity premia.

Our paper is most related to Graham, Leary and Roberts (2014), who investigate the government crowding out of corporate debt using long-term U.S. data from 1920-2012. They find a robust negative relationship between government leverage and corporate leverage. Their analysis of the portfolios of different financial intermediaries, such as commercial banks, insurance companies and pension funds, suggests that financial intermediaries respond to increased government borrowing by increasing their holdings of government debt and by reducing their holdings of corporate debt. Our paper contributes to the literature by investigating the crowding out effect between government and corporate debt using a cross-country sample. Using international data allows us to benefit from a larger variation of changes in government debt and allows us to control for year effects, country effects, and time-varying macroeconomic factors. Furthermore, our empirical analysis of the Euro integration also helps us to mitigate potential endogeneity concerns.

The remainder of the paper is organized as follows: Section 2 presents a simple model that formalizes the main ideas discussed in the Introduction. Section 3 describes the data and reports the summary statistics. Section 4 presents the country-level empirical analysis followed by Section 5 that studies how the relation between corporate leverage and government debt changes around the formation of the EMU. Section 6 reports the results from firm-level analysis. We conclude in the final section.

2 The Model

We describe in this section a simple model that illustrates crowding out effects. Our model includes three economic agents: households who save, entrepreneurs who require financing to fund their projects, and the government.

2.1 Household's Optimization Problem

The representative household is endowed with an initial wealth of W, and decides how much to allocate to debt and equity securities in order to maximize the utility from

next period's consumption:

$$\max_{w_D, w_G} \; U\left[(1 - w_D - w_G)(1 + r_E)W + w_D(1 + r_D)W + w_G(1 + r_G)W + v(\rho w_D + w_G)W\right],$$

where r_E, r_D, and r_G are deterministic returns on equity, corporate debt, and government debt. The portfolio weights w_E, w_D, and w_G denote the fractions of initial wealth invested in corporate equity, corporate debt, and government debt securities, respectively. Note that the portfolio weights have to add up to one ($w_E + w_D + w_G = 1$).

Similar to the model in Krishnamurthy and Vissing-Jorgensen (2015), the household obtains additional utility for holding debt-like assets. We assume that $v''(.) < 0$. Finally, ρ captures the substitutability between corporate and government debt ($\rho \in (0, 1]$). Corporate debt is a security with intermediate characteristics between government debt and equity such that as ρ approaches zero, corporate debt resembles more equity, and as ρ approaches one, corporate debt resembles more government debt. If $\rho = 1$, then corporate and government debt are treated by households as perfect substitutes.[4]

The household's first order conditions imply:

$$v'(\rho w_D + w_G) = r_E - r_G, \tag{1}$$

$$\rho v'(\rho w_D + w_G) = r_E - r_D. \tag{2}$$

Thus, the spread between the return on equity and debt securities is determined by the additional marginal utility that debt securities provide relative to equity. By combining these two equations, one can show the spread between corporate debt and government debt is given by:

$$r_D - r_G = (1 - \rho)v'(\rho w_D + w_G). \tag{3}$$

As corporate debt becomes a perfect substitute for government debt (i.e. as $\rho \to 1$), the spread between corporate debt and government debt shrinks towards zero. On the other hand, when $\rho = 0$ the spread between corporate debt and government debt equals

[4]Different than our model, the function $v(.)$ in Krishnamurthy and Vissing-Jorgensen (2015) takes as argument the ratio of bank deposits plus Treasury bonds to next period's consumption. They argue that there is a demand from investors for "extremely safe" assets that cannot be accounted for by a CCAPM model. The parameter ρ allows us to differentiate between investors' preferences for "extremely safe" (e.g. Treasury bonds) and "safe" assets (e.g. corporate bonds) relative to equity.

the spread between equity and government debt.

2.2 Firm's Optimization Problem

The entrepreneur has a project that requires an investment of K in the first period and produces an output of $f(K)$ in the second period. The total investment K is financed by equity and debt. The firm has an optimal target capital structure that involves having λ of total capital financed by debt. The entrepreneur incurs quadratic costs if she deviates from this target in either direction. These costs capture the impact of various market frictions, such as taxes, agency costs, and other financing costs. The entrepreneur chooses the leverage ratio d that maximizes total output net of financing costs:

$$\max_{d} \quad f(K) - d(1 + r_D)K - (1 - d)(1 + r_E)K - \frac{\theta}{2}(d - \lambda)^2 K,$$

where

$$d = \frac{D}{K}.$$

The firm's first-order condition is as follows:

$$\theta\,(d - \lambda) = r_E - r_D. \tag{4}$$

The entrepreneur raises debt financing up to the point where the cost of debt financing is equal to the cost of equity financing.

2.3 Market Equilibrium

The following equilibrium condition follows from equations (4) and (2):

$$r_E^* - r_D^* = \theta(d^* - \lambda) = \rho v'(\rho w_D^* + w_G), \tag{5}$$

which indicates that the equilibrium level of the debt-to-capital ratio d is determined by the additional marginal utility that the household derives from holding debt and the

marginal cost of debt financing relative to equity for the entrepreneur.[5] Whether the equilibrium level of corporate debt is above or below the target depends in the sign of $v'(.) > 0$. If the additional percentage increase in wealth invested into debt securities increases (decreases) the household's utility, then $d^* > \lambda$ ($d^* < \lambda$) and the spread between equity and corporate debt is positive (negative). In equilibrium, equity and debt markets clear such that:

$$W = E + D + G = K + G.$$

Therefore, an increase in government debt is absorbed by the household sector and shrinks the corporate sector by the same amount.[6] Substituting the market clearing condition in the definitions of w_D, w_G and d, we obtain the following relationship between the household's portfolio share of debt and the firm's leverage ratio:[7]

$$w_D^* = d^*(1 - w_G). \tag{6}$$

Equation (6) implies that for $w_G > 0$, the household's portfolio share of corporate debt is less than the firm's leverage ratio ($w_D^* < d^*$).

Figure 1 depicts the debt-to-capital ratio in equilibrium for the case when $v(.)$ is a logarithmic function (i.e., $v(x) = log(1 + x)$). The horizontal axis shows different leverage levels d and the vertical axis shows the equity premium $r_E - r_D$. The preferences of households for debt securities are captured by the downward-sloping curve $\rho v'(\rho d(1 - w_G) + w_G)$. As debt securities become more abundant, households do not require a large equity premium to be indifferent between holding equity and debt securities. The

[5] An alternative way of formulating the household's problem is to assume an optimal portfolio share for debt securities and quadratic costs of deviating from this optimum. All of the implications that we derive using our current model survive as long as the optimal portfolio share of debt for the household is greater than the firm's target leverage ratio.

[6] In an extended model where the entrepreneur determines the amount of investment, we show that an increase in government debt results in a lower equilibrium level of investment.

[7] Given

$$w_D^* + w_G = \frac{D + G}{W} = \frac{D + G}{K + G}$$

and

$$d = \frac{D}{K},$$

it is easy to show that

$$w_D^* + w_G = d^* + w_G(1 - d^*).$$

upward-sloping line $\theta(d-\lambda)$ captures the capital structure preferences of firms. At a leverage ratio of $d=\lambda$, the frictions of debt financing would be minimized, and the firm would be indifferent between issuing equity and debt securities. However, due to the household's preference for debt-like securities, the return that households demand for holding equity is higher than debt at $d=\lambda$ by an amount of $\rho v'(\rho\lambda(1-w_G)+w_G)$. Therefore, the firm increases its leverage from the target level λ to d^* where the marginal cost of debt financing equals the marginal benefit of holding debt for the household. The figure shows that the equilibrium level of debt-to-capital (d^*) corresponds to a positive equity premium.

<Figure 1 about here>

2.4 Impact of Government Debt

In order to investigate the impact of government debt on the equilibrium leverage ratio, we take the derivative of both sides in equation (5) with respect to w_G, and solve for $\partial d^*/\partial w_G$

$$\left[\theta-\rho^2(1-w_G)v''(\rho d^*(1-w_G)+w_G)\right]\frac{\partial d^*}{\partial w_G}=\rho\,(1-\rho d^*)\,v''(\rho d^*(1-w_G)+w_G). \quad (7)$$

Given that $v''(.)<0$, $\rho\leq 1$, and $d^*<1$, equation (7) implies that

$$\frac{\partial d^*}{\partial w_G}<0.$$

Similarly, taking the partial derivative of both sides in equation (6) yields

$$\frac{\partial w_D^*}{\partial w_G}=\frac{\partial d^*}{\partial w_G}(1-w_G)-d^*,$$

which implies that

$$\frac{\partial w_D^*}{\partial w_G}<0.$$

Thus, as government debt increases, both d^* and w_D^* decrease relative to the previous equilibrium. It follows from equation (5) that the spread between equity and corporate debt returns shrinks when the supply of government debt securities increases.

Implication 1: Given households' preference for debt-like instruments and financing frictions of the corporate sector, the increase in government debt leads to lower corporate leverage ratios. Furthermore, it reduces the spread between equity and corporate debt.

Figure 2 shows how the introduction of government debt affects the equilibrium in financial markets. The introduction of government debt shifts the household's marginal utility curve (v') to the left, since the household now has a larger share of debt securities for a given portfolio share of corporate debt. The introduction of government debt reduces the equity premium as well as the optimal amount of corporate debt.

<Figure 2 about here>

Note that in addition to this substitution effect between corporate debt and corporate equity, there is also a direct crowding out effect since the size of the corporate sector ($K = D + E$) shrinks after the introduction of a government sector (G). Thus, the introduction of a government sector shrinks the total value of corporate debt D because the size of the overall corporate sector is reduced by the government debt amount $K = W - G$ (direct crowding out effect) and because corporations reduce their leverage levels $d = D/K$ (indirect crowding out effect).

2.5 Countries with Different Financing Frictions

Next, we investigate whether the crowding out effect differs between countries with different financing frictions. In particular we study two countries $i \in \{L, H\}$ that exhibit different financing costs θ_i, where $\theta_H > \theta_L$. We compare the equilibrium outcomes without a government sector (denoted with one asterisk) and with a government sector (denoted with two asterisks). Furthermore, to simplify notation we abbreviate the equity premium as: $EP = r_E - r_D$. It can be shown that the following inequality holds:

$$\theta_H = \frac{EP_H^* - EP_H^{**}}{d_H^* - d_H^{**}} > \frac{EP_L^* - EP_L^{**}}{d_L^* - d_L^{**}} = \theta_L. \tag{8}$$

When financing frictions are high, the introduction of a government sector generates relatively stronger price responses and relatively weaker quantity responses compared to the case with low adjustment costs. This outcome is intuitive because firms are not as flexible to adjust their leverage levels in environments with more substantial frictions.[8]

Implication 2: Given an increase in government debt, countries where firms face higher financial frictions experience a smaller drop in corporate debt relative to the decrease in the equity premium.

Figure 3 compares the change in the equilibrium level of debt for countries with high (θ_H) and low (θ_L) financial frictions.

<Figure 3 about here>

2.6 Heterogeneity in Firm Composition

We also analyze the model's implications for two firms that are incorporated in the same country but (i) are subject to different levels of financing frictions proxied by θ and (ii) issue corporate debt securities that have different levels of substitutability with government debt. We assume that the firms have the same optimal target leverage ($\lambda_L = \lambda_H = \lambda$). The household's problem is summarized as follows

$$\begin{aligned}\max_{w_{E_L}, w_{D_L}, w_{D_H}, w_G} \; & U[(1 - w_{E_L} - w_{D_L} - w_{D_H} - w_G)(1 + r_{E_H})W + w_{E_L}(1 + r_{E_L})W \\ & + w_{D_L}(1 + r_{D_L})W + w_{D_H}(1 + r_{D_H})W + w_G(1 + r_G)W \\ & + v\left(\rho_L w_{D_L} + \rho_H w_{D_H} + w_G\right)W],\end{aligned}$$

[8] In order to see this, first solve for d^* and d^{**} using equation (5), respectively:

$$EP_i^* = \theta\left(d_i^* - \lambda\right) \quad \text{and} \quad EP_i^{**} = \theta(d_i^{**} - \lambda).$$

Taking the differences between the equity premiums yields:

$$EP_i^* - EP_i^{**} = \theta_i(d_i^* - d_i^{**}).$$

Finally, by solving for θ_i we obtain:

$$\theta_i = \frac{EP_i^* - EP_i^{**}}{d_i^* - d_i^{**}}.$$

where w_{D_i} and w_{E_i} are the fractions of initial wealth invested into debt and equity of firm $i \in \{L, H\}$. The following equations are derived from the household's first order conditions:

$$r_{E_i} - r_G = v'(\rho_L w_{D_L} + \rho_H w_{D_H} + w_G) \tag{9}$$

$$r_{E_i} - r_{D_i} = \rho_i v'(\rho_L w_{D_L} + \rho_H w_{D_H} + w_G). \tag{10}$$

In equilibrium, the representative investor is indifferent between investing into the equities of high-θ and the low-θ firm such that $r^*_{E_L} = r^*_{E_H}$. Consequently, the difference between the returns on debt securities supplied by the high-θ and the low-θ firm are determined by the difference between their contributions to marginal utility. Each entrepreneur $i \in \{L, H\}$ solves the following problem:

$$\max_{d_i} \quad f(K_i) - d_i(1 + r_{D_i})K - (1 - d_i)(1 + r_{E_i})K - \frac{\theta_i}{2}\left(d_i - \lambda_i\right)^2 K_i.$$

We derive the following first order condition for the entrepreneur i's problem

$$r_{E_i} - r_{D_i} = \theta_i \left(d_i - \lambda_i\right). \tag{11}$$

First, we analyze the case where the firms only differ in the costs that they incur because of financing frictions and their debt securities contribute to the household's marginal utility by the same amount ($\rho_L = \rho_H = \rho$). It follows from equation (10) that in equilibrium $r_{E_H} - r_{D_H} = r_{E_L} - r_{D_L}$. By combining equations (10) and (11) we obtain the following equilibrium condition

$$r^*_E - r^*_D = \rho v'(\rho w^*_{D_L} + \rho w^*_{D_H} + w_G) = \theta_L \left(d^*_L - \lambda\right) = \theta_H \left(d^*_H - \lambda\right), \tag{12}$$

Debt and equity markets clear in equilibrium, and the household's budget constraint is satisfied:

$$K_i = E_i + D_i \quad \text{and} \quad W = E_L + E_H + D_L + D_H + G.$$

In order to understand the impact of government debt on leverage ratios, we take the

derivative of both sides of equation (12) with respect to the government ratio w_G:

$$\rho v''(\rho w^*_{D_L} + \rho w^*_{D_H} + w_G)\left(1 + \rho\frac{\partial w^*_L}{\partial w_G} + \rho\frac{\partial w^*_H}{\partial w_G}\right) = \theta_L\frac{\partial d^*_L}{\partial w_G} = \theta_H\frac{\partial d^*_H}{\partial w_G}. \tag{13}$$

Given that $\theta_H > \theta_L$, equation (13) suggests that the absolute value of the marginal change in the leverage ratio of the high-θ firm is less than that of the low-θ firm such that

$$\left|\frac{\partial d^*_H}{\partial w_G}\right| < \left|\frac{\partial d^*_L}{\partial w_G}\right|.$$

Implication 3: Within a country, for a given level of government debt increase, firms that are subject to more financing frictions choose a smaller reduction in leverage than firms with lower adjustment costs.

Figure 4 illustrates how the introduction of government debt affects the equilibrium in a market with two firms. The equilibrium level of the equity premium is given by the horizontal dotted lines. Note that the firms' equilibrium leverage ratios given by the vertical dashed lines, decrease after the introduction of the government sector.

<Figure 4 about here>

Now consider the case where the two firms are subject to the same financing frictions $\theta_H = \theta_L = \theta$, but their debt securities have different levels of substitutability with government debt. In this case, the equilibrium condition is given by:

$$\rho_i v'\left(\rho_L w_{D_L} + \rho_H w_{D_H} + w_G\right) = \theta\left(d^*_i - \lambda\right), \tag{14}$$

which implies that

$$v'\left(\rho_L w_{D_L} + \rho_H w_{D_H} + w_G\right) = \theta\frac{(d^*_L - \lambda)}{\rho_L} = \theta\frac{(d^*_H - t)}{\rho_H}. \tag{15}$$

We obtain the following expression by taking the derivative of both sides with respect to the government debt ratio w_G:

$$\frac{1}{\rho_L}\frac{\partial d^*_L}{\partial w_G} = \frac{1}{\rho_H}\frac{\partial d^*_H}{\partial w_G}. \tag{16}$$

Given that $\rho_H > \rho_L$, equation (16) implies that the absolute value of the derivative of the leverage ratio with respect to the government debt for the high-theta firm exceeds that for the low-theta firm such that

$$\left|\frac{\partial d_H^*}{\partial w_G}\right| > \left|\frac{\partial d_L^*}{\partial w_G}\right|$$

Implication 4: Within a country, for a given level of government debt increase, firms with debt securities that are closer substitutes for government debt decrease their leverage more than others.

<Figure 5 about here>

3 Data and Summary Statistics

This section describes the data sources and summarizes the main variables used in our empirical analysis.

3.1 Data

We obtain firm-level accounting data from Compustat Global and Compustat North America, and firm-level market data from Compustat Global Security Daily. The main variable of interest is the total government debt-to-GDP ratio, which we obtain from the World Economic Outlook (WEO) database available through the IMF[9]. For other country-level variables, we use data from the World Bank, IMF and the ECB. To ensure that the country-level variables are consistently defined over time, for each country and variable, we use the data source that provides us with the longest series. We obtain the data on sovereign debt defaults and restructuring episodes from Carmen M. Reinhart and Kenneth S. Rogoff's webpage.[10] The website offers the longest historical annual

[9]The WEO series are not available for the earlier periods of our sample for some countries. For those countries with short series we use government debt data from the central banks whenever available or other sources such as World Bank. Those countries are Ireland, Israel, Peru, South Africa, and the US.

[10]`http://www.reinhartandrogoff.com/`

government debt data from as early as 1692 for the UK and 1719 for Sweden to 2010 for 70 countries.

Our sample covers the period between 1990 and 2014, and the first year of the sample is determined by the availability of the firm-level and country-level data which vary across countries. Observations with missing and/or negative book value of assets are dropped from the sample. We exclude financial (6000-6999), public (9000-9999) and utility (4900-4999) firms. Since we focus on the time-series variation in corporate and public debt, each firm is required to have data on book leverage, lagged firm-level controls, as well as lagged values of government debt, GDP per capita, inflation, S&P index level, unemployment, and nominal exchange rate. We also exclude country-year observations with less than ten firms.

Our sample includes 16 country-year observations in which we observe a domestic or external sovereign debt default or restructuring event. These events are associated with large decreases and increases in government debt-to-GDP ratios that might result from significant devaluations of the local currency and debt forgiveness. While our exchange rate captures such devaluations, our macro controls cannot account for debt forgiveness. We exclude these 16 country-year observations from our analysis. The final sample consists of 38,595 firms from 40 countries with a total of 341,868 firm-year observations and 812 country-year observations.

Table 1 shows the distribution of countries in our sample. The sample includes firms from different parts of the world, mainly Europe, Asia, North America, and South America. Hong Kong has the shortest time series that mainly results from government debt not being available in the earlier periods of the sample. The U.S., U.K., and Japan are the countries with the highest number of firm-year observations.

<Table 1 about here>

3.2 Summary Statistics

We use three leverage measures for our firm-level analyses. First, we define the traditional leverage measures, *Book Leverage* and *Market Leverage*, which are total debt over book value of assets and total debt over market value of assets, respectively. The third measure, *Debt-to-Capital Ratio*, is proposed by Welch (2011) and is defined as the book value of debt divided by debt plus the book value of equity. The book value of total assets includes the value of non-financial liabilities such as trade credit. As a result, an increase in accounts receivable causes a decrease in the traditional measure of book leverage, even if total debt of the firm stays constant. The third definition of leverage is not affected by changes in non-financial liabilities. We require all firm-level leverage measures to have values between zero and one. The country-level variables follow firm-level definitions, and are calculated by aggregating the numerator and denominator values over all firms in a given year and country. All country-level ratio variables, including leverage measures, are winsorized at the 1% level.

Table 2 reports country averages for corporate leverage and macroeconomic variables. While, on average, firms in Hong Kong have the lowest leverage ratio, firms in Portugal have the highest corporate leverage in our sample. Belgium, Greece, Italy, and Japan are countries with an average government debt-to-GDP ratio exceeding 100%. Chile, Hong Kong, and Russia have the lowest average government debt-to-GDP ratios that are all below 20%.

<Table 2 about here>

Besides our main country-level debt variables, we also control for other country characteristics.[11] Our main specification includes GDP per capita, the level of inflation, the level of the equity index, the unemployment rate, and the exchange rate. The natural logarithm of *GDP per Capita* is measured in current U.S. dollars, whereas *Inflation* is measured as the natural logarithm of the level of the consumer price index. In order to

[11] See Korajczyk and Levy (2003) for the macroeconomic determinants of capital structure.

account for the movements in the stock market, we convert each country's return on the *S&P Global Equity Index* into a variable that tracks the index level assuming that the base year is the first year in the sample, and include the natural logarithm of this index in our regressions. *Unemployment* is the number of unemployed as a percentage of the potential labor force. Although we use year fixed effects in all specifications, we cannot control for economic downturns specific to each country, which makes the unemployment rate an important variable to include in the analysis. Finally, *Nominal Exchange Rate* is the value of the local currency relative to one U.S. dollar calculated as an annual rate based on monthly averages, and we control for its natural logarithm in all our analysis.

We also compute additional firm-level variables that have been shown to relate to corporate leverage (Rajan and Zingales,1995, Baker and Wurgler, 2002, Frank and Goyal, 2003, and Lemmon, Roberts and Zender, 2008). *Tangibility* is defined as the ratio between the value of property, plant, and equipment (PPE) and total assets. We use the book value of total assets (*Assets*) to account for the impact of firm size on leverage. The return on assets (*ROA*) is defined as operating income scaled by total assets. Finally, *Market-to-Book Ratio* is defined as the ratio between the market value of total assets and the book value of the firm. We use Compustat currency exchange rate data in order to convert non-ratio variables into U.S. dollars. Detailed variable definitions are given in the Appendix A1.

Panels A and B of Table 3 report the summary statistics for country- and firm-level variables, respectively. *Government debt-to-GDP* has a mean of 58.3% and an interquartile range of 37.2% and 72.5%. On average, the *GDP per Capita* is $16,075, and the average unemployment rate is about 7.4%. Panel A of Table 3 shows that the ratio between corporate debt and corporate total assets has a mean (median) of 28.3% (27.7%) and a standard deviation of 6.5%. Since it is normalized by the book value of total capital rather than total assets, the *Debt-to-Capital Ratio* is higher than the *Book Leverage*, with a mean (median) of 42.3% (42%). Finally, the *Market Leverage* has an average of 19.5% and a median of 18.5%.

<Table 3 about here>

Panel B reports the summary statistics for firm-level variables. On average, *Book Leverage*, *Debt-to-Capital* and *Market Leverage* are 21.3%, 29.8% and 18.1%, respectively. Consistent with the capital structure literature, we find a significant variation in the tangibility of firms. The mean tangibility equals 30.5% with an interquartile range of [11.3%, 44.6%]. Most firms in our sample are profitable, as captured by the 4.4% positive mean ROA. Finally, the median firm's market value exceeds the book value by 23.3%.

4 Country-Level Analysis

This section presents the results of our empirical analyses using the country panel where we aggregate firm-level variables by year and country. One potential caveat of this approach is that the composition of the aggregated sample might change as firms go public or are delisted from security exchanges. To alleviate this problem, we report the results from firm-level specifications in Section 6. We start with the country-level regressions for both levels and changes, followed by results from robustness tests.

4.1 Main Results

Our baseline specification relates the country-level corporate debt to government debt-to-GDP ratio and additional macro variables. More specifically, we estimate the following regression equation:

$$\begin{aligned} Leverage_{j,t} \;&=\; \beta_0 \;+\; \beta_1 \mathit{Government\ Debt\text{-}to\text{-}GDP}_{j,t-1} \\ &\quad + \beta_2 X_{j,t-1} \;+\; \beta_3 Y_{j,t-1} \;+\; u_j \;+\; \delta_t \;+\; \varepsilon_{j,t}. \end{aligned} \tag{17}$$

Equation (17) is estimated separately for three different definitions of $Leverage_{j,t}$, namely book leverage, market leverage, and total debt divided by debt plus equity. $\mathit{Government\ Debt\text{-}to\text{-}GDP}_{j,t-1}$ is total government debt as a percentage of GDP in country j; $X_{j,t-1}$ denotes macro variables, including the natural logarithm of GDP per capita, inflation, the level of equity index, the unemployment and the exchange rate; $Y_{j,t-1}$ denotes aggregated values of traditional determinants of leverage that are frequently used

in capital structure studies, mainly tangibility, size, profitability, and the market-to-book ratio. Finally, u_j and δ_t denote country and year fixed effects, respectively. Year fixed effects account for worldwide events such as the financial crisis, and country fixed effects control for time-invariant country characteristics.

Panel A of Table 4 reports the results for the level specification. The standard errors are clustered at the country level and t-statistics are reported in parentheses. The results indicate a negative relationship between government debt and aggregate corporate leverage. A 10 percentage point increase in government debt relative to GDP reduces book leverage (market leverage) by about 0.75 (0.56) percentage points. Government debt is also negatively correlated with the debt-to-capital ratio: a 10 percentage point increase in government debt-to-GDP is associated with a 0.96 percentage point decrease in the debt-to-capital ratio. The unemployment rate and the exchange rate are significant determinants of corporate leverage. Also, the profitability is also significantly related to the aggregate leverage.

<Table 4 about here>

We also repeat our analysis for the subsample of countries that are members of the OECD.[12] Panel B of Table 4 reports the fixed effects regression results for the 25 OECD countries. Results are similar to those for the whole sample suggesting that the relationship between government debt and corporate debt is stronger for developed countries.

A second method for analyzing the time-series relationship between corporate debt and government debt is to estimate equation (17) in first differences:

$$\begin{aligned} \Delta Leverage_{j,t,t-1} \;&=\; \beta_0 \;+\; \beta_1 \Delta \textit{Government Debt-to-GDP}_{j,t-1,t-2} \\ &\quad + \beta_2 \Delta X_{j,t-1,t-2} \;+\; \beta_3 \Delta Y_{j,t-1,t-2} \;+\; \delta_t \;+ \varepsilon_{j,t}. \end{aligned} \tag{18}$$

[12]Those countries are: Austria, Australia, Belgium, Canada, Denmark, Germany, Finland, France, Greece, Ireland, Italy, Japan, South Korea, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, US, UK. Since they became members in 2010, Chile and Israel are not included in the OECD sample. Note that only two OECD countries, Turkey and Greece, experienced a default or a restructuring in our sample. Therefore, only two observations in this subsample are dropped due to such episodes.

Panel A of Table 5 reports the results for country-level first difference regressions. The coefficient estimates for the government debt-to-GDP ratio are all negative for our three different leverage measures such that corporate leverage decreases significantly in the year after an increase in government debt. For example, a 10% increase in government debt-to-GDP is associated with a 0.68% (0.59%) decrease in firm book leverage (market leverage) in the subsequent year. The economic magnitude in the first difference specification is very similar to the magnitude in the level specification. Note that changes in GDP per capita, ROA, and the market-to-book ratio are typically significantly related to changes in corporate debt. Overall, our findings suggest that there is a negative relation between firm leverage and government debt supply.

<Table 5 about here>

We repeat our first difference analysis for the OECD countries as we did for the levels specification in Table 4. Table 5 Panel B reports the results. Consistent with the fixed effects regression results, the coefficient estimates for the OECD subsample are similar to the coefficient estimates for the whole sample.

One possible concern about using the government debt-to-GDP ratio as the independent variable is that the relationship between corporate leverage and government debt could be driven by changes in GDP. In order to eliminate this concern, we estimate an alternative specification. More specifically, we regress the natural logarithm of the dollar value of corporate debt on the natural logarithm of the dollar value of lagged government debt. Table 6 reports the estimation results which confirm our findings in Tables 4 and 5. The fixed effects specification indicates that a one standard deviation increase in the natural logarithm of government debt is associated with a 0.145 standard deviation decrease in the natural logarithm of corporate debt. We obtain similar results for the first difference specification.[13]

[13]In order to ensure that the results are not driven by a single country in our sample, we repeat the fixed effects and first difference regressions in Tables 4 and 5 by dropping one country at a time from our sample. Our results are robust to exclusion of each country at a time.

<Table 6 about here>

4.2 External Debt

Our government debt variable includes both external and domestic government debt. Therefore, there can be cases where the increase in the supply of government debt is absorbed by foreign investors or international financial institutions such as the IMF. In the latter case, we do not expect the change in government debt to have any impact on corporate leverage as long as the stock of local government debt stays constant. There are two potential channels through which corporate debt can be affected from changes in foreign demand for government bonds. First, holding the change in total government debt constant, a larger fraction of the debt issue is absorbed by foreign investors, leaving more local funds available for corporations. Second, the increase in foreign demand for government debt can crowd out foreign investment into corporations. The latter effect would be more prominent in those countries where external private debt is a more important source of debt financing than domestic private debt. According to the IMF (2015), over the period between 2003 and 2014, foreign bank lending to the private sector in emerging markets stayed below 8% of total debt, whereas domestic bank lending was above 78%. Although, bond financing has doubled from 8% to 16% since 2008, domestic bank lending is still the main source of debt financing in emerging markets.

In Table 7, we repeat our baseline analysis by replacing *Government debt-to-GDP* by *Internal Government Debt* and *External Government Debt* measured in percent of GDP. *Internal Government Debt* is calculated by subtracting external government debt from total government debt outstanding. The results are reported for both the fixed effects and first difference specifications. The economic magnitude of the estimate for the coefficient of internal government debt is twice the estimate for total government debt reported in Table 4. Furthermore, the coefficient estimate for external debt is insignificant suggesting that the negative relationship between corporate leverage and government leverage is

driven by domestic public debt rather than external debt.[14]

<Table 7 about here>

4.3 Country Characteristics and Crowding Out

We also investigate the cross-country variation in the crowding out effect. We hypothesize that in countries where financial markets are more developed, it is less costly for firms to adjust their capital structure. Consequently, we expect firms in such countries to find it easier to change their capital structure when government debt changes.

We use two proxies, bank dependence and equity market development, in order to test the cross-country variation in crowding out. The first variable is the amount of bank credit extended to the private sector (% total credit) that proxies for the dependence of corporations on banks. More specifically, in each year, we split the sample into three equally-sized groups based on previous year's fraction of bank credit to total private sector credit. Then, we estimate our baseline first difference specification for countries in these three groups separately. Panel A of Table 8 reports the estimation results. While the coefficient estimates for the change in the government debt-to-GDP ratio is economically and statistically significant for countries where banks are less prominent, the coefficients are not significant for other countries.

<Table 8 about here>

In Panel B of Table 8, we repeat the same analysis this time for the subsamples of countries based on the size of their equity markets. We expect that firms incorporated in countries with more developed equity markets to incur smaller financial frictions and to react more to changes in government debt. Consistent with our prior, we find that the

[14]The correlation between the levels (first differences) of external and internal government debt is 0.214 (0.376). Although, they are statistically significant, correlation coefficients are not large enough to raise multicollinearity concerns. Furthermore, the variance inflation factors associated with the first differences of external and internal government debt are both close to one.

impact of government debt is less significant for countries with small equity markets relative to GDP. The results are economically and statistically significant for the subsample of countries with large equity markets when book values of leverage are used.

5 Euro-Area Integration

Although we control in our baseline analysis for time-invariant country characteristics, various macroeconomic controls, and year fixed effects that account for worldwide events such as the financial crisis, endogeneity concerns might remain. In this section, we address this concern by using the integration of the bond market in the European Monetary Union (EMU) as a quasi-natural experiment. Since the second half of the 1990s, the degree of integration in various European financial markets has significantly increased (ECB, 2006). The effect has especially been prominent in government and corporate bond markets (Pagano and Von Thadden, 2004 and ECB, 2006).

Coeurdacier and Martin (2007) argue that in theory, the monetary integration can have opposing effects on the holdings of Euro assets by countries in the Euro zone. For instance, by reducing currency risk, integration can decrease transaction costs of trading across different financial markets in the Euro zone. On the other hand, a single currency may increase the elasticity of a substitution between assets issued by member countries which in turn decreases the Euro asset holdings of the member countries. The results of Coeurdacier and Martin (2007) suggest that the single currency decreased transaction costs for a cross border purchase of a Euro bond or equity for both Euro and non-Euro countries. Although, they also find evidence for the negative impact of substitution effect on the holdings of Euro assets, the results indicate that the positive impact of lower transaction costs dominates the substitution effect. More specifically, consistent with Lane (2006), they show that there is an "Euro bias" in bilateral bond holdings between two Euro countries.

We hypothesize that after the EMU integration the sensitivity of corporate leverage to local government debt decreases for companies incorporated in one of the EMU countries.

The integration can weaken the crowding out effect through increased demand by foreign investors for government debt and/or corporate debt securities. While the former helps local investors in absorbing government debt supply, and increases funds available to the corporate sector, the latter decreases firms' dependence on local investors, especially on financial institutions.

Figure 6 depicts the relation between changes in corporate leverage and changes in the government debt to GDP ratio for EMU and non-EMU countries before (1990-1998) and after the introduction of the Euro (1999-2006). While we do not observe a significant change in the relation for non-EMU countries after the integration, for EMU countries the direction of the relation changes from negative to positive. Corporate leverage is not any longer negatively related with local government debt for EMU countries after the formation of the EMU.

<Figure 6 about here>

Next, we verify the finding in Figure 6 in a regression framework using all the countries in our sample. We define an *After 1999* indicator variable that equals one for 1999 and years following that. The indicator variable *EMU* takes the value one for EMU countries. The coefficient of interest is the coefficient of the triple interaction between the change in *Government Debt-to-GDP ratio*, *After 1999*, and *EMU* dummy.

Panel A of Table 9 reports the estimation results for the 10-year period between 1994 and 2003. We report the estimation results for the three leverage variables. The negative coefficient estimate for the change in government debt-to-GDP represents the impact of government debt on leverage before 1999 for non-EMU countries. Consistent with our prior, the positive coefficient estimate for the triple interaction suggests that corporate leverage becomes less sensitive to local government debt in EMU countries after the integration. The coefficient estimate for the triple interaction is statistically significant for the specifications *Book Leverage* and *Debt-to-Capital* at 1% and 5% levels, respectively. These results are robust to inclusion of year fixed effects. Note that the relation between corporate leverage and government debt does not change to a significant

degree for non-EMU countries suggested by the insignificant coefficient estimate for the interaction between the change in government debt-to-GDP ratio and *After 1999* dummy. On average, there is a decrease in the magnitude of the changes in corporate debt after 1998. EMU countries do not differ from others in terms of book leverage ratios, but the change in market leverage ratios are smaller in magnitude for countries incorporated in EMU countries.

<Table 9 about here>

Panel B of Table 9 reports the results for the period between 1990 and 2006 that coincides with the subsample before the financial crisis. While the coefficient estimates for the triple interaction term are positive and statistically insignificant when *Debt-to-Capital* and *Market Leverage* are used as the dependent variables, the results are significant for *Book Leverage* over this longer period.

6 Firm-Level Analysis

In this section, we estimate our baseline model at the firm level. Table 10 reports the estimation results with firm fixed effects and for the first difference specification. The results show that the coefficient estimates for the firm-level controls have the signs consistent with the literature. While tangibility and size have a positive impact on leverage, profitable firms and those with high market-to-book ratios have lower leverage. We obtain a negative relation between the level of government debt and firm leverage levels for all three leverage measures. The coefficient estimates imply that a 10 percentage point increase in government debt relative to GDP reduces firm leverage by 0.49-0.76 percentage points. Similarly, the coefficient estimates from the first difference specification are consistent with our previous findings. A 10 percentage point change in government debt relative to GDP reduces firm leverage by 0.80-1.05 percentage points

<Table 10 about here>

As a robustness test, we also estimate the baseline specification using the natural logarithms of government debt and corporate debt. Table 11 shows that the results are robust to this alternative definition.

<Table 11 about here>

One advantage of our firm-level analysis is that it allows us to investigate the impact of firm characteristics on the crowding out effect, as discussed in our theoretical model. The impact of government debt on capital structure might differ across firms for two reasons. First, some types of corporate debt are closer substitutes to government debt than others. For example, bonds issued by larger firms might be more liquidly traded. Similarly, more profitable firms tend to have lower default risk, which makes their debt a better substitute for government debt. Thus, the crowding out effect should be stronger for large profitable firms. Second, firms with more financial flexibility incur lower costs of switching between debt and equity financing. These firms are in a better position to adjust their capital structure in response to shifts in demand. For example, larger firms are more flexible in their choices between debt and equity financing, since they are potentially less subject to asymmetric information problems. In contrast, high equity issuance costs or borrowing costs might prevent small firms from drastically changing their method of financing. Similarly, more profitable firms face lower costs in adjusting their capital structure because they have the flexibility of first drawing down their internal funds before tapping the external capital market. Moreover, they may face a lower cost of switching between debt and equity financing. Therefore, both the substitution effect and the adjustment cost effect suggest that larger and more profitable firms should respond more to government debt changes.

In columns (1)-(3) of Table 12 we interact government debt to GDP ratio with indicator variables for firm size. The size indicator variable takes a value of one for those companies with lagged total book assets in the top 20% of their country of incorporation. Consistent with our prior, we find that the crowding out effect is significantly higher for large firms than for small firms.

<Table 12 about here>

Similarly, we expect profitable firms to respond more to changes in government debt. Such firms are more likely to have high retained earnings that they can use towards investment without any need for external financing. Columns (4)-(6) of Table 12 reports the results for profitability interactions, where the *ROA Above Median* indicates that the firm's lagged ROA is above its country median in a given year. The results show that the crowding out effect is more significant for profitable firms. The estimation results for the interaction of government debt with size and profitability indicate that government crowding out is more significant for firms that are expected to be financially less constrained.

We also investigate whether the negative impact of government debt on corporate leverage is specific to long-term or short-term corporate debt. In Table 13, we repeat our main analysis for *LT Debt* defined as long-term debt that matures in more than one year divided by total assets, and for *ST Debt* defined as the ratio of debt in current liabilities to total assets. Results indicate that the negative relationship holds for both long-term and short-term corporate debt.

<Table 13 about here>

7 Conclusions

In this paper, we investigate the impact of government debt on firms' capital structure decisions using data on 40 countries between 1990-2014. We argue that an increase in government debt supply might reduce investors' demand for corporate debt relative to equity since government debt is a better substitute for corporate debt than for equity. As a result, corporations might adjust their capital structure and reduce their leverage. Our results support these hypotheses: we document a negative relation between government debt and corporate leverage both in levels and changes of debt after controlling for country

and year fixed effects as well as country-level controls. Our firm-level analysis shows that the effect is more prominent for large firms, which have more flexibility in substituting between debt and equity. In order to address potential endogeneity problems, we use the integration of the European Monetary Union as a quasi-natural experiment. Overall, our results are consistent with government debt crowding out corporate debt.

References

Badoer, D.C. and James, C.M., 2015. The Determinants of Long-Term Corporate Debt Issuances. *Journal of Finance*.

Baker, M. and Wurgler, J., 2002. Market timing and capital structure. *Journal of Finance*, 57(1), pp.1-32.

Bhamra, Harjoat, Lars-Alexander Kuehn, and Ilya Strebulaev, 2010, The Aggregate Dynamics of Capital Structure and Macroeconomic Risk. *Review of Financial Studies*, 23, pp.4187-4241.

Booth, Laurence, Varouj Aivazian, Asli Demirguc-Kunt and Vojislav Maksimovic, 2001, Capital Structures in Developing Countries, *Journal of Finance*, 56 (2001), 87-130.

Coeurdacier, N. and Martin, P., 2009. The geography of asset trade and the euro: Insiders and outsiders. *Journal of the Japanese and International Economies*, 23(2), pp.90-113.

Claessens, Stijn, Simeon Djankov and Tatiana Nenova, 2001, Corporate Risk around the World, Working Paper, World Bank, CEPR, and Harvard University.

De Jong, Abe, Rezaul Kabir and Thuy Thu Nguyen, 2008, Capital Structure around the World: the Roles of Firm- and Country-Specific Determinants, *Journal of Banking and Finance*, 32 (2008), 1954-1969.

Demirguc-Kunt, Asli, and Vojislav Maksimovic, 1996, Stock Market Development and Financing Choices of Firms, *Word Bank Economic Review*, 10 (1996), 341-369.

Demirguc-Kunt, Asli, and Vojislav Maksimovic, 1998, Law, Finance, and Firm Growth, *Journal of Finance*, 53 (1998), 2107-2137.

Demirguc-Kunt, Asli, and Vojislav Maksimovic, 1999, Institutions, Financial Markets, and Firm Debt Maturity, *Journal of Financial Economics*, 54 (1999), 295-336.

ECB, 2006, Indicators of Financial Integration in the Euro Area, Available at https://www.ecb.europa.eu/pub/pdf/other/indicatorsfinancialintegration200609en.pdf

Fan, J. P. H., G. Twite and S. Titman, 2012, An international comparison of capital structure and debt maturity choices, *Journal of Financial & Quantitative Analysis*, Volume 47, Issue 1.

Foley-Fisher, N., Ramcharan, R. and Yu, E.G., 2014. The impact of unconventional monetary policy on firm financing constraints: evidence from the maturity extension program. Available at SSRN 2537958.

Frank, M.Z. and Goyal, V.K., 2003. Testing the pecking order theory of capital structure. *Journal of Financial Economics*, 67(2), pp.217-248.

Frank, Murray Z., and Vidhan K. Goyal, 2007, Trade-off and pecking order theories of debt, in Espen Eckbo ed.: *Handbook of Corporate Finance: Empirical Corporate Finance*.

Giannetti, M., 2003, Do Better Institutions Mitigate Agency Problems? Evidence from Corporate Finance Choices, *Journal of Financial and Quantitative Analysis*, 38 (2003), 185-212.

Graham, J., Leary, M.T. and Roberts, M.R., 2014. How Does Government Borrowing Affect Corporate Financing and Investment? (No. w20581). National Bureau of Economic Research.

Greenwood, Robin, Samuel Hanson, and Jeremy C. Stein, 2010, A Gap-Filling Theory of Corporate Debt Maturity Choice, *Journal of Finance*, 65, 993-1028.

Hackbarth, Dirk, Jianjun Miao, and Erwan Morellec, 2006, Capital Structure, Credit Risk, and Macroeconomic Conditions. *Journal of Financial Economics* 82, 519-550.

Halling, Michael, Jin Yu, and Josef Zechner, 2016, Leverage Dynamics over the Business Cylce. *Forthcoming: Journal of Financial Economics*.

IMF, 2015, Vulnerabilities, Legacies, and Policy Challenge: Risks Rotating to Emerging Markets, Global Financial Stability Report (GFSR), October 2015, IMF Publications.

Korajczyk, R.A. and Levy, A., 2003. Capital structure choice: macroeconomic conditions and financial constraints. *Journal of Financial Economics*, 68(1), pp.75-109.

Krishnamurthy, Arvind, and Annette Vissing-Jorgensen, 2012, The aggregate demand for treasury debt, *Journal of Political Economy*, 120.2 (2012): 233-267.

Krishnamurthy, A. and Vissing-Jorgensen, A., 2015. The impact of Treasury supply on financial sector lending and stability. *Journal of Financial Economics*, 118(3), pp.571-600.

Lane, P.R., 2006. Global bond portfolios and EMU. *International Journal of Central Banking*, 2 (2), 1-23

Leary, M.T. and Roberts, M.R., 2014. Do peer firms affect corporate financial policy?. *Journal of Finance*, 69(1), pp.139-178.

Lemmon, M.L., Roberts, M.R. and Zender, J.F., 2008. Back to the beginning: persistence and the cross-section of corporate capital structure. *Journal of Finance*, 63(4), pp.1575-1608.

Pagano, M. and Von Thadden, E.L., 2004. The European bond markets under EMU. *Oxford Review of Economic Policy*, 20(4), pp.531-554.

Pels, B., 2010. International Asset Holdings and the Euro, The Institute for International Integration Studies Discussion Paper Series.

Rajan, R.G. and Zingales, L., 1995. What do we know about capital structure? Some evidence from international data. *Journal of Finance*, 50(5), pp.1421-1460.

Titman, Sheridan, and Roberto Wessels, 1988, The determinants of capital structure, *Journal of Finance*, 43 (1), 1-19.

Welch, Ivo, 2004, Capital Structure and Stock Returns, *Journal of Political Economy*, Vol. 112, No. 1 (February 2004), pp. 106-132

Welch, Ivo, 2011. Two Common Problems in Capital Structure Research: The Financial Debt To Asset Ratio and Issuing Activity Versus Leverage Changes. *International Review of Finance*, 11(1), pp.1-17.

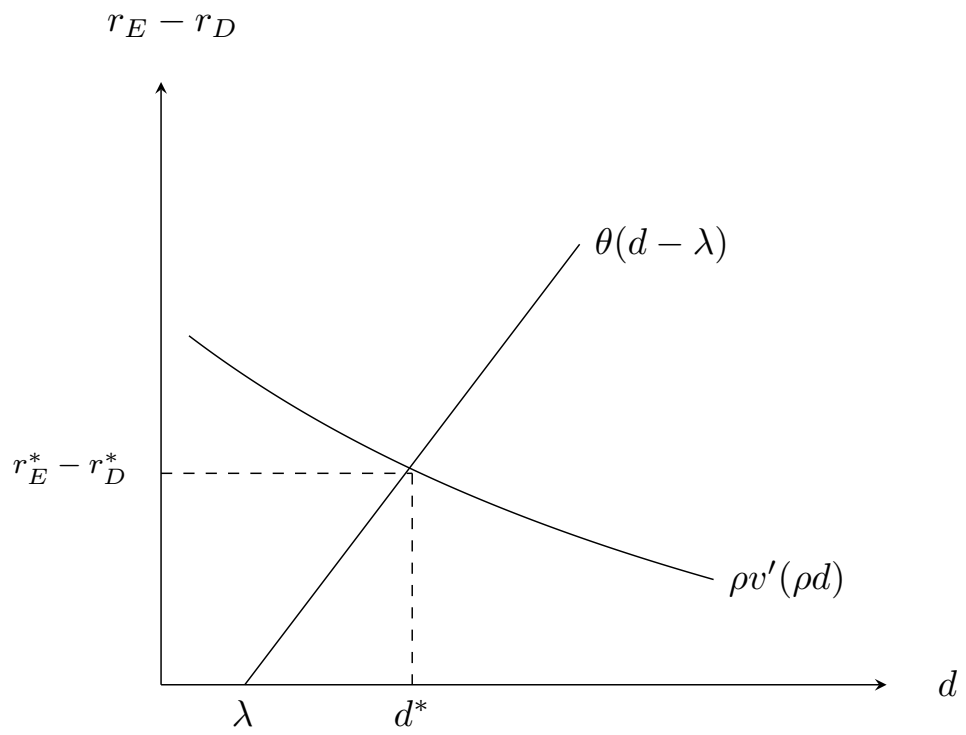

Figure 1: Baseline model This figure shows the equilibrium level of debt-to-capital ratio (d^*) for the baseline case without government sector assuming that $v(.)$ is a logarithmic function.

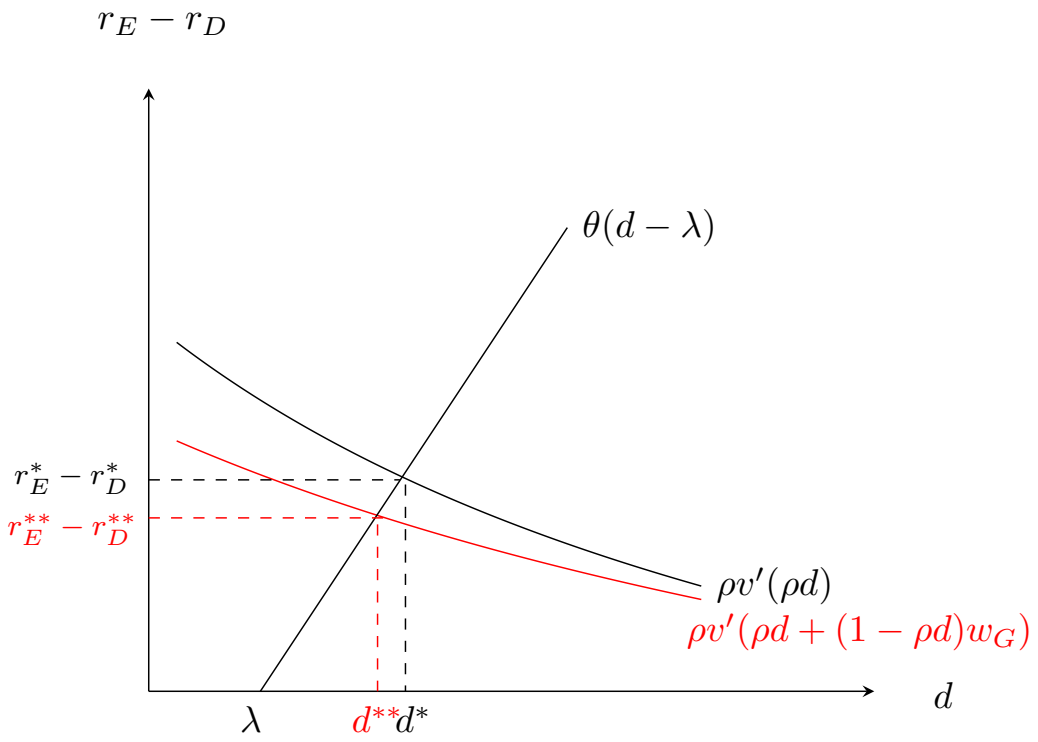

Figure 2: Government sector This figure shows the impact of the introduction of government sector on the equilibrium level of debt-to-capital ratio (d^{**}) for the case when $v(.)$ is a logarithmic function.

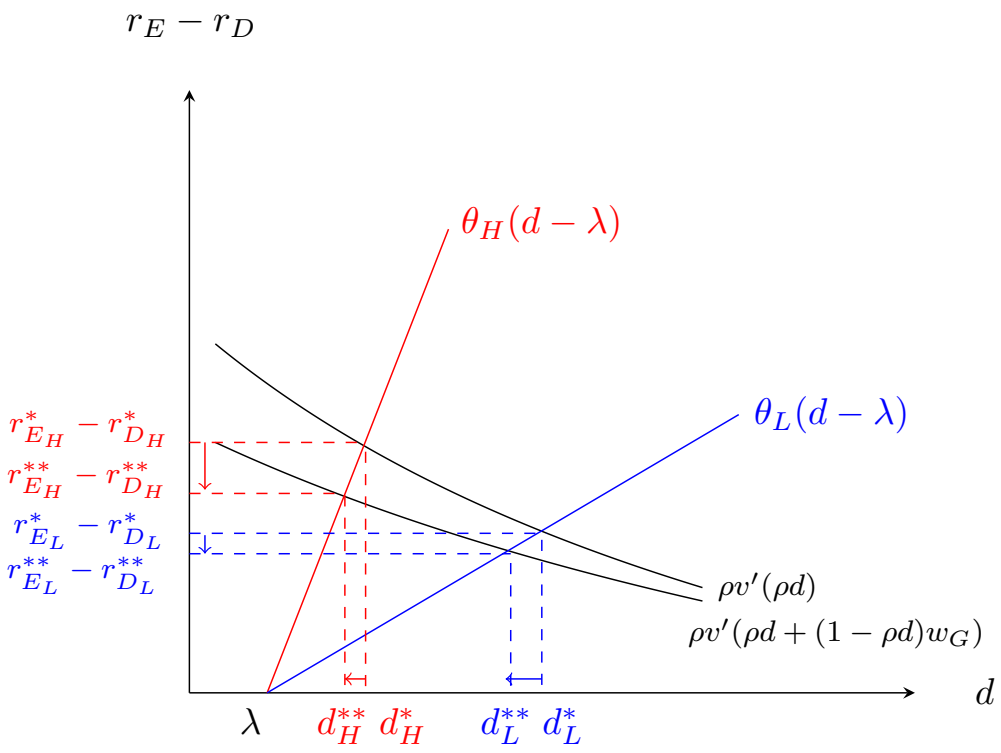

Figure 3: Two firms in different countries This figure shows the impact of the introduction of government sector on the equilibrium level of debt-to-capital ratio for two firms in countries with different adjustment costs θ.

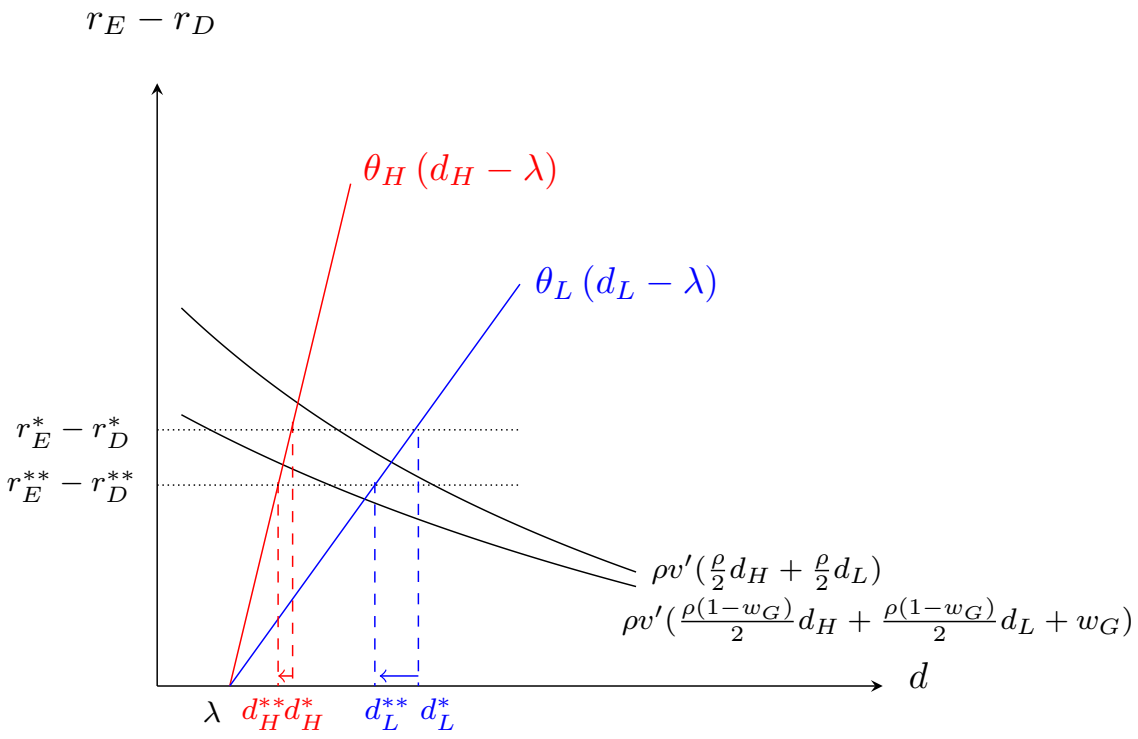

Figure 4: Two firms in the same economy This figure shows the impact of the introduction of government sector on the equilibrium level of debt-to-capital ratio for two equal-size firms with different cost parameters θ incorporated in the same country.

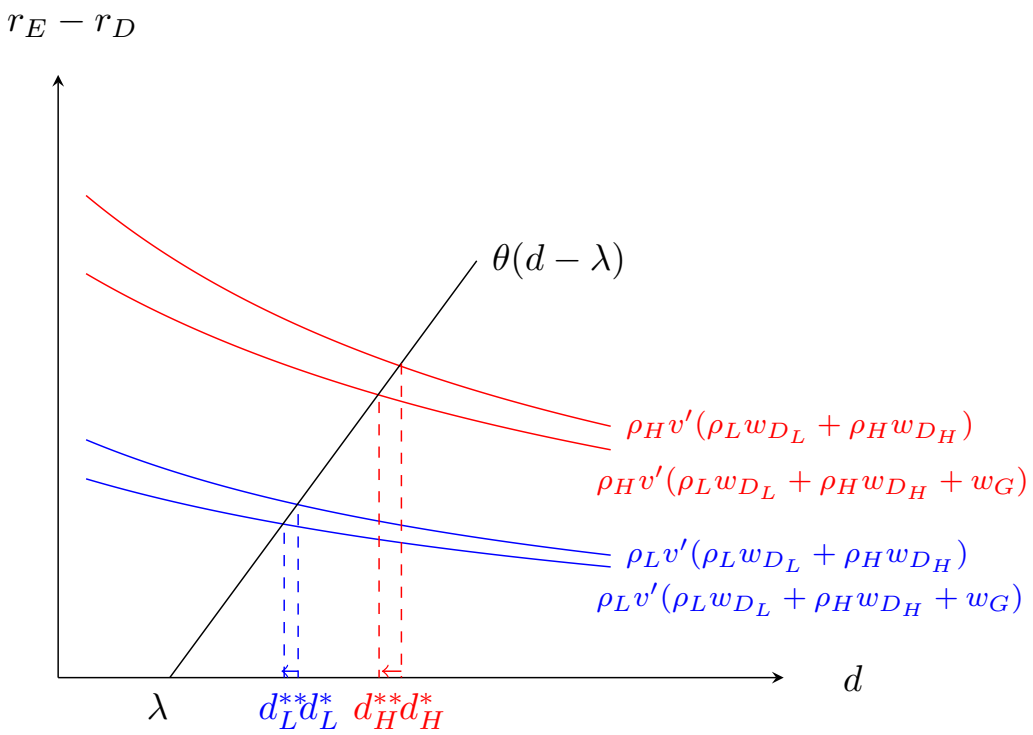

Figure 5: Two firms in the same economy This figure shows the impact of the introduction of government sector on the equilibrium level of debt-to-capital ratio for two firms with substitutability of debt ρ incorporated in the same country.

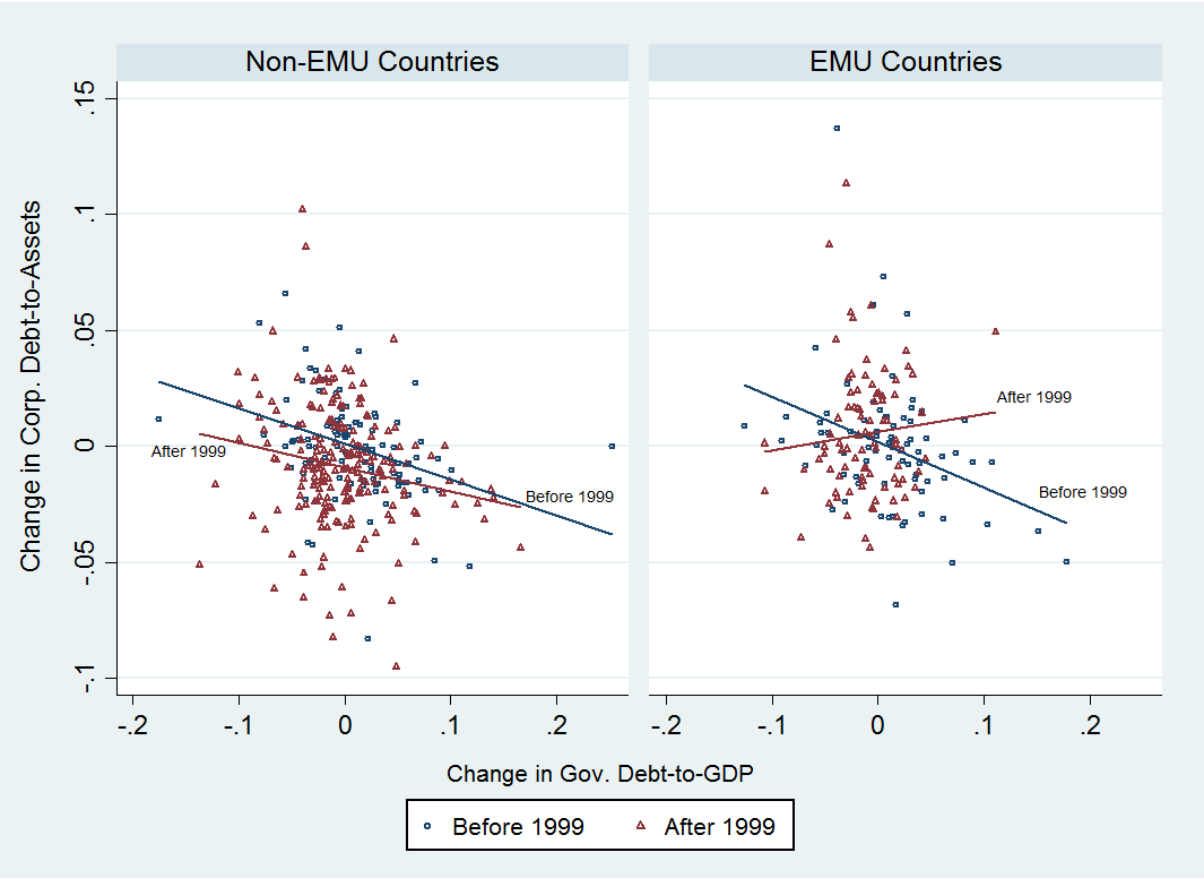

Figure 6: EMU Integration This figure scatter plot the ΔGovernment Debt-to-GDP$_{t-1,t-2}$ to ΔBook Leverage$_{t,t-1}$ in countries that are members of the EMU and all other countries over the 17-year period around the integration (1990-2006). The lines represent the linear regression fits before and after 1999.

Table 1: Sample Distribution

This table reports the frequency distribution of countries in our sample. Observations with missing and/or negative book value of assets and total debt are dropped from the sample. We also exclude firms operating in financial (6000-6999), public (9000-9999) and utility (4900-4999) sectors. Each firm is required to have data on book leverage, firm-level controls as well as government debt-to-GDP, GDP per capita, inflation, S&P index, unemployment and exchange rate. We also exclude country-year observations with less than 10 firms in a given year.

	# of years	# of firms	# of firm-year observations	Min	Max
Argentina	7	55	245	1999	2014
Australia	25	1,984	16,275	1990	2014
Austria	25	116	1,173	1990	2014
Belgium	25	140	1,525	1990	2014
Brazil	13	230	1,468	2001	2014
Canada	25	2,901	19,977	1990	2014
Chile	18	136	1,291	1997	2014
China	19	2,343	17,190	1996	2014
Denmark	22	186	1,873	1993	2014
Finland	25	152	1,878	1990	2014
France	25	937	9,238	1990	2014
Germany	23	884	8,797	1992	2014
Greece	17	231	2,217	1997	2014
Hong Kong	13	127	1,241	2002	2014
India	19	2,449	14,692	1996	2014
Indonesia	12	360	2,572	2002	2014
Ireland	25	93	911	1990	2014
Israel	17	343	2,138	1998	2014
Italy	25	303	2,940	1990	2014
Japan	25	3,820	53,403	1990	2014
Malaysia	19	974	10,604	1996	2014
Mexico	18	116	1,153	1997	2014
Netherlands	25	240	2,672	1990	2014
New Zealand	23	145	1,284	1992	2014
Norway	25	290	2,294	1990	2014
Peru	15	72	609	2000	2014
Philippines	19	155	1,524	1996	2014
Poland	18	432	2,871	1997	2014
Portugal	20	77	702	1995	2014
Russia	13	156	950	2002	2014
Singapore	24	700	6,937	1991	2014
South Africa	19	344	3,238	1996	2014
South Korea	19	1,476	9,417	1996	2014
Spain	23	171	1,839	1992	2014
Sweden	21	568	4,420	1994	2014
Switzerland	25	243	3,080	1990	2014
Thailand	18	505	5,200	1997	2014
Turkey	13	237	1,851	2001	2014
United Kingdom	25	2,515	22,353	1990	2014
United States	25	11,389	97,826	1990	2014
Total	812	38,595	341,868	1990	2014

Table 2: Summary Statistics by Country

This table shows the summary statistics for the country-level variables. *Book Leverage* is defined as the ratio of total book debt of all firms in a country to their total assets. *Debt-to-Capital* is the ratio of total corporate debt to total corporate capital (book value of debt plus equity) in each country. *Market Leverage* is defined as the ratio of total book debt of all firms in a country to their market value of assets. *Government Debt (% GDP)* is gross government debt divided by GDP, *GDP Per Capita* is measured in current U.S. dollars, *Unemployment* is measured as a percentage of the labor force, and *Exchange Rate* is denoted in local currency units per US dollar. *Ln(S&P Index)* and *Ln(CPI Level)* are calculated by taking the natural logarithm of the level of S&P Global Equity Index return and change in CPI assuming 1988 (or the earliest year available) as the base year (100).

Country	Leverage	Debt-to Capital	Market Leverage	Gov. Debt (% GDP)	Ln(GDP Per Capita)	Ln(CPI Level)	Ln(S&P Index)	Unemployment	Ln(Exchange Rate)
Argentina	0.259	0.351	0.171	0.402	9.213	5.153	5.104	0.103	1.241
Australia	0.271	0.379	0.179	0.207	10.242	5.016	5.251	0.067	0.852
Austria	0.246	0.434	0.211	0.673	10.375	4.882	4.802	0.049	1.376
Belgium	0.282	0.450	0.207	1.122	10.318	4.892	5.210	0.080	1.785
Brazil	0.314	0.440	0.059	0.657	8.796	22.205	5.811	0.081	1.143
Canada	0.271	0.387	0.196	0.837	10.272	4.926	5.172	0.081	0.811
Chile	0.283	0.367	0.222	0.106	8.943	6.026	4.834	0.076	6.275
China	0.258	0.365	0.216	0.336	7.497	5.587	4.955	0.037	2.158
Denmark	0.271	0.386	0.172	0.514	10.639	4.941	5.638	0.066	1.975
Finland	0.288	0.438	0.184	0.425	10.364	4.924	5.727	0.095	1.059
France	0.270	0.483	0.199	0.613	10.284	4.880	5.148	0.091	1.118
Germany	0.260	0.495	0.200	0.615	10.378	4.921	5.541	0.081	0.730
Greece	0.313	0.446	0.242	1.106	9.856	5.932	5.347	0.117	2.092
Hong Kong	0.172	0.233	0.092	0.014	10.295	5.330	6.283	0.050	2.172
India	0.331	0.457	0.236	0.733	6.576	5.810	5.268	0.040	3.812
Indonesia	0.323	0.431	0.192	0.370	7.569	6.616	4.251	0.084	9.153
Ireland	0.329	0.457	0.178	0.677	10.300	4.959	5.340	0.098	0.564
Israel	0.343	0.513	0.234	0.799	10.067	5.956	5.400	0.081	1.616
Italy	0.304	0.529	0.258	1.079	10.168	5.096	4.788	0.092	3.282
Japan	0.318	0.486	0.259	1.477	10.469	4.717	3.927	0.039	4.713
Malaysia	0.281	0.375	0.214	0.418	8.645	5.087	4.159	0.033	1.479
Mexico	0.297	0.433	0.208	0.426	8.893	6.867	5.698	0.038	2.451
Netherlands	0.251	0.442	0.146	0.633	10.400	4.882	5.467	0.055	0.783
New Zealand	0.322	0.410	0.173	0.298	9.958	4.965	4.667	0.064	0.966
Norway	0.296	0.460	0.225	0.366	10.796	4.929	5.119	0.040	2.042
Peru	0.235	0.306	0.185	0.356	8.095	15.848	5.658	0.083	1.422
Philippines	0.349	0.474	0.276	0.528	7.244	5.830	3.866	0.090	3.785
Poland	0.224	0.314	0.178	0.460	8.923	10.190	5.320	0.133	1.466
Portugal	0.390	0.594	0.289	0.698	9.688	5.407	5.225	0.087	1.734
Russia	0.196	0.244	0.159	0.188	8.816	11.816	5.372	0.072	3.406
Singapore	0.221	0.320	0.132	0.854	10.219	4.861	5.138	0.027	0.938
South Africa	0.197	0.301	0.108	0.390	8.442	5.957	4.847	0.240	2.059
South Korea	0.330	0.510	0.305	0.226	9.681	5.363	4.740	0.036	6.993
Spain	0.354	0.562	0.230	0.564	9.941	5.186	5.350	0.160	2.081
Sweden	0.246	0.384	0.132	0.513	10.554	5.022	5.779	0.076	2.151
Switzerland	0.252	0.382	0.146	0.520	10.821	4.874	5.746	0.031	0.832
Thailand	0.372	0.495	0.248	0.437	8.015	5.267	3.420	0.018	3.603
Turkey	0.248	0.354	0.184	0.486	8.922	12.510	6.012	0.097	0.888
United Kingdom	0.223	0.346	0.127	0.485	10.271	5.004	5.250	0.069	0.476
United States	0.275	0.424	0.158	0.676	10.500	5.000	5.540	0.061	0.693
Total	0.283	0.423	0.195	0.583	9.685	6.021	5.146	0.074	2.066

Table 3: Summary Statistics for Country- and Firm-Level Variables

This table shows the summary statistics for the country-level (Panel A) and firm-level (Panel B) variables. We use three leverage measures for our firm-level analyses. We define the traditional leverage measures, *Book Leverage* and *Market Leverage*, which are total debt over book value of assets and total debt over market value of assets, respectively. The third measure is defined as total debt divided by debt plus equity, and is labeled as *Debt-to-Capital*. All firm-level debt measures are required to lie within the interval [0,1]. *Tangibility* is defined as the ratio between the value of property, plant, and equipment (PPE) and total assets. We use the natural logarithm of book value of total assets (*Ln(Assets)*) in order to account for the impact of firm size on leverage. Return on assets (*ROA*) is defined as operating income scaled by total assets. Finally, *Market-to-Book* is defined as the ratio between the market value of total assets and the book value of the firm. Country-level corporate variables are calculated by aggregating the numerator and the denominator over all firms with non-missing dependent and control variables in a given year and country. All country-level ratio variables, and all firm-level ratio variables (except leverage measures) are winsorized at 1% on both ends of the distribution. We use Compustat currency exchange rate data in order to convert non-ratio variables into U.S. dollars.

Panel A: Country-Level Summary Statistics

	Mean	St. Dev.	p25	Median	p75	N
Book Leverage	0.283	0.065	0.239	0.277	0.318	812
Debt-to-Capital	0.423	0.098	0.359	0.420	0.481	812
Market Leverage	0.195	0.079	0.141	0.185	0.237	812
Gov. Debt-to-GDP	0.583	0.335	0.372	0.527	0.725	812
Ln(GDP Per Capita)	9.685	1.118	9.156	10.049	10.478	812
Ln(CPI Index Level)	6.021	2.901	4.881	5.095	5.640	812
Ln(S&P Index Level)	5.146	0.796	4.605	5.186	5.715	812
Unemployment Rate	0.074	0.045	0.043	0.068	0.091	812
Ln(Nominal Exchange Rate)	2.066	1.909	0.710	1.403	2.416	812
Tangibility	0.405	0.107	0.329	0.403	0.477	812
Ln(Assets)	12.093	1.595	10.937	11.983	13.138	812
ROA	0.126	0.033	0.102	0.121	0.146	812
Market-to-Book	1.780	2.072	1.232	1.470	1.797	812

Panel B: Firm-Level Summary Statistics

	Mean	St. Dev.	p25	Median	p75	N
Book Leverage	0.213	0.191	0.034	0.183	0.337	341,868
Debt-to-Capital	0.298	0.253	0.049	0.270	0.482	336,258
Market Leverage	0.181	0.181	0.019	0.132	0.290	329,974
Tangibility	0.305	0.232	0.113	0.261	0.446	341,868
Ln(Assets)	5.107	2.082	3.732	5.074	6.427	341,868
ROA	0.044	0.246	0.026	0.084	0.141	341,868
Market-to-Book	1.739	1.576	0.946	1.233	1.857	341,868

Table 4: Leverage Regressions (Fixed Effects)

This table reports the coefficient estimates from the following fixed effects regression: Leverage$_{j,t}$ = β_0 + β_1Government Debt-to-GDP$_{j,t-1}$ + β_2Corporate controls$_{j,t-1}$ + β_3Macro controls$_{j,t-1}$ + u_j + δ_t + $\varepsilon_{j,t}$, where j and t denote the country and year, respectively. *Leverage* denotes one of the following debt measures: *Book Leverage* is defined as the ratio of total book debt of all firms in a country to their total assets; *Debt-to-Capital* is the ratio of total corporate debt to total corporate capital (book value of debt plus equity) in each country; and *Market Leverage* is defined as the ratio of total book debt of all firms in a country to their market value of assets. All other variables are explained in Table 2 and Table 3. All regressions include country fixed effects (u_j) and year fixed effects (δ_t). Standard errors are clustered at the country level. Statistical significance at the 10%, 5% and 1% levels are denoted by "*", "**" and "***", respectively.

	Panel A: All countries			Panel B: OECD countries only		
	Book Leverage	Debt-to Capital	Market Leverage	Book Leverage	Debt-to Capital	Market Leverage
Gov. Debt-to-GDP$_{t-1}$	-0.075***	-0.096***	-0.056**	-0.080***	-0.099**	-0.048*
	(-3.456)	(-2.993)	(-2.269)	(-3.281)	(-2.469)	(-2.003)
Ln(GDP Per Capita$_{t-1}$)	0.013	0.047*	0.028	-0.031	0.017	0.019
	(0.585)	(1.873)	(0.964)	(-0.953)	(0.450)	(0.495)
Ln(CPI Index Level$_{t-1}$)	0.015	0.028	-0.022	0.027	0.059	-0.002
	(0.579)	(0.813)	(-0.558)	(0.845)	(0.998)	(-0.049)
Ln(S&P Index Level$_{t-1}$)	-0.016	-0.032*	-0.049***	-0.024	-0.044*	-0.049**
	(-1.354)	(-2.021)	(-3.660)	(-1.348)	(-1.969)	(-2.449)
Unemployment Rate$_{t-1}$	0.267***	0.324**	0.133	0.134	0.206	0.146*
	(2.918)	(2.422)	(1.160)	(1.138)	(1.180)	(1.885)
Ln(Nominal Exchange Rate$_{t-1}$)	-0.016***	-0.015*	-0.014***	-0.013***	-0.013	-0.009**
	(-3.376)	(-1.864)	(-3.345)	(-3.045)	(-1.647)	(-2.660)
Tangibility$_{t-1}$	0.044	-0.065	0.135	0.026	-0.025	0.071
	(0.586)	(-0.624)	(1.552)	(0.301)	(-0.183)	(0.950)
Ln(Assets$_{t-1}$)	-0.001	0.007	-0.010	0.028**	0.030*	0.018
	(-0.141)	(0.615)	(-1.082)	(2.341)	(1.885)	(1.492)
ROA$_{t-1}$	-0.820***	-1.179***	-1.062***	-0.849***	-1.318***	-0.858***
	(-5.492)	(-5.618)	(-4.237)	(-4.732)	(-5.034)	(-3.888)
Market-to-Book$_{t-1}$	-0.000	0.003*	-0.007***	0.007	0.015	-0.022
	(-0.062)	(1.955)	(-2.780)	(1.042)	(1.422)	(-1.695)
Observations	812	812	812	567	567	567
R-squared	0.694	0.747	0.710	0.661	0.704	0.751
Year FE	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES

Table 5: Leverage Regressions (First Differences)

This table estimates the following first difference specification: $\Delta\text{Leverage}_{j,t,t-1} = \beta_0 + \beta_1\Delta\text{Government Debt-to-GDP}_{j,t-1,t-2} + \beta_2\Delta\text{Corporate controls}_{j,t-1,t-2} + \beta_3\Delta\text{Macro controls}_{j,t-1,t-2} + \delta_t + \varepsilon_{j,t}$, where j and t denote the country and year, respectively. *Leverage* denotes one of the following debt measures: *Book Leverage* is defined as the ratio of total book debt of all firms in a country to their total assets; *Debt-to-Capital* is the ratio of total corporate debt to total corporate capital (book value of debt plus equity) in each country; and *Market Leverage* is defined as the ratio of total book debt of all firms in a country to their market value of assets. All other variables are explained in Table 2 and Table 3. All regressions include year fixed effects (δ_t). Standard errors are clustered at the country level. Statistical significance at the 10%, 5% and 1% levels are denoted by "*", "**" and "***", respectively.

	Panel A: All countries			Panel B: OECD countries only		
	Δ Book Leverage	Δ Debt-to Capital	Δ Market Leverage	Δ Book Leverage	Δ Debt-to Capital	Δ Market Leverage
Δ Gov. Debt-to-GDP$_{t-1,t-2}$	-0.068***	-0.108***	-0.059*	-0.064**	-0.083**	-0.026
	(-3.194)	(-3.586)	(-1.836)	(-2.669)	(-2.446)	(-0.927)
Δ Ln(GDP Per Capita$_{t-1,t-2}$)	0.031**	0.046**	0.041*	0.061***	0.095***	0.082***
	(2.179)	(2.260)	(1.953)	(3.913)	(4.269)	(4.752)
Δ Ln(CPI Index Level$_{t-1,t-2}$)	-0.034	-0.048	-0.022	-0.066	-0.083	-0.037
	(-1.027)	(-0.835)	(-0.356)	(-1.524)	(-0.973)	(-0.529)
Δ Ln(S&P Index Level$_{t-1,t-2}$)	-0.005	-0.003	-0.011	-0.003	-0.003	0.001
	(-0.880)	(-0.453)	(-1.353)	(-0.371)	(-0.318)	(0.140)
Δ Unemployment Rate$_{t-1,t-2}$	-0.109	-0.083	-0.102	-0.052	-0.063	-0.046
	(-1.267)	(-0.664)	(-0.757)	(-0.645)	(-0.465)	(-0.427)
Δ Ln(Nominal Exchange Rate$_{t-1,t-2}$)	-0.001	-0.000	-0.003	-0.001	0.001	-0.002
	(-0.764)	(-0.080)	(-1.068)	(-0.351)	(0.325)	(-0.775)
Δ Tangibility$_{t-1,t-2}$	0.005	-0.077	-0.029	0.054	0.011	-0.002
	(0.101)	(-0.992)	(-0.458)	(0.657)	(0.098)	(-0.031)
Δ Ln(Assets)$_{t-1,t-2}$	-0.000	0.005	0.013**	0.008	0.013	0.016**
	(-0.057)	(0.654)	(2.184)	(1.078)	(1.130)	(2.226)
Δ ROA$_{t-1,t-2}$	-0.148**	-0.187*	-0.143	-0.230**	-0.273*	-0.283**
	(-2.181)	(-1.942)	(-1.223)	(-2.531)	(-1.898)	(-2.717)
Δ Martket-to-Book$_{t-1,t-2}$	-0.001**	-0.001***	-0.003**	0.001	0.001	-0.007**
	(-2.536)	(-2.903)	(-2.065)	(0.396)	(0.349)	(-2.452)
Observations	779	779	779	546	546	546
R-squared	0.188	0.192	0.389	0.231	0.237	0.469
Year FE	YES	YES	YES	YES	YES	YES

Table 6: Alternative Specification

Corporate Debt is the sum of the dollar value of total (short term+long term) debt of all firms in a country and year. *Ln(Government Debt)* is the natural logarithm of the dollar value of government debt outstanding. Standard errors are clustered at the country level. Statistical significance at the 10%, 5% and 1% levels are denoted by "*", "**" and "***", respectively.

	Ln(Corporate Debt)	
	Fixed Effects	First Difference
Ln(Gov. Debt$_{t-1}$)	-0.143**	-0.199***
	(-2.237)	(-2.926)
Ln(GDP Per Capita$_{t-1}$)	0.145	-0.043
	(1.626)	(-0.371)
Ln(CPI Index Level$_{t-1}$)	0.111	0.236
	(1.094)	(0.696)
Ln(S&P Index Level$_{t-1}$)	0.033	0.160***
	(0.790)	(3.769)
Unemployment Rate$_{t-1}$	1.109***	-0.544
	(2.812)	(-0.652)
Ln(Nominal Exchange Rate$_{t-1}$)	-0.045***	0.031
	(-2.708)	(1.634)
Tangibility$_{t-1}$	0.084	0.182
	(0.304)	(0.487)
Ln(Assets$_{t-1}$)	1.006***	0.897***
	(25.605)	(11.850)
ROA$_{t-1}$	-2.051***	0.510
	(-3.954)	(1.218)
Market-to-Book$_{t-1}$	0.002	0.003
	(0.887)	(0.447)
Observations	812	778
R-squared	0.990	0.681
Year FE	YES	YES
Country FE	YES	NO

Table 7: External Debt

This table investigates the impact of external government debt on corporate leverage by repeating both the fixed effects and the first difference specifications in Table 4 and Table 5 after decomposing *Government Debt-to-GDP*$_{t-1}$ as *Internal Government Debt*$_{t-1}$ and *External Government Debt*$_{t-1}$ measured in percent of GDP. Standard errors are clustered at the country level. Statistical significance at the 10%, 5% and 1% levels are denoted by "*", "**" and "***", respectively.

	Fixed Effects			First Difference		
	Book Leverage	Debt-to Capital	Market Leverage	Δ Book Leverage	Δ Debt-to Capital	Δ Market Leverage
Internal Gov. Debt-to-GDP$_{t-1}$	-0.166***	-0.218***	-0.167***	-0.129***	-0.155***	-0.140***
	(-5.076)	(-3.377)	(-4.209)	(-4.993)	(-4.577)	(-3.013)
External Gov. Debt-to-GDP$_{t-1}$	0.028	0.003	0.043	-0.000	-0.027	-0.003
	(0.705)	(0.058)	(0.961)	(-0.006)	(-0.644)	(-0.070)
Ln(GDP Per Capita$_{t-1}$)	0.017	0.055***	0.023	0.030**	0.037**	0.033
	(1.174)	(2.717)	(0.807)	(2.239)	(2.226)	(1.252)
Ln(CPI Index Level$_{t-1}$)	0.040	0.035	-0.034	-0.016	0.017	-0.044
	(1.259)	(0.746)	(-0.641)	(-0.430)	(0.341)	(-0.535)
Ln(S&P Index Level$_{t-1}$)	-0.006	-0.025*	-0.038***	-0.005	-0.004	-0.014
	(-0.637)	(-1.758)	(-2.802)	(-0.846)	(-0.449)	(-1.424)
Unemployment Rate$_{t-1}$	0.289**	0.393**	0.107	-0.019	-0.043	0.016
	(2.088)	(2.106)	(0.630)	(-0.201)	(-0.352)	(0.097)
Ln(Nominal Exchange Rate$_{t-1}$)	-0.005	-0.001	-0.005**	0.000	0.001	-0.001
	(-1.411)	(-0.139)	(-2.067)	(0.050)	(0.349)	(-0.331)
Tangibility$_{t-1}$	0.089	-0.022	0.180**	-0.005	-0.070	0.009
	(1.331)	(-0.213)	(2.043)	(-0.093)	(-0.965)	(0.112)
Ln(Assets$_{t-1}$)	-0.000	0.009	-0.005	0.000	0.009	0.017*
	(-0.069)	(1.084)	(-0.953)	(0.057)	(0.809)	(1.971)
ROA$_{t-1}$	-0.689***	-0.986***	-1.047***	-0.047	-0.094	-0.069
	(-5.082)	(-4.935)	(-4.378)	(-0.609)	(-0.837)	(-0.481)
Market-to-Book$_{t-1}$	0.001	0.003**	-0.006**	-0.001	-0.000	-0.004
	(1.475)	(2.625)	(-2.375)	(-1.144)	(-0.523)	(-1.181)
Observations	633	633	633	592	592	592
R-squared	0.752	0.785	0.751	0.195	0.197	0.418
Year FE	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	NO	NO	NO

Table 8: Country Characteristics and Crowding Out

Panel A and Panel B report the results from the first difference specification for countries with low, medium and high bank credit to private sector (% total credit) and for those with low, medium and high equity market capitalization-to-GDP ratios, respectively. Each year, countries are divided into three equally-sized groups depending on previous year's ratio of bank credit and the size of their equity market. All regressions include macro and firm controls used in the baseline specification. Standard errors are clustered at the country level. Statistical significance at the 10%, 5% and 1% levels are denoted by "*", "**" and "***", respectively.

Panel A	Low Bank Credit			Medium Bank Credit			High Bank Credit		
	Δ Book Leverage	Δ Debt-to Capital	Δ Market Leverage	Δ Book Leverage	Δ Debt-to Capital	Δ Market Leverage	Δ Book Leverage	Δ Debt-to Capital	Δ Market Leverage
Δ Gov. Debt-to-GDP$_{t-1,t-2}$	-0.093***	-0.124***	-0.081**	-0.033	-0.049	0.090	-0.021	-0.049	-0.127
	(-4.322)	(-3.014)	(-2.809)	(-0.691)	(-0.915)	(1.447)	(-0.450)	(-0.765)	(-1.361)
Observations	273	273	273	247	247	247	209	209	209
R-squared	0.333	0.324	0.576	0.215	0.203	0.395	0.121	0.116	0.229
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Panel B	Small Equity Market			Medium Equity Market			Large Equity Market		
	Δ Book Leverage	Δ Debt-to Capital	Δ Market Leverage	Δ Book Leverage	Δ Debt-to Capital	Δ Market Leverage	Δ Book Leverage	Δ Debt-to Capital	Δ Market Leverage
Δ Gov. Debt-to-GDP$_{t-1,t-2}$	-0.041	-0.084*	0.002	-0.048	-0.063	-0.030	-0.082**	-0.142**	-0.096
	(-1.384)	(-1.859)	(0.043)	(-1.025)	(-1.020)	(-0.620)	(-2.525)	(-2.524)	(-1.610)
Observations	249	249	249	245	245	245	240	240	240
R-squared	0.220	0.232	0.425	0.217	0.188	0.504	0.185	0.222	0.438
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 9: EMU Integration

This table investigates the impact of EMU integration on the sensitivity of corporate leverage to government debt for all countries. *EMU* is a dummy variable that indicates whether the country is a member of the EMU. All regressions are estimated for the first difference specification. All regressions include macro and firm controls used in the baseline specification. Standard errors are clustered at the country level. Statistical significance at the 10%, 5% and 1% levels are denoted by "*", "**" and "***", respectively.

Panel A: 1994-2003	Δ Book Leverage		Δ Debt-to-Capital		Δ Market Leverage	
Δ Gov. Debt-to-GDP$_{t-1,t-2}$	-0.150***	-0.117***	-0.267***	-0.220***	-0.250***	-0.234***
	(-3.124)	(-3.313)	(-3.629)	(-3.316)	(-2.888)	(-2.755)
After 1999 X EMU X Δ Gov. Debt-to-GDP$_{t-1,t-2}$	0.373***	0.344***	0.401**	0.373**	0.202	0.041
	(3.287)	(3.681)	(2.459)	(2.648)	(1.392)	(0.294)
After 1999 X Δ Gov. Debt-to-GDP$_{t-1,t-2}$	0.028	0.017	0.155	0.136	0.092	0.167
	(0.438)	(0.312)	(1.578)	(1.511)	(0.823)	(1.610)
EMU X Δ Gov. Debt-to-GDP$_{t-1,t-2}$	-0.001	0.036	0.018	0.046	0.255***	0.259***
	(-0.012)	(0.560)	(0.153)	(0.454)	(2.720)	(3.145)
After 1999 X EMU	0.019***	0.018***	0.028***	0.027***	0.041***	0.046***
	(3.045)	(3.157)	(3.087)	(3.048)	(4.353)	(4.843)
After 1999	-0.008***		-0.011**		-0.020***	
	(-2.793)		(-2.478)		(-3.447)	
EMU	-0.002	-0.000	-0.007	-0.004	-0.018***	-0.016**
	(-0.485)	(-0.077)	(-0.893)	(-0.547)	(-2.734)	(-2.565)
Observations	298	298	298	298	298	298
R-squared	0.104	0.203	0.123	0.178	0.103	0.316
Controls	YES	YES	YES	YES	YES	YES
Year FE	NO	YES	NO	YES	NO	YES

Panel B: 1990-2006	Δ Book Leverage		Δ Debt-to-Capital		Δ Market Leverage	
Δ Gov. Debt-to-GDP$_{t-1,t-2}$	-0.154***	-0.110***	-0.290***	-0.245***	-0.249***	-0.209**
	(-3.982)	(-3.250)	(-4.482)	(-3.672)	(-3.017)	(-2.642)
After 1999 X EMU X Δ Gov. Debt-to-GDP$_{t-1,t-2}$	0.222**	0.215**	0.144	0.147	0.110	-0.023
	(2.049)	(2.158)	(0.884)	(1.000)	(0.804)	(-0.216)
After 1999 X Δ Gov. Debt-to-GDP$_{t-1,t-2}$	0.042	0.026	0.170	0.162	0.103	0.135
	(0.715)	(0.469)	(1.663)	(1.638)	(0.953)	(1.389)
EMU X Δ Gov. Debt-to-GDP$_{t-1,t-2}$	0.008	0.028	0.074	0.091	0.186*	0.197**
	(0.133)	(0.461)	(0.691)	(0.942)	(1.996)	(2.453)
After 1999 X EMU	0.011**	0.011**	0.014**	0.015**	0.026***	0.028***
	(2.210)	(2.255)	(2.043)	(2.151)	(3.124)	(3.276)
After 1999	-0.008***		-0.011**		-0.015**	
	(-2.938)		(-2.601)		(-2.684)	
EMU	0.002	0.002	0.001	0.001	-0.012*	-0.011*
	(0.447)	(0.613)	(0.119)	(0.201)	(-1.843)	(-1.739)
Observations	464	464	464	464	464	464
R-squared	0.110	0.210	0.108	0.175	0.108	0.291
Controls	YES	YES	YES	YES	YES	YES
Year FE	NO	YES	NO	YES	NO	YES

Table 10: Firm-Level Results

This table reports the coefficient estimates from the following fixed effects regression: Leverage$_{i,t}$ = β_0 + β_1Government Debt-to-GDP$_{j,t-1}$ + β_2Macro controls$_{j,t-1}$ + β_3Company controls$_{i,t-1}$ + u_i + δ_t + $\varepsilon_{i,t}$, and the following first difference regression: ΔLeverage$_{i,t,t-1}$ = β_0 + $\beta_1\Delta$Government Debt-to-GDP$_{j,t-1,t-2}$ + $\beta_2\Delta$Macro controls$_{j,t-1,t-2}$ + $\beta_3\Delta$ Company controls$_{i,t-1,t-2}$ + δ_t + $\varepsilon_{i,t}$ where i and j denote the firm and its country of incorporation, respectively. All regressions include firm fixed effects (u_i) and year fixed effects (δ_t). Standard errors are clustered at the country level. Statistical significance at the 10%, 5% and 1% levels are denoted by "*", "**" and "***", respectively.

	Fixed Effects			First Difference		
	Book Leverage	Debt-to Capital	Market Leverage	Δ Book Leverage	Δ Debt-to Capital	Δ Market Leverage
Gov. Debt-to-GDP$_{t-1}$	-0.064***	-0.076***	-0.049***	-0.092***	-0.105***	-0.080***
	(-4.443)	(-4.080)	(-3.127)	(-3.887)	(-4.266)	(-3.678)
Ln(GDP Per Capita$_{t-1}$)	-0.027***	-0.024**	-0.010	0.001	0.006	0.001
	(-3.871)	(-2.608)	(-0.690)	(0.167)	(0.554)	(0.032)
Ln(CPI Index Level$_{t-1}$)	0.013	0.038	0.020	-0.056*	-0.046	-0.041
	(0.486)	(1.088)	(0.671)	(-1.868)	(-1.285)	(-0.800)
Ln(S&P Index Level$_{t-1}$)	-0.016**	-0.018*	-0.047***	-0.004	-0.002	-0.007
	(-2.330)	(-1.945)	(-5.630)	(-1.365)	(-0.581)	(-1.160)
Unemployment Rate$_{t-1}$	0.008	0.060	-0.118	-0.028	-0.034	-0.212*
	(0.101)	(0.531)	(-1.068)	(-0.363)	(-0.323)	(-1.999)
Ln(Nominal Exchange Rate$_{t-1}$)	-0.012***	-0.013**	-0.014**	-0.005***	-0.005***	-0.003
	(-3.356)	(-2.339)	(-2.569)	(-3.771)	(-3.598)	(-1.078)
Tangibility$_{t-1}$	0.122***	0.148***	0.107***	0.041***	0.055***	0.038***
	(6.612)	(6.049)	(6.086)	(4.805)	(5.387)	(4.977)
Ln(Assets$_{t-1}$)	0.037***	0.048***	0.043***	0.009***	0.011***	0.019***
	(8.383)	(7.579)	(9.836)	(6.202)	(7.281)	(8.612)
ROA$_{t-1}$	-0.077***	-0.102***	-0.076***	-0.015***	-0.017***	-0.015***
	(-6.039)	(-5.472)	(-5.328)	(-6.529)	(-6.408)	(-8.045)
Market-to-Book$_{t-1}$	-0.003***	-0.005***	-0.010***	-0.001***	-0.002***	0.001***
	(-2.734)	(-2.880)	(-12.560)	(-2.728)	(-4.509)	(3.713)
Observations	341,868	336,258	329,974	297,846	293,524	287,937
R-squared	0.691	0.706	0.727	0.0115	0.0111	0.0641
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	NO	NO	NO

Table 11: Alternative Specification

Corporate Debt is the sum of dollar value of long-term debt and debt in current liabilities. *Ln(Government Debt)* is the natural logarithm of the dollar value of government debt outstanding. Standard errors are clustered at the country level. Statistical significance at the 10%, 5% and 1% levels are denoted by "*", "**" and "***", respectively.

	Ln(Corporate Debt)	
	Fixed Effects	First Difference
Ln(Government Debt$_{t-1}$)	-0.258***	-0.253***
	(-3.010)	(-3.984)
Ln(GDP Per Capita$_{t-1}$)	0.079	0.319***
	(0.662)	(2.854)
Ln(CPI Index Level$_{t-1}$)	0.440	0.426
	(1.560)	(0.884)
Ln(S&P Index Level$_{t-1}$)	0.066	0.107***
	(1.566)	(3.253)
Unemployment Rate$_{t-1}$	-0.003	-1.273**
	(-0.004)	(-2.277)
Ln(Nominal Exchange Rate$_{t-1}$)	-0.092***	-0.027***
	(-3.308)	(-4.197)
Tangibility$_{t-1}$	0.736***	0.341***
	(4.945)	(5.933)
Ln(Assets$_{t-1}$)	0.791***	0.169***
	(17.429)	(15.350)
ROA$_{t-1}$	-0.613***	-0.060***
	(-9.399)	(-5.354)
Market-to-Book$_{t-1}$	0.011	0.015***
	(1.017)	(7.374)
Observations	338,243	294,302
R-squared	0.880	0.0162
Year FE	YES	YES
Firm FE	YES	NO

Table 12: Government Debt and Company Characteristics

Columns (1)-(3) and (4)-(6) report the results from firm fixed effects regression with firm size and profitability interactions. *Size Above 80th Percentile* is a dummy variable that takes one if the firm's lagged total assets are within the top 20% percentile of their country, and zero otherwise. *ROA Above Median* is a dummy variable that equals one if the firm's lagged return on assets is above the country median, and zero otherwise. All regressions include firm and year fixed effects. Heteroskedasticity-robust t-statistics are reported in parentheses. Standard errors are clustered at the country level. Statistical significance at the 10%, 5% and 1% levels are denoted by "*", "**" and "***", respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Book Leverage	Debt-to-Capital	Market Leverage	Book Leverage	Debt-to-Capital	Market Leverage
Gov. Debt-to-GDP$_{t-1}$	-0.061***	-0.072***	-0.046***	-0.059***	-0.070***	-0.045***
	(-4.188)	(-3.834)	(-3.013)	(-4.228)	(-3.914)	(-2.923)
Size Above 80th Percentile$_{t-1}$	0.015**	0.019**	0.016***			
	(2.227)	(2.036)	(2.801)			
X Gov. Debt-to-GDP$_{t-1}$	-0.012**	-0.014*	-0.011**			
	(-2.374)	(-1.970)	(-2.454)			
ROA Above Median$_{t-1}$				-0.007**	-0.014***	-0.014***
				(-2.424)	(-3.252)	(-3.948)
X Gov. Debt-to-GDP$_{t-1}$				-0.017***	-0.021***	-0.017***
				(-7.115)	(-6.804)	(-6.497)
Ln(GDP Per Capita$_{t-1}$)	-0.028***	-0.025**	-0.011	-0.027***	-0.024***	-0.010
	(-3.867)	(-2.686)	(-0.718)	(-3.652)	(-2.716)	(-0.636)
Ln(CPI Index Level$_{t-1}$)	0.013	0.039	0.020	0.012	0.037	0.019
	(0.498)	(1.097)	(0.684)	(0.440)	(1.033)	(0.628)
Ln(S&P Index Level$_{t-1}$)	-0.016**	-0.018*	-0.047***	-0.016**	-0.019*	-0.048***
	(-2.304)	(-1.922)	(-5.544)	(-2.377)	(-2.019)	(-5.588)
Unemployment Rate$_{t-1}$	0.012	0.067	-0.112	0.007	0.058	-0.121
	(0.171)	(0.599)	(-1.020)	(0.097)	(0.519)	(-1.053)
Ln(Nominal Exchange Rate$_{t-1}$)	-0.013***	-0.013**	-0.014**	-0.012***	-0.013**	-0.014**
	(-3.363)	(-2.342)	(-2.565)	(-3.316)	(-2.319)	(-2.523)
Tangibility$_{t-1}$	0.122***	0.148***	0.107***	0.122***	0.149***	0.107***
	(6.628)	(6.064)	(6.115)	(6.540)	(5.961)	(6.084)
Ln(Assets$_{t-1}$)	0.037***	0.047***	0.042***	0.037***	0.048***	0.042***
	(8.202)	(7.483)	(9.559)	(8.373)	(7.545)	(9.954)
ROA$_{t-1}$	-0.077***	-0.102***	-0.075***	-0.064***	-0.080***	-0.056***
	(-5.953)	(-5.413)	(-5.274)	(-6.775)	(-5.611)	(-5.517)
Market-to-Book$_{t-1}$	-0.003***	-0.005***	-0.010***	-0.003**	-0.004**	-0.009***
	(-2.777)	(-2.920)	(-12.905)	(-2.044)	(-2.237)	(-12.713)
Observations	341,868	336,258	329,974	341,868	336,258	329,974
R-squared	0.691	0.706	0.727	0.692	0.708	0.730
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES

Table 13: Debt Maturity

This table reports the results from firm fixed effects regression of *Long-Term Debt* and *Short-Term Debt* as well as their ratio. *Long-Term Debt* is total debt due in more than one year. *Short-Term Debt* is debt in current liabilities. Heteroskedasticity-robust t-statistics are reported in parentheses. Standard errors are clustered at the country level. Statistical significance at the 10%, 5% and 1% levels are denoted by "*", "**" and "***", respectively.

	LT Debt/ Assets	ST Debt/ Assets	LT Debt/ ST Debt
Gov. Debt-to-GDP$_{t-1}$	-0.032*	-0.032***	-0.033
	(-1.946)	(-3.432)	(-0.715)
Ln(GDP Per Capita$_{t-1}$)	-0.017	-0.010	-0.024
	(-1.280)	(-0.690)	(-0.579)
Ln(CPI Index Level$_{t-1}$)	-0.031	0.044	-0.141
	(-0.682)	(1.471)	(-1.046)
Ln(S&P Index Level$_{t-1}$)	-0.001	-0.014***	0.015
	(-0.242)	(-3.948)	(1.206)
Unemployment Rate$_{t-1}$	-0.027	0.035	0.078
	(-0.308)	(0.496)	(0.304)
Ln(Nominal Exchange Rate$_{t-1}$)	-0.009***	-0.004**	-0.012**
	(-3.248)	(-2.147)	(-2.467)
Tangibility$_{t-1}$	0.078***	0.043***	0.068***
	(5.074)	(9.618)	(3.931)
Ln(Assets$_{t-1}$)	0.027***	0.010**	0.038***
	(13.734)	(2.636)	(21.038)
ROA$_{t-1}$	-0.039***	-0.038***	0.022*
	(-7.673)	(-4.546)	(1.911)
Market-to-Book$_{t-1}$	-0.001	-0.002***	0.004***
	(-0.983)	(-5.627)	(3.855)
Observations	341,868	341,868	293,795
R-squared	0.643	0.594	0.544
Year FE	YES	YES	YES
Firm FE	YES	YES	YES

Appendix

Table A1: Variable Definitions

This table details the variable construction for the analysis of the sample. Panel A lists the definitions of Compustat variables. The variable Xpressfeed pneumonics are given in italic. The country-level variables follow firm-level definitions and are calculated by aggregating the numerator and denominator values over all firms in a given year and country. Panel B lists the data source for and the definitions of macro variables. If a variable is available through two different sources for a country, we use the data source that provides us with the longest series.

Panel A: Compustat Variables

Variable	Compustat Item Name
Ln(Assets)	Ln(Total Book Assets)
ROA	Income / Assets = **oibdp / at**
Tangibility	Net PPE / Assets = **ppent / at**
Market-to-Book	MVA / Total Book Assets
Market Value of Assets	= **at - ceq + prcc** $\times$ **cshoc**
Total Debt	Short-Term Debt + Long-Term Debt = **dltt + dlc**
Book Leverage	Total Debt / Total Book Assets = **(dltt + dlc) / at**
Debt-to-Capital	Total Debt / Total Capital = **(dltt+dlc) / (ceq+dltt+dlc)**
Market Leverage	Total Debt / Market Value of Assets

Panel B: Macro Variables

Variable	Data Source	Definition
Gov. Debt-to-GDP	WEO data on IMF	Gross government debt (%GDP)
GDP Per Capita	World Bank	GDP per capita (current US$)
Inflation	World Bank and IMF	Inflation, consumer prices (annual %)
S&P Return	World Bank	S&P global equity indices (annual % change)
Unemployment Rate	World Bank and IMF	Unemployment, total (% of total labor force)
Nominal Exchange Rate	World Bank and ECB	Official exchange rate (LCU per US$, period avr.)
External Government Debt	IMF, World Bank and ECB	Gross external debt (%GDP)
Bank credit to private sector	BIS	Bank credit (% GDP)