Financial Crowding Out

Abstract:

Using a novel dataset of accounting and market information that spans most publicly traded firms over the last century, we show that government deficit financing crowds out nonfinancial corporate debt financing and investment. Specifically, an increase in the supply of treasury debt is associated with a significant reduction in corporate leverage, debt issuances, and investment, but no significant change in corporate equity issuances. Further, this crowding out effect is present across industries and is more pronounced for larger, less risky firms whose debt is a closer substitute for treasuries. The channel through which this effect appears to operate is financial intermediaries, whose balance sheets reveal a substitution between lending to the federal government and lending to the corporate sector.

How does government debt affect the economy? The "conventional view," as summarized by Elmendorf and Mankiw (1999), is that government debt stimulates aggregate demand and economic growth in the short-run, but retards growth in the long-run via increased real interest rates and reduced private capital formation.[1] To test the latter implication, numerous studies have empirically examined the link between government debt and interest rates. The results of these studies have been described as lacking consensus (Hubbard (2005, 2011)), and "largely uninformative" (Elmendorf and Mankiw (1999)) in surveys of the literature. However, even if one accepts a significant relation between debt and interest rates, this relation by itself provides little insight into the effect of government debt on economic quantities. For example, whether the link between debt and interest rates is economically meaningful for output requires knowledge of the aggregate production function. Thus, despite much evidence, it remains unclear how government debt impacts the economy and, consequently, what policy implications follow.

In this study, we examine the link between government debt and the economy from a financing perspective that exploits a novel, panel dataset containing accounting and market information for U.S. nonfinancial publicly traded firms over the last century. In particular, we study the linkages between the quantity of public debt and the quantity of corporate debt, equity, and investment. Our approach of focusing on quantities, as opposed to prices, is motivated by a large literature highlighting the importance of financing frictions for real activity (Stein (2003)) and the limitations of the price mechanism to clear markets (Wojnilower (1980), Stiglitz and Weiss (1985)). Indeed, there is now a large empirical literature emphasizing the importance of an imperfectly elastic supply of financial capital for corporate behavior (Baker (2009)). We further motivate our approach by showing that other non-price dimensions of debt contracts, such as maturity and control right allocations, contain important cyclical components that are indicative of their role in clearing credit markets.

In our main analysis, we document a sizeable and robust relation between government debt, corporate financing, and corporate investment. Specifically, we find a significant contemporaneous negative relation between public and corporate debt, in both the stocks and flows. A one standard deviation increase in government leverage (i.e., the ratio of US federal

[1] An alternative view is that the mode of public finance – taxes or debt – is irrelevant because of Ricardian Equivalence (Barro (1974)).

debt held by the public to GDP) is associated with a 0.11 standard deviation decrease in corporate leverage (i.e., the ratio of total nonfinancial corporate debt to the sum of debt and equity). This marginal effect on corporate capital structure is significantly larger than that of other macroeconomic factors, such as GDP growth, inflation, and the BAA–AAA corporate bond credit spread. It is also larger than that of firm characteristics, such as profit margins, asset growth, and the market-to-book equity ratio.

This relation is robust. We find similar negative relations between government leverage and corporate leverage at the sector level (e.g., regulated vs. unregulated, durables vs. non-durables). The relation is found in both level and first difference specifications to address concerns over nonstationarity. The relation is largely insensitive to the choice of corporate leverage measure – debt-to-GDP, debt-to-assets, debt-to-market capitalization, debt net of cash-to-assets. Nonlinear specifications and additional control variables accounting for variation in taxes, security market conditions, general economic conditions, and monetary policy have little effect on the relation. Finally, the negative association is found in a variety of subsamples including one that removes the years surrounding World War II.

Driving this negative relationship between the stocks of debt capital is a negative relationship between the net flows of debt capital. A one percent increase in the net flow of government debt is associated with a 9.3 basis point decrease in the net flow of corporate debt. In contrast, we find a smaller, statistically insignificant relation between government net debt issuances and corporate net equity issuances, which are primarily driven by relative equity valuations. Thus, the crowding out effect appears more prominently in credit markets, the primary source of external financing for corporations (Gorton and Winton (2003)).

Without an offsetting increase in equity – internal or external – any reduction in debt implies a reduction in investment via the sources and uses accounting identity. This is precisely what we find, a strong negative relation between the flow of government debt and corporate investment. A one standard deviation increase in the flow of government debt is associated with a one-quarter standard deviation decrease in investment.

While these results are suggestive of a crowding out effect, the lack of exogenous variation in the supply of Treasuries creates an endogeneity problem. Government debt, and in particular deficits, is countercyclical. Consequently, the relations between government debt and corporate policies may reflect changes in aggregate investment opportunities that are

inadequately controlled for in our regressions. In bad times when deficit financing increases and investment opportunities are poor, firms require less external financing and invest less. The differential effect of government debt on corporate debt and equity is suggestive of crowding out but does not completely alleviate this concern if firms have a preference for debt financing due to tax (Miller (1977)) or information (Myers and Majluf (1984)) frictions, for example, or if firms' debt capacities or optimal leverage ratios are procyclical (e.g., Bernanke and Gertler (1989), Gertler and Hubbard (1991)).

To address this identification challenge, we exploit cross-sectional variation in our data. We find that the negative relations discussed above are concentrated among the most credit worthy firms – large, financially unconstrained firms with low earnings volatility and a small probability of default. Further, these results hold if we condition the sample on industries producing durable or non-durable goods. In other words, variation in the supply of treasuries affects corporate securities that are the closest substitutes – the debt of financially safe firms.

These results are difficult to reconcile with the alternative hypothesis based on mismeasured investment opportunities. If government debt simply proxies for macroeconomic conditions and aggregate investment opportunities, then a stronger relationship is expected among smaller, more constrained and less credit-worthy firms (Gertler and Gilchrist (1994), Himmelberg and Hubbard (1996), Korajczyk and Levy (2003)) – the opposite of what we find. They are also difficult to reconcile with variation in alternative determinants of corporate capital structure, such as expected default costs, which suggest a heightened sensitivity of financing and investment to variation in these costs among small, constrained firms.

To understand the channels through which these linkages occur, we turn to an analysis of financial intermediaries balance sheets. Banks, insurance companies, and pension funds have originated and held the large majority of corporate debt since the 1930s. We find a strong negative relation between the change in government leverage and the change in the fraction of intermediary assets dedicated to corporate lending for each of the three intermediaries. When government borrowing increases, bank lending to corporations in the form of commercial and industrial (C&I) loans declines as a share of total bank assets. Likewise, corporate bonds and commercial paper as a share of insurance companies and public pension funds assets fall in response to increases in government borrowing.

To probe further into the channels behind our results, we examine temporal variation in the crowding out effect. Unfortunately, low power and multicollinearity preclude sharp inferences. We find little relation between the magnitude of the crowding out effect and the level of interest rates, variation in government expenditures, or the level of government debt and size of the deficit. We do find suggestive evidence that the crowding out effect is stronger in the second half of the sample, despite a dramatic increase in foreign holdings of US debt since 1970 and gradual deregulation of the banking sector (Krozner and Strahan (2008)). This result is consistent with a growing importance of US treasuries as a form of collateral and store of value (Krishnamurthy and Vissing-Jorgensen (2012).

Our study is related to a number of papers examining the link between government debt and corporate behavior. As indicated above, there is a large literature investigating the link between government debt and real interest rates. More closely related to our study, Friedman (1978) posits a form of portfolio crowding out in which the substitutability between government debt and other assets in investors' portfolios can lead to either crowding out or crowding in of private investment. Theoretical work by McDonald (1983), Taggart (1985), and Benninga and Tamor (1988) suggest a similar linkage between government and corporate debt arises from the presence of market imperfections – primarily taxes – that generate an imperfectly elastic demand curve for corporate debt.

More recently, Krishnamurthy and Vissing-Jorgensen (2012) identify a link between the government debt-to-GDP ratio and corporate bond yield spreads over treasuries, which they argue is due to the unique safety and liquidity features of treasury securities. Krishnamurthy and Vissing-Jorgensen (2013) use a similar argument to show that government debt crowds out short-term safe and liquid debt issued by the financial sector. Greenwood, Hansen, and Stein (2012) show that corporate debt maturity is chosen to "fill the gaps" in the yield curve left by changes in the supply of treasuries of different maturities, a consequence of segmented capital markets and limited arbitrage capital. Our study compliments these efforts by showing that government financing affects more than just yields and the maturity structure of corporate debt, but also the overall quantity of debt, the distribution of corporate liabilities, and investment.

The remainder of the paper is as follows. In Section 1 we discuss the data and sample construction. Section 2 presents the motivating theory of why government debt would effect

corporate financing and investment. Section 3 presents the empirical results. Section 4 concludes.

I. Data and Summary Statistics

Our sample frame begins with all nonfinancial firms listed in the Center for Research in Security Prices (CRSP) monthly stock files. This frame includes all firms listed on the New York Stock Exchange (NYSE) since 1925, all firms listed on the American Stock Exchange (AMEX) since 1962, and all firms listed on the NASDAQ since 1972. For these firms, stock market data comes from CRSP. Accounting data is obtained from two sources: Standard and Poor's (S&P) Compustat database and data hand-collected from Moody's Industrial and Railroad manuals.[2] The end result is an unbalanced firm-year panel beginning in 1920 and ending in 2010.

We also gather data on a number of macroeconomic time-series. Together, the corporate data and macroeconomic data form two samples. The first is an annual time-series containing aggregate corporate measures and macroeconomic factors. The aggregate corporate measures are constructed by summing across firms each year. For ratios, we sum separately the numerator and denominator before taking the ratio. The second sample is a firm-year panel also containing information on firm balance sheets and income statements. Specific details regarding data sources and variable construction are described in Appendix A.

Table 1 presents summary statistics for these samples. Panel A examines the aggregate time-series, Panel B the panel data. Focusing on panel A we see that most corporate series are highly persistent. We present in the table four measures of leverage: debt-to-capital, market leverage, net leverage, and debt-to-GDP. While an analysis of aggregates might naturally focus on the last of these measures – and measures normalized by GDP more broadly – doing so is problematic in our setting because the sample growth rate is different than that of the economy. As such, we focus attention on the first but examine all measures to ensure the robustness of our results. Aggregate leverage is quite volatile with an annual standard deviation of approximately 10%. On average, firms are net security issuers. The different magnitudes between debt and

[2] Missing from our data is information on public utilities, a deficiency we are currently working to remedy. However, we examine alternative data sources below to determine whether this deficiency has a material effect on our results.

equity reflect differences in firm selection: smaller firms tend to issue equity. In aggregate, debt is the primary source of financing (Gorton and Winton (2003)).

Like corporate financial policy, fiscal policy is quite volatile. We define government leverage as the ratio of federal debt help by the public to GDP. The flow of government credit is measured the change in federal debt held by the public from year t-1 to year t divided by GDP in year t-1. We focus on federal debt for two reasons.[3] First, federal debt comprises the majority of total government debt, and is responsible for most of its variation over time. As such, replacing federal debt with the sum of federal, state, and local debt has little impact on our findings below. The relative importance of federal debt can be clearly seen in Figure 1, which presents a stacked area chart of government debt divided by GDP. In fact, the estimates of state and local debt are somewhat misleading. A significant fraction of state and local assets consists of U.S. treasuries (on average $0.5 trillion between 2000 and 2010). Thus, state and local governments can act as a pass through for federal debt by issuing their own debt claims against these assets.

Panel B presents similar statistics for the firm-year panel sample. We winsorize each ratio at the upper and lower one percentiles to address possible data-coding errors and mitigate the influence of outliers on our results. These statistics provide a useful benchmark for comparison with more recent studies of capital structure (e.g., Frank and Goyal (2005), Lemmon, Roberts, and Zender (2008)), and help in quantifying the economic significance of several of our findings below. We refer back to these estimates later.

II. Theoretical Motivation and Identification Challenge

This section discusses the theoretical motivation for our study. To synthesize the theoretical literature, we closely following Taggart (1985) and refer interested readers to his paper for further details.[4] Taggart begins with a three-sector economy consisting of households, nonfinancial corporations and financial institutions. Financial assets are in net zero supply so that

[3] We focus on federal debt help by the public to avoid "double counting" of debt because a significant amount of U.S. treasuries are held by other government entities, such as the social security administration. In unreported analysis, we examine gross federal debt and federal debt held by the public net of Treasury holdings by the federal reserve. Our results are qualitatively similar with these alternative measures.

[4] Taggart (1985) extends the aggregate model of Miller (1977). For other theories of aggregate corporate capital structure, see McDonald (1983) and Benninga and Talmor (1988).

the economy-wide balance sheet consists of tangible assets and household net worth. The role of the financial system is to reconcile the return stream generated by tangible assets with the planned consumption path of the household sector. That is, the securities issued by corporations and the services provided by financial intermediaries are designed to transform the timing and certainty of the cash flow streams generated by the economy's physical assets to meet household demands. Thus, aggregate capital structure is determined by households' demand for asset characteristics, the corporate sector's financial transformation technology, and competition over transformation services among the sectors.

Figure 2 presents two figures from Taggart (1985). On the horizontal axis of each figure is the aggregate quantity of corporate debt (B), on the vertical axis the risk-adjusted return on debt (r^*_D) and equity (r^*_E). Investment is held fixed so that movements along the horizontal axis correspond to substitutions between debt and equity.

In equilibrium, aggregate leverage will depend on the interaction of corporations' willingness to supply debt, and investor demands to hold debt at different yields. The elasticities of these supply and demand curves reflect the willingness of firms and investors, respectively, to freely substitute between debt and equity securities. Panel A presents the aggregate supply and demand curves under the perfect markets assumptions of Modigliani and Miller (1958). These assumptions imply that both supply and demand curves are infinitely elastic, as firms and investors can costlessly transform streams of cash flows.[5] Thus, investors are unwilling to accept any yield differential between debt and equity and corporate capital structure is indeterminate.

Panel B presents the general case in which the presence of market imperfections generates imperfectly elastic supply and demand curves. Frictions impacting firms' ability to transform cash flows, such as bankruptcy costs (Robichek and Myers (1967)) and agency costs (Jensen and Meckling (1976)), create a downward sloping supply curve. As debt increases, these costs increase, which leads to steeper supply curves and lower equilibrium quantities of debt. Variation in corporate taxes shifts the supply curve because the tax deductibility of interest payments reduces the after-tax cost of debt. Frictions impacting investors' – or intermediaries – abilities to transform cash flows, such as personal taxes and tax arbitrage restrictions (Miller

[5] Demand would still be perfectly elastic if households could not costlessly perform transformation services but instead financial intermediaries could.

(1977)), general an upward sloping demand curve. If these costs are significant, then aggregate leverage will depend on investor tax rates, risk preferences and future cash flow expectations.

II.B The Role of Government Debt

As Taggart (1985) notes, the demand curve for corporate securities must be *im*perfectly elastic in order for competing securities to have a role in determining aggregate leverage. Thus, any relation between corporate debt and substitute securities is driven by capital market frictions that make it costly to transform return streams from one security to that of another.

In Miller (1977) and McDonald (1983), personal taxes generate an upward sloping demand curve. McDonald extends the Miller (1977) model to incorporate uncertainty and a government sector. He shows that an increase in the supply of taxable debt will reduce the demand for corporate debt. In effect, when the supply of treasuries is increased the demand curve for corporate debt will shift up and to the left. In McDonald's model, there are no frictions faced by the firm, but for corporate taxes. As such, the supply curve is perfectly elastic as in the Miller (1977) model. Consequently, equilibrium risk-adjusted debt and equity returns are unaffected by the demand curve shift. The effect on equity is ambiguous, depending on the assumption of whether the government debt is net wealth or not (Barro (1974)). If government debt is not net wealth, then corporate equity should increase one-for-one with the decline in corporate debt.[6]

More recently, Greenwood, Hansen, and Stein (2012) build a preferred habitat model (Modigliani and Sutch (1967)) of debt markets that are segmented along the dimension of maturity. A limited supply of capital prevents arbitrageurs from completely eliminating predictability in bond returns and, thus, generates an upward sloping demand curve. While framed in the context of debt maturity, one can also think of their model in the context of the debt-equity decision in which government debt displaces debt more broadly.

Krishnamurthy and Vissing-Jorgensen (2012a) present a model in which a representative agent derives utility from holding Treasuries because of a convenience yield comprised of the safety and liquidity features of Treasuries. In their model, an upward sloping demand curve results from two key assumptions. First Treasuries are assumed to have unique convenience

[6] Benninga and Talmore (1988) take a similar approach to McDonald but examine the implications of fiscal policy for corporate financial policy in a general equilibrium framework. Their findings suggest that while a relationship between government and corporate debt policy likely exists, the nature of that relationship is ambiguous.

properties that cannot be perfectly replicated by other assets. Second, the marginal benefit of holding convenience assets declines as holdings increase. Like earlier works, their model predicts that fluctuations in the supply of Treasuries will impact the yield spread of substitute securities, such as corporate bonds, over Treasuries because of variation in the convenience yield. Indeed, they find a negative relation between the corporate-Treasury yield spread and government debt-to-GDP ratio.

II.C Identification Challenge

Our empirical approach taken below consists primarily of regressions of corporate outcomes (e.g., debt issuance, investment, etc.) on functions of government debt (e.g., the stock and flow of treasury securities normalized by GDP). Absent exogenous variation in the supply of Treasury securities, government debt is endogenous. This endogeneity stems from two sources. The first is changes in latent or unmeasured aggregate investment opportunities that are correlated with variation in the supply of treasuries. Our inability to "perfectly" control for investment opportunities can generate a spurious correlation between corporate policies and government debt. In particular, because government deficit financing is countercyclical, we expect this endogeneity problem to bias any estimated relation down, consistent with the empirical implications of theory discussed above. That is, if our government debt variable is just a proxy for mismeasured investment opportunities, we would expect to see a negative relation with corporate financing and investment.

The second source is shifts in the supply curve of corporate debt, which is unlikely perfectly elastic, as in the Miller (1977) model and its extensions. Shifts in the supply of treasuries – which induce shifts in the demand curve for corporate debt – will most likely be accompanied by shifts in the supply curve for corporate debt. Again, because deficit financing is countercyclical, determinants such as default and agency costs are likely to increase and steepen the supply curve of corporate debt. The effect is a downward bias in any estimated relation between corporate policies and government debt. Thus, like changing investment opportunities, shifts in the supply of corporate debt contemporaneous with variation in the supply of treasuries will lead to a negative relation between government debt and corporate policies absent any economic relation between the two.

Our approach to addressing these concerns is to exploit cross-sectional and time-series variation in the relation between government debt and corporate policies that mitigate the scope for alternative explanations based on these endogeneity concerns.

III. Non-Price Market Clearing Mechanisms

Our analysis begins by further motivating our focus on quantities by emphasizing the importance of non-price mechanisms in clearing financial markets, particular credit markets. Quantity rationing is well established both theoretically (e.g., Jaffee and Russell (1976), Stiglitz and Weiss (1983)) and empirically (Jaffee and Modigliani (1969), Faulkender and Petersen (2005), Leary (2009), Lemmon and Roberts (2010)). Additionally, several studies identify a low price elasticity of credit demand by firms (Wojnilower (1988) and Mackinlay (2012)). Less studied but no less important is variation in other dimensions of financial contracts – mainly debt contracts – such as maturity and the allocation of control rights. If these non-price mechanisms are working to clear credit markets, then we should, at a minimum see substantial time-series variation that is correlated with the business cycle.

Panel A of Figure 3 presents two quarterly time-series. The dashed line presents the average maturity for corporate bonds, value-weighted by the principal amount of the bond. The solid line presents the same time-series for sole-lender and syndicated corporate loans. To ease the presentation, both series are smoothed by averaging over the previous four quarters. There are two striking features of the figure. The first is the difference in levels of the two series. Bonds, on average, have significantly longer maturities than loans. The second feature is the significant variation over time in the average maturity of both types of corporate debt. For loans, the quarterly standard deviation is 10 months, for bonds it is 33 months.

Somewhat less clear is evidence of a pro-cyclical component to maturity. Untabulated regression results show a statistically significant correlation between debt maturity and real GDP growth. Some of this pro-cyclicality may be due to firms tilting their investment portfolios in bad times towards shorter-lived projects – that are matched with shorter maturity debt (Myers (1977)) – to mitigate liquidity concerns. However, this is an unsatisfactory explanation for the magnitude of the temporal variation.

Panel B of Figure 3 presents the quarterly time series for the probability of a covenant violation, or breach of a contract term other than the payment of interest and principal. For example, most every corporate loan restricts one or more accounting metrics, such as the ratio of debt-to-ebitda ratio or net worth – to remain below or above a certain threshold. Economically, these contract features correspond to a state contingent allocation of decision rights that help mitigate incentive conflicts and increase pledgeable income (Aghion and Bolton (1992)). Empirically, covenants are frequently violated (Dichev and Skinner (2002)), and often accompanied by reductions in the availability of credit (Sufi and Roberts (2010)) and corresponding reductions in investment (Chava and Roberts (2008)).

For our sample of corporate loans, we estimate the probability that a borrower will violate an accounting metric covenant during the life of the loan using the method of Murfin (2012). The primary driver of variation in this probability is the tightness of covenant thresholds set at origination. For example, a loan requiring a borrower to maintain a debt-to-ebitda ratio below four is tighter than loan requiring the borrower to maintain a debt-to-ebitda ratio below five, all else equal (e.g., the volatility of the accounting ratios measures). As with maturity, we compute a principal value-weighted average across all loans in each quarter to obtain the aggregate series. The result is an aggregate measure of the allocation of decision rights between borrowers and lenders.

As with debt maturity, there is a significant variation over time in the probability of violating a covenant. The quarterly standard deviation is 5%. Also like debt maturity, the probability of violating a covenant is pro-cyclical – significantly positively related to real GDP growth. At first glance, this finding is counterintuitive because economic theory predicts that banks retain stronger control rights in bad times (Garleanu and Zwiebel (2009)) so that the covenant thresholds are tighter and the probability of violating a covenant are counter-cyclical. However, this finding simply emphasizes the importance of quantity rationing in credit markets. In bad times, financially weak firms do not receive credit. Thus, the pro-cyclicality of the probability of violating a covenant is more indicative of sample selection arising from credit rationing. Indeed, we find that corporate leverage for our sample of bank borrowers is also pro-cyclical, precisely the opposite relation found among the broader population of firms (e.g., Korajczyk and Levy (2003) and Frank and Goyal (2008)).

In sum, maturity and control right allocations are volatile and cyclical – variation that is consistent with their role in clearing credit markets.

IV. The Relation Between Government Debt and Corporate Policies

IV.A Corporate Leverage

Panel A Figure 4 illustrates the relation between government and corporate leverage. While we examine a variety of leverage measures, we focus our attention on corporate leverage defined as the ratio of total debt to total capital for two reasons. First, book leverage is one of the most common measures of leverage used in the empirical capital structure literature. Second, the focus of most corporate financial managers, such as CFOs and Treasurers, and bankers is on book value based measures of leverage (Taylor and Sansome (2007)). Thus, this measure arguably best represents corporate financial policy as it pertains to the stock of debt.

During the last century, government debt experienced several notable transitions beginning with a dramatic expansion after the Great Depression to fund World War II. From its peak of 109% of GDP in 1946, government debt as a share of income fell steadily until 1972 when it leveled off at approximately 25% of GDP. The 1980s saw a renewed increase in public sector leverage that was spawned by the Reagan-era military buildup, and that persisted until the mid-1990s. In 2008, public debt-to-GDP began another dramatic increase in response to the most recent recession and financial crisis.

Turning to corporate leverage, a negative relation with government leverage is apparent. As government leverage increased sharply from 1917 to 1945, corporate leverage experienced a less severe but nonetheless significant decline from 17% to 11% over this same period. From 1945 to 1970, as government debt fell, corporate leverage increased more than threefold to 35%. After little change during the 1970s, corporate leverage increased sharply in the mid-1980s in conjunction with the leveraged buyout boom (Kaplan and Stromberg (2009)) before trending downward over the next thirty years. As shown in Graham, Leary, and Roberts (2013), the other measures of leverage examined in Table 1 show similar patterns.

Panel B of Figure 4 presents corporate leverage for nonfinancial regulated firms (i.e., utilities, transportation and telecommunications) to account for our lack of information on

utilities. To construct this series, we rely on data from the Statistics of Income (SOI). Though the pattern is similar to that found in Panel A, the different scale of the y-axis indicates two key differences in the leverage of regulated and unregulated firms. Leverage of regulated firms is both significantly higher and relatively more stable over time.

Table 2 presents ordinary least squares (OLS) regression results for several models of corporate leverage. More precisely, we estimate the following regressions

$$(1)\ CL_t = \alpha + \beta GL_t + \Gamma X_t + \phi t + \varepsilon_t,$$

and

$$(2)\ \Delta CL_t = \alpha + \beta \Delta GL_t + \Gamma \Delta X_t + \eta_t.$$

Corporate leverage is denoted *CL* and defined as the ratio of total debt-to-total capital. Government leverage is denoted *GL* and defined as before – the ratio of federal debt held by the public to GDP. We include a time trend, *t*, in the level specification to absorb any finite sample time trends. We use Δ to denote the first difference operator ($\Delta CL_t = CL_t - CL_{t-1}$). Serial correlation in the error term of both equations is addressed with Newey-West standard errors assuming a four-period lag structure.

The control variables, *X*, are included to absorb variation in the supply curve of corporate debt, as well as changes in investment opportunities. As such, we include both firm and macroeconomic characteristics to capture variation in corporate taxes, expected bankruptcy costs, agency costs, and the investment environment. The estimates reveal the following inferences. First, government leverage and corporate leverage are strongly negatively related. This relation is robust to the inclusion of both macroeconomic and firm characteristic control variables. This relation is also found in both levels and first differences. In fact, the coefficient estimate in the levels specification, column (3), is almost identical in magnitude to that in the first difference specification, column (6).

Column (3) of Table 2 indicates that a one percentage point increase in government debt financing is associated with a 7.6 basis point decrease in corporate debt financing. Combined with the summary statistics in Panel A of Table 1, this coefficient estimate implies that a one standard deviation increase in government leverage (17.7%) leads to a 1.3% decline in corporate leverage. Relative to the annual standard deviation of corporate leverage (11.81%), this marginal effect is economically significant.

The estimates also indicate that macroeconomic conditions play an important role in shaping corporate leverage. Corporate leverage is counter-cyclical: high and increasing during economic slowdowns. Inflation is positively associated with corporate leverage, consistent with the findings of Frank and Goyal (2009), though the estimates in the difference specification are statistically insignificant. A high interest rate is associated with high levels of leverage, perhaps because of a contraction in asset values. Changes in the credit spread (BAA – AAA yield spread) have a strong negative impact on corporate leverage, while the rate of change in the credit spread has precisely the opposite effect, though less robust. In other words, corporate leverage is lower when the spread is large and tends to increase when the spread widens. A wide spread implies that credit for (most) corporations is relatively expensive. Spreads increase precisely when firms take advantage of relatively inexpensive debt financing.

Firm characteristics play a significant role in determining the level of corporate leverage, but a negligible role in determining the change in corporate leverage. Profit margins, asset intangibility, and growth opportunities – proxied by the market-to-book ratio – all have a negative relation with the level of corporate leverage. This is consistent with the results in many firm level studies (e.g., Rajan and Zingales (1995)). The signs are unchanged in the first difference specification but we see a sharp attenuation in the coefficient magnitudes and corresponding t-statistics.

Panel B of Table 2 presents the results of a host of additional robustness tests. The baseline model for this analysis is the same as that presented in columns (3) and (6) in Panel A. The dependent variable is corporate leverage, measured contemporaneously with the covariates unless otherwise specified. We modify this baseline specification in a variety of ways, as indicated by each row. The figures in each row correspond to the coefficient estimates (and t-statistics in parentheses) on the government leverage variable. The first column corresponds to specifications in levels of all of the variables, the second column first differences.

The first four rows explore alternative measures of corporate leverage, our dependent variable. The estimates on the government leverage ratio are similar to those found in Panel A. The second row defines corporate leverage as the ratio of "net debt" (debt – cash holdings and short-term investments) to assets. The marginal effect of government leverage on net debt leverage is significantly larger in magnitude due to the positive correlation between corporate cash holdings and government leverage (Graham, Leary, and Roberts (2012)). The third row

replaces book value of equity in the debt-to-capital ratio with the market value of equity.[7] This measure is closer to theoretical constructs. Finally, we normalize total debt by GDP. These alternative definitions have little effect on our estimates. Thus, the negative relation between corporate and government debt is largely insensitive to how one measures corporate leverage.

The next five rows alter the independent variables, *X*. We first substitute the aggregate corporate assets for GDP in the normalization of government debt. As with the y-variable, the scale factor has little impact on the estimated relation. Column (6) presents the results when we lag all of the covariates, including government leverage. The levels estimate attenuates but is still statistically significant, while the first difference estimate is statistically insignificant. These results are unsurprising in light of the persistence in the two leverage series (see Panel A of Table 1).

Inclusion of the corporate tax rate – unreported – has virtually no impact on the estimated relation. However, the tax incentive to issue debt created by corporate taxes is mitigated by the presence of personal taxes. As such, we include a debt-tax incentive variable defined as:

$$(3)\ \text{Debt Tax Incentive} = \frac{tax_{Corporate} - tax_{Personal}}{\left(1 - tax_{Personal}\right)}.$$

The relation between corporate and government leverage is unaffected.

The eighth row incorporates additional macroeconomic variables – the price of oil, the unemployment rate, growth in the money supply narrowly defined, and the ratio of government spending to GDP. The coefficient on government leverage is unaffected.[8]

Rows nine through twelve examine different subperiods to determine if the effect is concentrated in a particular era. With only 90 observations, statistical power is limited. Nonetheless, (lack of) variation in the magnitude of the coefficient on government leverage can

[7] Practically speaking, it is typically not possible, to get the total market value of debt for most firms. The majority of debt securities do not have a publicly available price (bank loans) or even an informative price (illiquid bonds). As such, we follow the convention in the capital structure literature of proxying for the market value of debt with the book value. For financially healthy companies, this is a reasonable approximation since most debt issued at par.

[8] In untabulated results, we also examine the effect of including second- and third-order polynomials of every control variable, except for government leverage. There is a slight attenuation in the estimated coefficient, which is still economically and statistically large. We also examine leverage in a fractional response model (Papke and Wooldridge (1996)). Intuitively, this model is akin to a logit but allows for y-values that lie on the boundaries of the unit interval, [0,1]. This model recognizes that our dependent variable is a fraction. Because this functional form is only defined on the unit interval, we can only estimate the model in level form. The resulting coefficient estimate is highly statistically significant.

still be informative. For all of these tests, we rely on our baseline specification with corporate leverage defined as the debt-to-capital ratio.

Excluding the years during and just after World War II has little affect on the economic magnitude or statistical significance of the government leverage coefficient. Focusing on just the first half of the sample, 1926 to 1968, reveals statistically significant estimates in both the levels and difference specification, though the magnitudes are slightly smaller than those in Panel A. Estimates from the second half of the sample are quite a bit noisier. The level specification estimate is actually positive, but insignificant, while the difference specification is negative and insignificant. This finding raises the question of what changed since 1970 to alter the relationship between corporate leverage and government leverage. We investigate this question below.

Finally, we exclude all recession years, defined as a year in which more than one quarter was deemed a recession by the National Bureau of Economic Research. There are 28 such recession years. This change has no impact on the coefficient estimates.

The last four rows examine the results using alternative samples. Row 13 examines the ratio of debt-to-capital computed using the data from only the 500 largest (by asset value) firms in our sample each year. This change is motivated by a desire to mitigate the effect of a changing sample composition due to firm entry and exit. The results are similar to those found for the broader sample. The final three rows rely exclusively on data from the Statistics of Income, which breaks out broadly defined industries. For all nonfinancial firms – regulated and unregulated – the relation between corporate and government leverage is similar to that found using our data. Likewise, focusing on just unregulated firms (i.e., excluding utilities, transportation and telecommunications) produces similar findings. Interestingly, when we focus exclusively on regulated nonfinancial firms, we find a very similar correlation as well, despite the relatively stable path of leverage for these firms (see Panel B of Figure 4).

In sum, the negative relation between corporate and government leverage is robust, and economically and statistically significant.

IV.B Net Security Issuances

While the first difference specifications examined above are suggestive of a link in financing decisions, they are confounded by contemporaneous changes in the denominator and,

thus, any economic growth or contraction. This section focuses on the flows of corporate debt and equity and how they relate to the flows of government debt.

Panels A and B of Figure 5 present plots of the flow of corporate debt and corporate equity, respectively, against the flow of government debt. To ease inspection, the large spikes in government debt during World War II are truncated at 12%.[9] Panel A reveals a clear negative association between the flows of credit in the two sectors, Panel B somewhat less so.

We formally investigate these relations with the following regressions:

$$(4)\ \Delta CD_t = \alpha + \beta \Delta GD_t + \Gamma X_t + \eta_t,$$

$$(5)\ \Delta CE_t = \alpha + \beta \Delta GD_t + \Gamma X_t + \eta_t,$$

where ΔCD_t is the change in corporate debt from *t-1* to *t* divided by total assets at *t-1* and ΔGD_t is the change in federal debt from *t-1* to *t* divided by GDP at *t-1*, ΔCE_t is the dollar value of corporate net equity issuances from *t-1* to *t* divided by total assets at *t-1*. The control variables in both equations (4) and (5) are denoted by X_t and consist of the same firm characteristics – except real asset growth – and macroeconomic variables used in Table 2. To avoid regressing security issuance activity on future information, we lag all stock and price variables one period and use contemporaneous measures for all flow variables. Serial correlation in the error term of equations (4) and (5) is addressed by Newey-West standard errors assuming a four-period lag structure.

Table 3 presents the coefficient estimates for the government net debt issuance variable and model information for equations (4) and (5). Focusing first on net debt issuances in columns (1) through (3), we see a significant negative relation between corporate and government net debt issuing activity. There is some attenuation as we add control variables, much like leverage, but the result is statistically significant and sizable across specifications. A one percent increase in the flow of government debt is associated with a five to seven basis point reduction in the flow of corporate debt relative to assets. Net equity issues also show a negative relation with government debt issues. Economically speaking, a one standard deviation increase in net debt issuing activity by the government is associated with a 0.16 standard deviation decrease in corporate net debt issuing activity.

Columns (4) and (5) reveal a negative relation between corporate net equity issuance and government net debt issuance similar in magnitude to that found with corporate debt. However, column (6) reveals that government deficit financing is economically and statistically irrelevant

[9] Government deficits as a percent of GDP between 1942 and 1945 were 15%, 37%, 29%, and 23%, respectively.

once we account for firms' relative equity valuations, i.e., the market-to-book ratio. This asymmetry reinforces the leverage results above. Government financing has a strong negative effect on the net flow of corporate debt and, consequently, the stock of debt, but not that of equity. This asymmetry is also interesting because it casts some doubt on the interpretation of the relation between corporate and government financing as being reflective of latent shifts in investment opportunities. It does not fully eliminate the concern, though, since any preference corporations have for debt as a means of financing investment would leave our results open to this alternative interpretation.

We also note that in untabulated results, normalizing the flow of corporate security issuances by lagged GDP, instead of total assets, produces qualitatively similar findings. Additionally, when we split our sample in half, as in Panel B of Table 2, we find an economically stronger negative relation in the *second* half of the sample, though the estimates are imprecisely estimated once we incorporate all of the macroeconomic and firm control variables.

IV.C Corporate Investment

Our findings of the previous section coupled with the sources and uses identity suggest that investment should fall in response to increases in government debt.[10] Table IV examines this hypothesis formally with the following regression:

$$(6)\ CI_t = \alpha + \beta \Delta GD_t + \Gamma X_t + \eta_t,$$

where CI_t is corporate investment, defined as the change in non-current assets plus inventory, from *t-1* to *t* as a fraction of total assets as of *t-1*, ΔGD_t is the change in federal debt from *t-1* to *t* divided by GDP at *t-1*, and X is a vector of control variables. Alternative definitions of investment, such as the growth in the capital stock net of depreciation, generate similar results and, as such, are not presented. As with the flow regressions in equations (4) and (5), we lag all stock and price variables one period and use contemporaneous measures for all flow variables.

[10] Our regressions control for earnings, which are highly correlated with cash flow, though it is possible that firms are scaling back on dividends in response to the reduction in debt usage to finance investment. However, dividends are small in relation to the flow of credit and "sticky," as firms are reluctant to cut dividends because of negative stock price reactions (Brav et al. (2006)).

Serial correlation in the error term is addressed by Newey-West standard errors assuming a four-period lag structure.

The results reveal a strong negative correlation between investment and the flow government debt. Including macroeconomic characteristics has little effect on this relation, as seen in column (2). Incorporating firm characteristics, the market-to-book ratio and profitability in particular, leads to a slight attenuation in the effect, though one that is still significant. Finally, including cash balances and lagged investment (Eberly, Rebelo, and Vincent (2012)) has a negligible effect on the estimated coefficient. A one percent increase in the flow of government debt relative to GDP is associated with a 17 basis point decline in investment.

Untabulated results show that this finding is also robust to normalizing corporate investment by lagged GDP. Further, we find a stronger association between corporate investment and government net debt issuances in the second half of the sample than the first. However, like the split sample results for corporate net debt issuances, the estimates are statistically imprecise.

V. Why is Government Debt Related to Corporate Policies?

Our analysis thus far has documented a robust negative relation between corporate and government debt – both stocks and flows – and between corporate investment and government debt. Interpretation of this result has thus far been limited by our reliance on aggregate data and the ability to control for confounding effects with observables. In this section we attempt to address the identification challenge by (1) exploiting cross-sectional variation provided by our panel data, and (2) investigating the channels through which government debt would affect corporate financial policy.

V.A Cross-Sectional Heterogeneity

This section addresses the question: which firms' financial and investment policies are more (less) sensitive to variation in government debt? In classifying firms, we focus on financial health, broadly defined. The motivation is two-fold. First, if corporate debt is a substitute for

government debt in investors' portfolios, then the debt of more credit-worthy firms is a closer substitute than that of less credit-worthy firms (Friedman (1978)).

Second, this classification provides a useful falsification test to held address identification concerns. In particular, one concern with interpreting our results above is the counter-cyclical nature of government debt and deficits. This correlation with the business cycle suggests that our estimates above may capture the effect of variation in aggregate investment opportunities that are not adequately controlled for with observables. Increases in government debt coincide with economic downturns when investment opportunities are poor and firms require less external capital – consistent with our results above. However, if this explanation is behind our results, then the association between corporate policies and government debt should be larger for financially weaker and more constrained firms as shown by Gertler and Gilchrist (1994) and Gertler and Himmelberg (1995).

Likewise, this analysis can help alleviate concerns about contemporaneous shifts in the supply curve of corporate debt due to variation in its determinants, such as expected default costs and agency costs. Specifically, financially constrained firms are characterized as such precisely because they face greater frictions, such as expected default costs, information asymmetry, or agency conflicts. If variation in government debt is just capturing variation in these frictions then we would expect that these frictions are exacerbated in bad times. For example, default costs are higher in bad times when secondary asset markets are depressed and less liquid and the likelihood of default is greater. Thus, if government debt is capturing contemporaneous shifts in the supply curve. we would expect the relation between corporate policies and government debt to be larger for more financially constrained firms.

To test these hypotheses, we examine the sensitivity of corporate policies to government debt as a function of firms' financial health, broadly defined. We use five proxies that capture financial health and credit-worthiness: firm size, earnings volatility, the Whited-Wu index of financial constraints, the Hadlock-Pierce index of financial constraints, and an estimated probability of default based on the model of Merton (1970). Each year, we classify firms into four buckets based on quartiles for each proxy. For our analysis, we focus on the lower and upper quartiles. For example, small firms are defined as those firms falling in the lowest quartile of the distribution of assets, while large firms are those firms falling in the highest quartile. We then run three regressions corresponding to three different dependent variables – corporate

leverage, corporate net debt issuance, and corporate investment – for each subsample, for each proxy. Each regression includes firm fixed effects to eliminate concerns about time-invariant cross-sectional heterogeneity. The control variables – not reported – are identical to those found in in column (3) of Panel A, Table II (corporate leverage), column (3) of Table III (corporate net debt issuance), and column (3) of Table IV (corporate investment).

The results are presented in Table V, with t-statistics in parentheses and firm-year observation counts (Obs). Columns (1) and (2) present the results using firm size as a proxy. The first set of results show that the coefficient estimate in the regression of corporate leverage on government leverage (and control variables) equals -0.039 when estimated on the subsample of small firms, and -0.096 when estimated on the subsample of large firms. The coefficient on the change in government debt divided by lagged GDP in the corporate net debt issuance regression is -0.033 for small firms, and -0.098 for large firms. Finally, the investment regression reveals a coefficient on the government debt variable equal to -0.047 for small firms and -0.126 for large firms. These results highlight that the corporate policies of large firms are more sensitive to government debt than those of small firms.

Moving across the table to columns (3) through (10) reveals similar findings in that financially unconstrained, more credit-worthy firms with less volatile earnings exhibit financial and investment policies that are more sensitive to variation in government debt. This inference holds without exception. It is difficult to reconcile these findings with the alternative interpretation of our findings that government debt is merely a proxy for aggregate investment opportunities or the determinants of supply of corporate debt, such as expected default costs and agency costs.

V.B The Role of Financial Intermediaries

Figure 6 presents the distribution of corporate bond holdings across investor types, as reported in the U.S. Flow of Funds. Clear from Figure 6, domestic financial institutions have historically held the large majority of corporate bonds. Insurance companies are the largest investors, with life insurers holding a significantly larger fraction, on average, than Property and Casualty companies. However, state and local pensions and commercial banks also hold a significant fraction. Since 1970, this distribution has experienced two significant changes. The

first began in the 1970s with the increase in foreign holdings, categorized as "Other." The second began in the 1980s with the increase in mutual fund holdings, also categorized as "Other." In conjunction with bank lending, commercial banks, insurance companies, and state and local pension funds have owned the lion's share of corporate debt during the last 70 years. As an aside, the spike in household share of direct ownership in 1945 is not a transitory spike. Rather, much corporate debt was directly held by households and traded on exchanges before 1945.

Figure 6 highlights that any linkage between government debt and the policies of the non-financial corporate sector are likely to be found in the portfolios of financial intermediaries. As such, Figure 7 examines the asset allocations of these intermediaries over time from the Flow of Funds. To ease the presentation, we focus on the allocation across credit market instruments. Panels A, B, and C present the results for commercial banks, insurance companies, and state and local pension funds, respectively. A few results standout. First, treasuries as a share of intermediaries' portfolios declined dramatically between 1945 and 1970 when the government retired outstanding bonds used to finance World War II. Second, there appears to be a negative association between treasury and corporate debt holdings, though the strength is unclear.

In Table VI, we examine this asset allocation tradeoff and its association with government debt using a simple regression. Specifically, we estimate the following regression

$$(7)\ \Delta\left(\frac{L_t}{A_t}\right) = \alpha + \beta \Delta GD_t + \Gamma \Delta X_t + \eta_t$$

where the dependent variable is the change in the ratio of intermediary corporate lending to total assets, ΔGD is the change government leverage (i.e., the ratio of federal debt held by the public to GDP). The control variables, X, are the same as found in column (3) of Table II and all variables are in first differences. The table presents the estimated coefficient on the government debt variable and t-statistic in parentheses. Serial correlation in the error term of both equations is addressed with Newey-West standard errors assuming a four-period lag structure. The presence of control variables and number of observations are indicated at the bottom of the table.

Panel A presents the results where the dependent variable is lending by intermediaries to corporations (i.e., the fraction of intermediary assets allocated to corporate debt). Columns (1) and (2) present the results using the balance sheet data of commercial banks, where corporate lending is defined as the sum commercial and industrial (C&I) loans and corporate bonds.

Columns (3) and (4) present the results for insurance companies – property and casualty and life where corporate lending is defined as corporate bonds. Finally, columns (5) and (6) present the results for state and local pension funds, where corporate lending is defined as the sum of corporate bonds and commercial paper. Panel B presents results where the dependent variable is the fraction of assets allocated to US treasuries.

Panel A shows a statistically significant and robust negative relation between corporate lending and variation in government debt. In other words, when the government increases its borrowing corporate lending by financial intermediaries decreases as a fraction of assets. Panel B shows that this is, in part, a consequence of increased intermediary lending to the federal government. Thus, intermediaries are substituting between lending to the government and to the nonfinancial corporate sector.

VI. Conclusion

We show that government debt crowds out corporate debt and investment – an effect we refer to as financial crowding out. In particular, when the government increases the supply of treasuries, financial intermediaries reallocate their assets to absorb the treasuries by reducing their lending to the nonfinancial corporate sector. Further, this effect is concentrated among the largest, most credit-worthy and financially unconstrained firms whose debt is a closer substitute for treasuries than that of smaller, riskier firms.

Our results also raise several questions. First, why do intermediaries engage in this substitution? Second, what is the role of alternative forms of debt, such as residential mortgages and consumer credit? Finally, what are the implications of the global credit market integration that began in the 1970's? We hope that future work will work answer these question to provide a more complete picture of the phenomenon documented here.

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Appendix A: Variable Definitions

This appendix provides details on the data sources, sample construction, and variable construction. We use the acronym GFD for Global Financial Database, a source for many macroeconomic series.

A.1 Government debt

Government leverage in our analyses is defined as the ratio of Federal debt held by the public to GDP. We focus on Federal debt because it comprises the majority of total government debt, and is responsible for most of its variation over time. This fact is made apparent in Figure A.4, which presents a stacked area chart of government debt divided by GDP. In fact, the estimates of state and local debt are somewhat misleading. A significant fraction of state and local assets consists of U.S. Treasuries (on average $0.5 trillion between 2000 and 2010). Thus, state and local governments can act as a pass through for Federal debt by issuing their own debt claims against these assets. Focusing on the debt held by the public avoids "double counting" since a significant fraction of U.S. Treasuries outstanding are held by other government entities, such as the social security administration.

A.2 Variable definitions

Gross Domestic Product Implicit Price Deflator: Source = GFD, Series = USGDPD, Annual data from 1947 to 2010.

United States Annualized Exports of Goods and Services: Source = GFD, Series = USEXPGSQ, Annual data from 1947 to 2010.

United States Annualized Exports of Goods and Services: Source = GFD, Series = USIMPGSQ, Annual data from 1947 to 2010.

United States Gross Federal Debt Held by the Public (Bil. of $, NA), Source = GFD, Series = USFYGFDPUBA, Annual data from 1938 to 2010. This series is extended back in time by

assuming that total Federal debt is equal to Federal debt held by the public. Pre-1938 Federal debt data is obtained from, http://www.usgovernmentspending.com/Federal_state_local_debt_chart.html.

Corporate Income Tax Rate: This rate corresponds to the top corporate income tax rate. Source = "Corporation Income Tax Brackets and Rates, 1909-2002", http://www.irs.gov/pub/irs-soi/02corate.pdf. Annual data from 1909 to 2010.

United States M1 Money Stock: Source = GFD, Series = USM1W, Year-end monthly data from 1929 to 2010.

United States M2 Money Stock: Source = GFD, Series = USM2W, Year-end monthly data from 1947 to 2010.

United States State and Local Debt: Source = US government spending (http://www.usgovernmentspending.com/Federal_state_local_debt_chart.html), Annual data from 1902 to 2010.

United States Nominal GDP: Source = GFD, Series = GDPUSA, Year-end annual data from 1790 to 2010.

United States Unemployment Rate: Source = GFD, Series = UNUSAM, Year-end annual data from 1890 to 1928. Year-end monthly data from 1929 to 2010

International Holdings of US Debt: Source = Flow of Funds, Series = Foreign Holdings of U.S. Treasuries. Annual data from 1945 to 2010. Prior to 1945 we assume that there are no foreign holdings of US Treasuries.

USA Government 90-day T-Bills Secondary Market: Source = GDP, Series = ITUSA3D, Year-end monthly data from 1920 to 2010.

USA 10-year Bond Constant Maturity Yield: Source GFD, Series, IGUSA10D, Year-end monthly data from 1790 to 2010.

United States BLS Consumer Price Index NSA: Source GFD, Series, IGUSA10D, Annual data from 1820 to 1874. Monthly data from 1875 to 2010 collapsed to an annual series by averaging within years.

Moody's Corporate AAA Yield: Source GFD, Series, MOCAAAD, Year-end monthly data from 1857 to 2010.

Moody's Corporate BAA Yield: Source GFD, Series, MOCBAAD, Year-end monthly data from 1919 to 2010.

Variable Construction

Inflation = [CPI(t) – CPI(t-1)] / CPI(t) where CPI(t) is the consumer price index in year t computed as the average monthly CPI for the year.

US Net exports = [US exports – US imports] / US GDP

GDP growth = [GDP(t) – GDP(t-1)] / GDP(t-1) where GDP(t) is US gross domestic product in year t.

Government Leverage = US public debt held by the public in year t / GDP(t)

Net Debt Issuances by the US Government = Change in US public debt held by the public from year t-1 to t / GDP(t-1)

Book Leverage = Total Debt / Total book value of assets

Market leverage = Total Debt / (Total Debt + Equity Market Capitalization)

Net Debt leverage = (Total Debt – Cash) / Total book value of assets

Net Debt Issuance = [Total Debt(t) – Total Debt(t-1)] / Total book value of assets(t-1)

Net Equity Issuance = [Equity issues(t) – Equity repurchases(t)] / Total book value of assets(t-1)

Market-to-Book Equity Ratio = Equity Market Capitalization / Book Equity

Profitability = operating income before depreciation / total book value of assets

Tangibility = net plant property and equipment / total book value of assets

Intangible Assets = [Total Assets – (Net PP&E + cash and marketable securities + accounts receivable + inventories)] / Total Assets

Asset growth = [Total book value of assets(t) - Total book value of assets(t-1)] / Total book value of assets(t)

Figure 1
Distribution of Public Debt as a Fraction of GDP

The figure presents debt at the local, state, and federal level as a fraction of GDP.

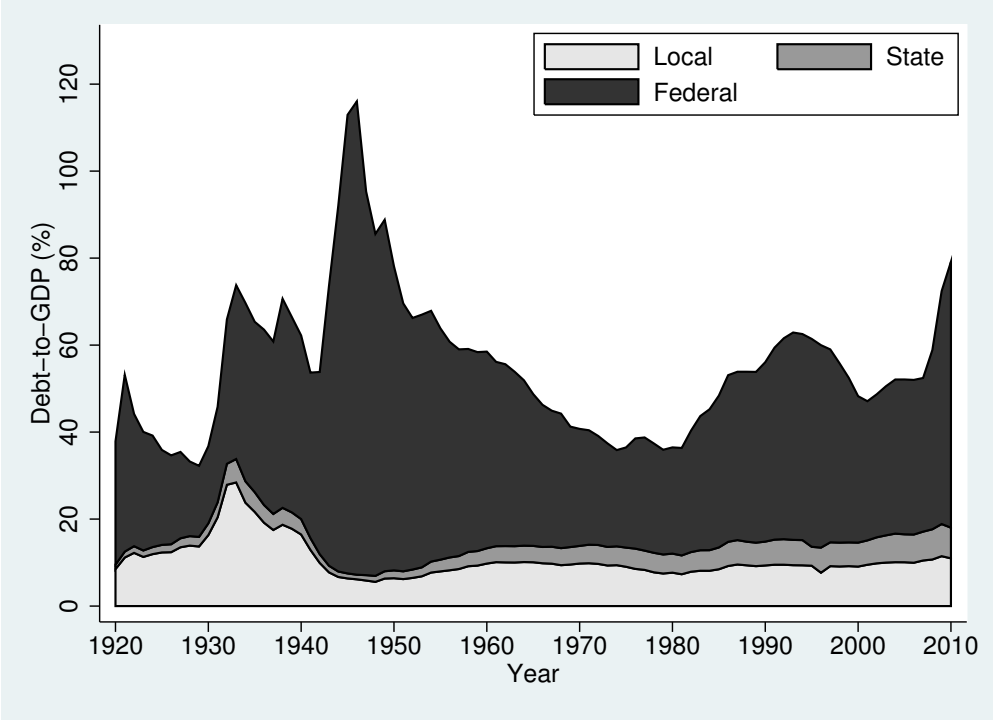
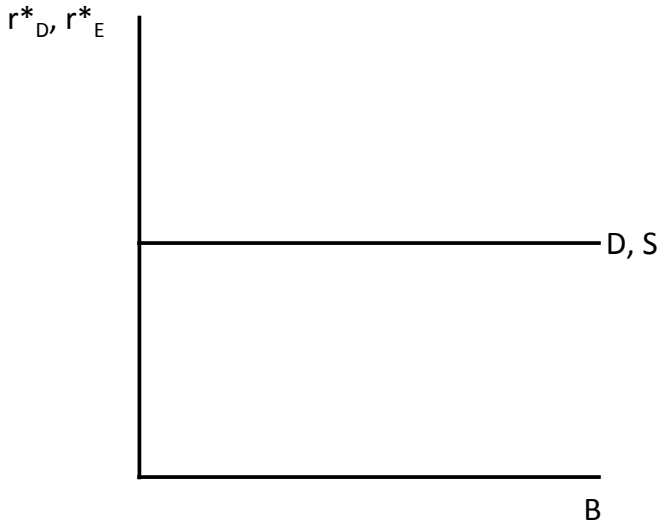


Figure 2
Supply and Demand for Corporate Debt

The figure shows the theoretical demand and supply curves for corporate debt under different assumptions about the relevant market frictions. On the horizontal axis of each figure is the aggregate quantity of corporate debt (B), on the vertical axis the risk-adjusted return on debt (r_D^*) and equity (r_E^*). Panel A presents the case of perfect markets as in Modigliani and Miller (1958). Panel B presents the general case in which firms face costs in transforming cash flow streams (e.g., corporate taxes, bankruptcy costs, agency costs), generating a downward sloping supply curve, and investors and intermediaries face costs in transforming cash flow streams (e.g., personal taxes, heterogeneous expectations), generating an upward sloping demand curve.

Panel A: M&M



Panel B: General Case

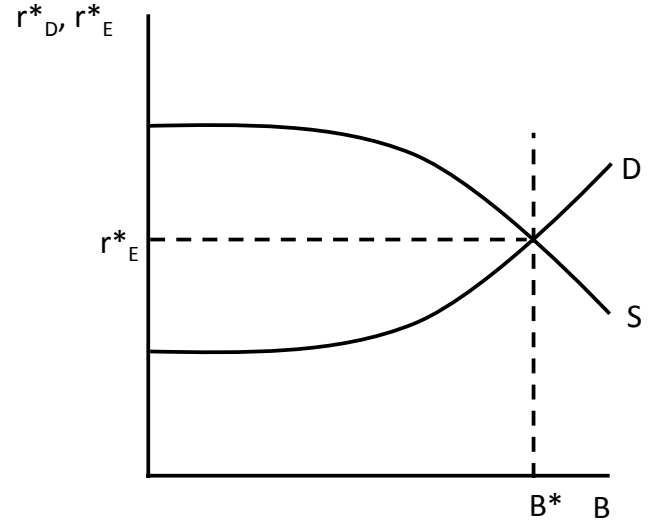
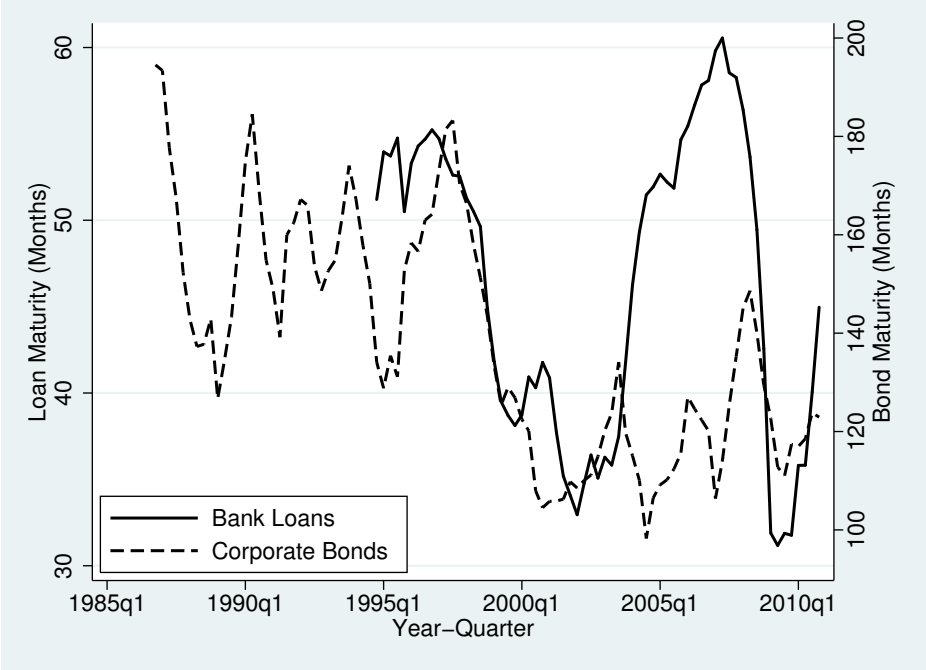


Figure 3
Corporate Debt Maturity and Control Right Allocations

Panel A presents the time series of annual principal weighted average maturity for corporate bonds and corporate loans from banks (i.e., bank loans). Panel B presents the time series of annual principal weighted average probability of a loan covenant violation.

Panel A: Debt Maturity



Panel B: Debt Covenant Tightness

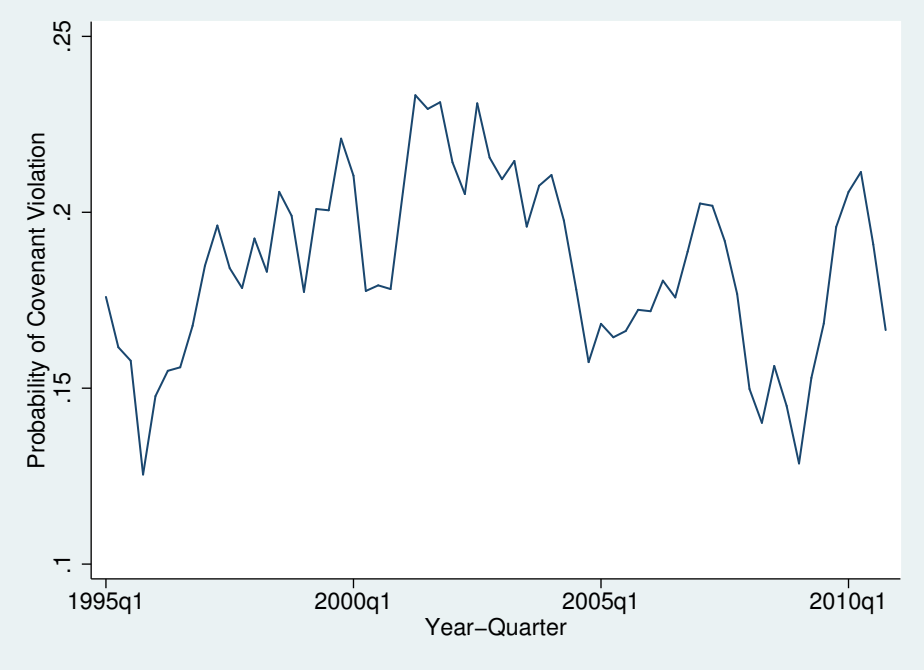
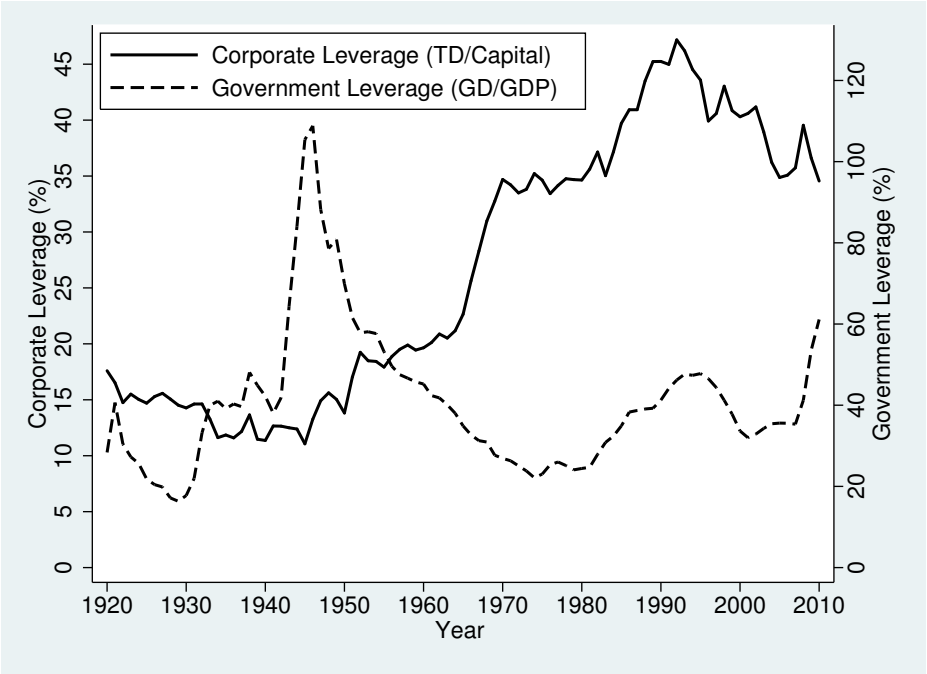


Figure 4
Corporate and Government Leverage

The figure presents annual time series of government leverage and corporate leverage. Panel A presents aggregate corporate levearge for unregulated firms, Panel B for regulated nonfinancial firms. Government leverage is the ratio of federal debt held by the public to GDP. Corporate leverage is the ratio of all interest bearing debt to total capital, defined as the sum of all interest bearing debt and book equity.

Panel A: Unregulated Firms



Panel B: Regulated Nonfinancial Firms

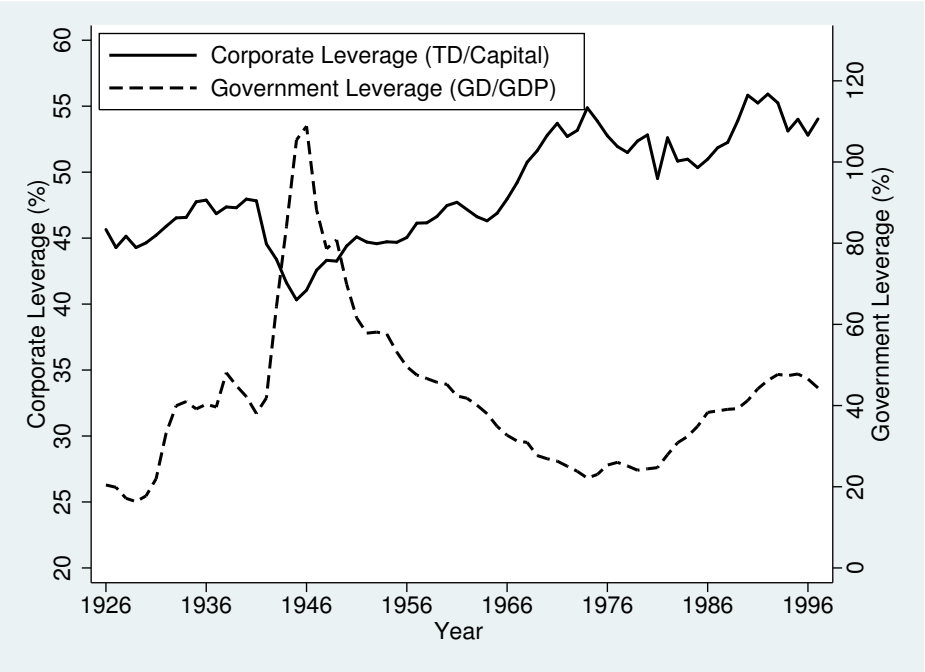
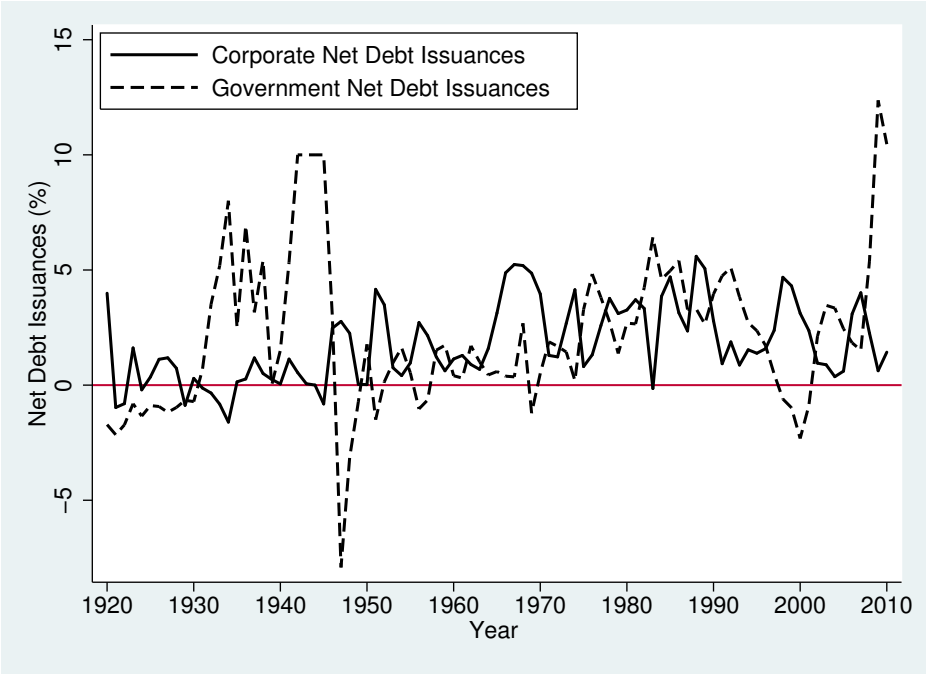


Figure 5
Corporate and Government Net Issuances

The figure presents annual time series of for the net flow of securities. Government net debt issuances is the annual change in federal debt held by the public divdied by lagged GDP. Corporate net debt issuances is the annual change in all interest bearing debt divdied by lagged total assets. Corporate net equity issuances is the annual issuance of equity, net of repurchases, divdied by lagged total assets. The corporate series represnts unregulated corporations.

Panel A: Corporate Net Debt



Panel B: Corporate Net Equity

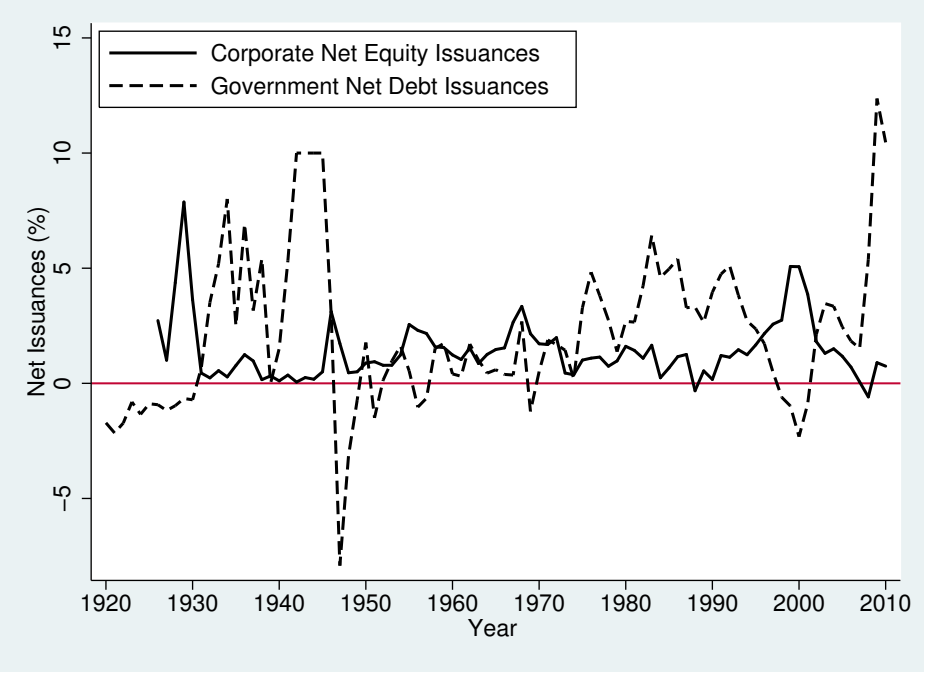


Figure 6
Distribution of Corporate Bond Holdings

The figure presents the distribution of corporate and foreign bond holdings from the Flow of Funds. The Funds category includes: Money market mutual funds, Mutual funds, Closed-end funds, and Exchange-traded funds. The Other category includes: Federal, State, and Local Governments, Federal Retirement, Foreign holdings, Government-sponsored enterprises, Finance companies, Real estate investment trusts, Security brokers and dealers, Holding companies, and Funding corporations.

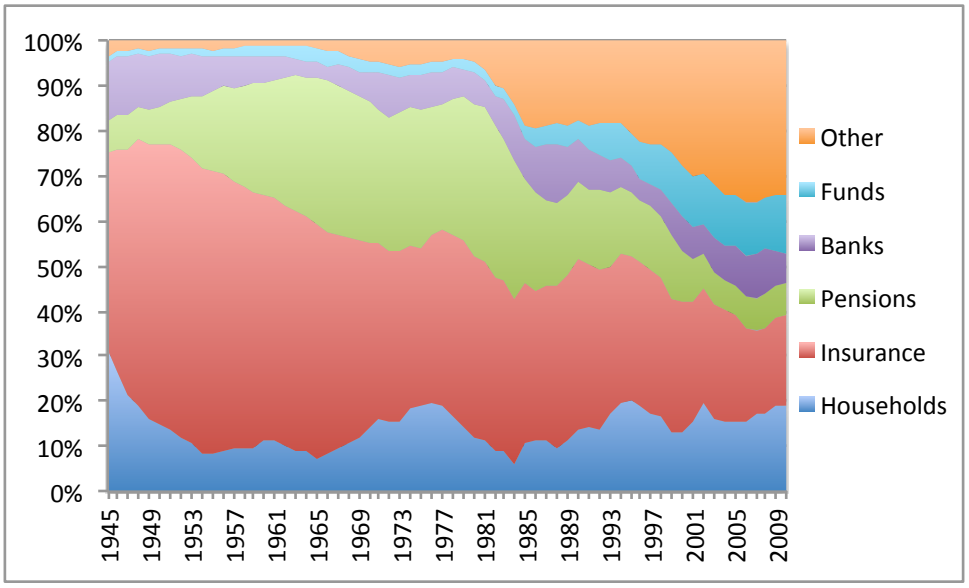
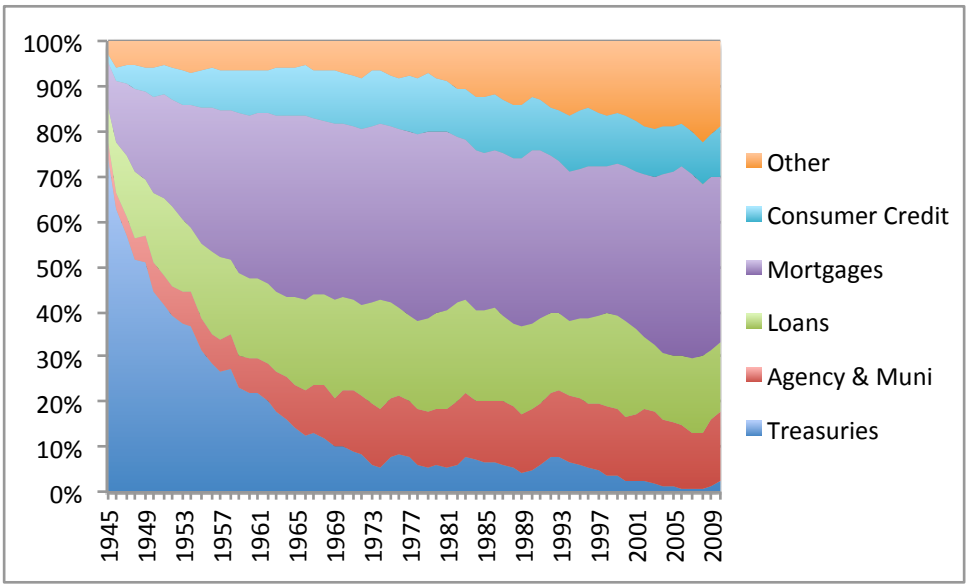


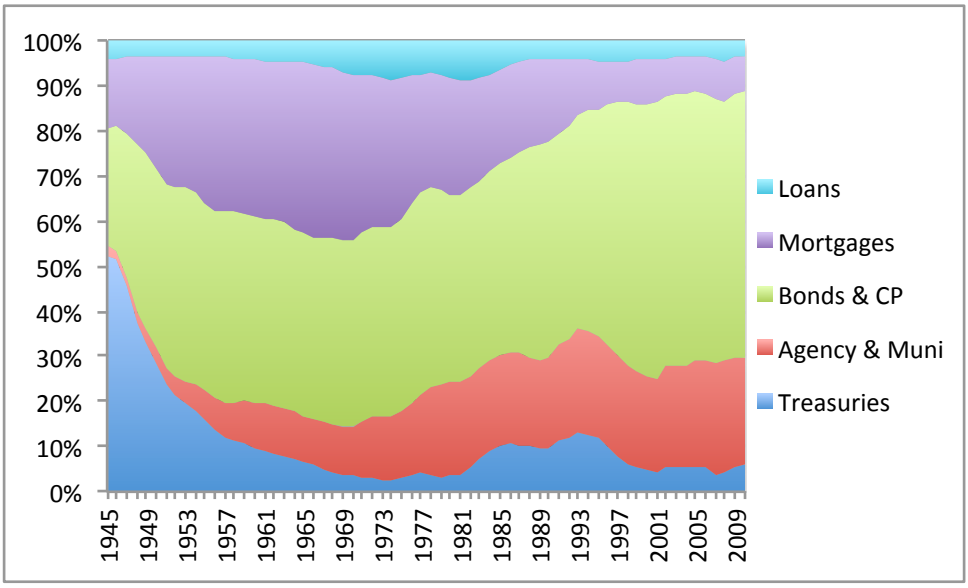
Figure 7
Financial Intermediary Asset Allocation Among Credit Market Instruments

The figure presents the annual portfolio allocations across credit instruments for US commercial banks, US Life and Property & Casualty Companies, and US State and Local Pension Funds.

Panel A: Commercial Banks



Panel B: Life and Property & Casualty Insurance Companies



Panel C: Public Pension Funds

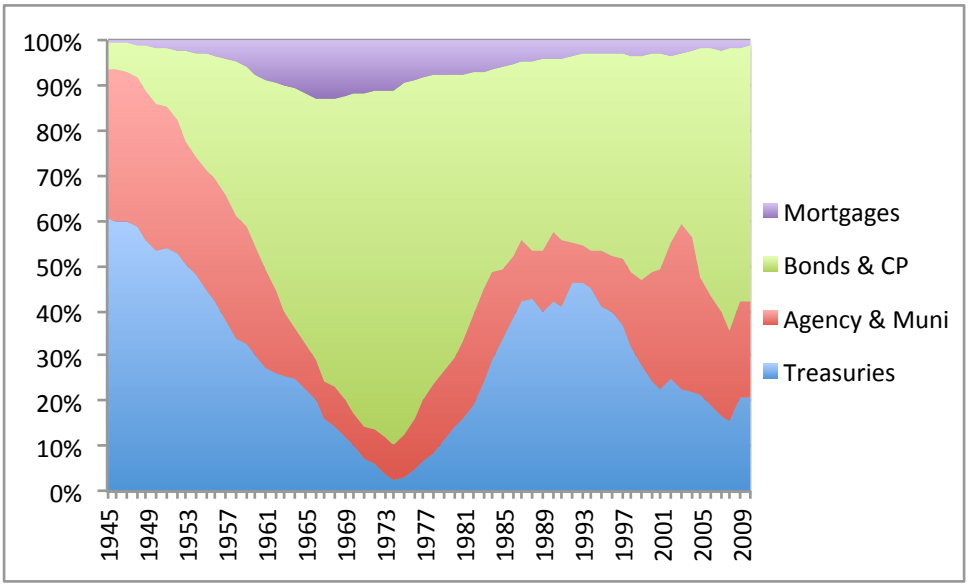


Table I

Summary Statistics;

Panel A presents summary statistics for the aggregate time series. Panel B presents summary statistics for the firm-level panel data. All variables are presented as percentages, except the market-to-book asset ratio. All variables are formally defined in Appendix A.

Panel A: Aggregate Time Series

	Obs	Mean	SD	Min	Max	AR(1)
Corporate Financial Policy						
Debt / (Debt + Book Equity)	91.00	26.63	11.81	11.06	47.17	0.99
Debt / (Debt + Market Equity)	86.00	20.10	8.14	7.59	36.69	0.90
Debt / GDP	91.00	11.90	8.49	1.83	27.62	1.01
(Debt - Cash) / Assets	91.00	8.07	9.93	-16.03	21.47	0.98
Net Debt Issuance / Assets	91.00	1.78	1.71	-1.61	5.60	0.60
Net Equity Issuance / Assets	85.00	1.41	1.31	-0.59	7.87	0.65
Firm Characteristics						
EBIT / Assets	91.00	9.99	2.98	1.83	17.54	0.81
Intangible Assets / Assets	91.00	15.80	9.85	5.88	38.37	1.02
Market-to-Book Ratio	86.00	1.27	0.25	0.57	1.90	0.79
Asset Growth	90.00	7.92	7.08	-12.77	25.98	0.15
Investment / Assets	91.00	8.80	3.78	-2.41	14.30	0.61
Macroeconomic Variables						
3-Month T-Bill Return	91.00	3.68	2.90	0.04	13.70	0.92
BAA - AAA Yield Spread	91.00	1.19	0.69	0.37	4.26	0.83
Inflation	91.00	2.92	4.44	-10.94	15.63	0.52
Equity Market Return	85.00	11.69	20.50	-44.36	57.50	0.01
Real GDP Growth	91.00	3.40	5.41	-13.00	18.52	0.40
Government Variables						
Federal Debt / GDP	91.00	40.79	17.71	16.34	108.82	0.95
Net Debt Issuance / GDP	91.00	2.87	6.01	-7.92	37.06	0.76

Panel B: Panel Data

	Obs	Mean	SD	Min	Max
Corporate Financial Policy					
Debt / (Debt + Book Equity)	214,817	29.42	27.66	0.00	137.67
Debt / (Debt + Market Equity)	207,859	25.22	25.56	0.00	95.61
(Debt - Cash) / Assets	214,151	6.57	31.78	-77.40	82.96
Net Debt Issuance / Assets	194,499	3.58	16.01	-32.00	90.24
Net Equity Issuance / Assets	183,602	7.41	23.10	-9.87	146.41
Firm Characteristics					
EBIT / Assets	209,233	4.08	17.64	-76.49	31.26
Intangible Assets / Assets	208,572	16.84	17.27	0.39	78.39
Market-to-Book Ratio	202,103	1.67	1.27	0.46	7.59
Asset Growth	194,257	13.48	38.62	-56.34	228.87
Investment / Assets	191,552	3.63	11.36	-23.45	64.83

Table II
Corporate and Government Leverage

The table presents OLS coefficient estimates and t-statistics in parentheses. In Panel A, the dependent variable is aggregate corporate leverage defined as the ratio of all interest bearing debt to the sum of total debt and total book equity. The first three columns present regressions estimated in levels, the last three in first differences. All right side variables are contemporaneous with the dependent variable and are formally defined in Appendix A. Panel B presents the results of a series of robustness tests. Each row represents a different OLS estimation. Column (1) presents the estimated coefficient on the government leverage variable from a levels specification, column (2) from a first difference specification. Each specification includes as controls, all of the macroeconomic variables and firm characteristics presented in Panel A. Rows (1) through (4) change the definition of the dependent variable, corporate leverage. Rows (5) through (8) change the right hand side varaibles. Rows (9) through (12) estimate the baseline model (columns (3) and (6) from Panel A) on different subsamples. Rows (13) through (15) estimate the baseline model (columns (3) and (6) from Panel A) using Statistics of Income data over the period 1926 to 1997. Newey-West standard errors assuming four non-zero lags are used to compute all t-statistics (in parentheses). Statistical significance at the 10%, 5% and 1% levels are indicated by "*", "**", and "***", respectively.

Panel A: Primary Results

	Levels			First Differences		
	(1)	(2)	(3)	(4)	(5)	(6)
Government Leverage	-0.145***	-0.063*	-0.085***	-0.043**	-0.073***	-0.078***
	(-5.739)	(-1.892)	(-2.710)	(-2.454)	(-3.296)	(-3.112)
Macroeconomic Variables						
T-Bill Return		0.904***	0.618**		-0.133	-0.093
		(2.605)	(2.216)		(-1.081)	(-0.645)
BAA - AAA Yield Spread		0.002	-4.527***		0.818**	0.594
		(0.002)	(-3.840)		(2.467)	(1.208)
Inflation		-0.066	0.103		0.060*	0.077*
		(-0.487)	(1.016)		(1.828)	(1.849)
Equity Market Return		0.007	0.018		-0.004	-0.005
		(0.748)	(1.265)		(-0.709)	(-0.589)
Real GDP Growth		-0.103*	-0.003		-0.102***	-0.084***
		(-1.924)	(-0.051)		(-4.076)	(-2.756)
Firm Characteristics						
Profitability			-1.409***			-0.150
			(-3.852)			(-1.060)
Intangibility			-0.210			-0.036
			(-1.567)			(-0.135)
Market-to-Book Asset Ratio			-8.680***			-0.164
			(-3.160)			(-0.137)
Obs	91	85	85	90	84	84

Panel B: Robustness Tests

	Levels	First Differences
	(1)	(2)
Alternative Measures of Corporate Leverage		
(1) Net Debt-to-Assets	-0.240***	-0.161***
	(-5.853)	(-4.352)
(3) Debt-to-Market Value	-0.094***	-0.072**
	(-4.005)	(-2.489)
(4) Debt-to-GDP	-0.055***	-0.032***
	(-3.587)	(-3.410)
Changes to the X-Variables		
(5) Federal Debt / Corporate Capital	-0.074***	-0.050**
	(-2.977)	(-2.420)
(6) One-year Lags	-0.060**	-0.040
	(-2.002)	(-1.309)
(7) Debt Tax Incentive Variable	-0.081**	-0.069***
	(-2.485)	(-2.771)
(8) Additional Macro Variables	-0.062**	-0.057**
	(-2.013)	(-1.971)
Subperiods		
(9) Excluding WW II Years (1942-1955)	-0.086*	-0.095*
	(-1.814)	(-1.821)
(10) Pre-1969	-0.060***	-0.074***
	(-3.561)	(-3.428)
(11) Post-1968	0.122	-0.048
	(1.052)	(-0.501)
(12) No Recession Years	-0.085***	-0.091**
	(-2.647)	(-2.271)
Alternative		
(13) 500 Largest Firms	-0.080**	-0.078***
	(-2.471)	(-3.086)
(14) HSUS Data - All Nonfirnal Firms	-0.101***	-0.062***
	(-5.014)	(-2.897)
(14) HSUS Data - Regulated Industries	-0.106***	-0.065***
	(-6.807)	(-4.044)
(14) HSUS Data - Unregulated Industries	-0.099***	-0.052**
	(-4.875)	(-2.266)

Table III

Corporate Net Security Issuances and Government Net Debt Issuances

The table presents OLS coefficient estimates and t-statistics in parentheses. The dependent variable is indicated at the top of the columns. Net Debt Issuance is the annual change in all interest bearing debt divided by lagged total assets. Net Equity Issuances is the annual issuance of equity, net of repurchases, divdied by lagged total assets. All flow control variables are contemporaneous with the dependent variable; stock variables, interest rates, and returns are lagged one period. All variables are formally defined in Appendix A. Newey-West standard errors assuming four non-zero lags are used to compute all t-statistics (in parentheses). Statistical significance at the 10%, 5% and 1% levels are indicated by "*", "**", and "***", respectively.

	Net Debt Issuance			Net Equity Issuance		
	(1)	(2)	(3)	(4)	(5)	(6)
Government Net Debt Issuance	-0.079***	-0.053***	-0.044***	-0.074**	-0.052**	-0.016
	(-2.851)	(-4.119)	(-2.875)	(-2.536)	(-2.377)	(-1.216)
Macroeconomic Variables						
T-Bill Return		0.168***	0.132*		0.089	0.226**
		(2.683)	(1.668)		(1.394)	(2.432)
BAA - AAA Yield Spread		-0.540**	-0.128		-0.617***	-0.217
		(-2.274)	(-0.513)		(-2.885)	(-1.167)
Inflation		0.104***	0.099***		-0.069	0.022
		(3.265)	(3.041)		(-1.517)	(0.563)
Equity Market Return		-0.003	-0.000		0.001	0.019***
		(-0.498)	(-0.022)		(0.137)	(3.586)
Real GDP Growth		-0.000	-0.024		0.019	-0.016
		(-0.015)	(-1.025)		(0.532)	(-0.705)
Firm Characteristics						
Profitability			0.014			0.021
			(0.159)			(0.203)
Intangibility			-0.041			0.110**
			(-0.906)			(2.101)
Market-to-Book Asset Ratio			1.359			4.040***
			(1.144)			(4.589)
Obs	91	85	85	85	85	85

Table IV

Corporate Investment and Government Net Debt Issuance

The table presents OLS coefficient estimates and t-statistics in parentheses. The dependent variable is the corporate investment in period t divided by total assets in period t-1. All flow control variables are contemporaneous with the dependent variable; stock variables, interest rates, and returns are lagged one period. Newey-West standard errors assuming four non-zero lags are used to compute all t-statistics (in parentheses). Statistical significance at the 10%, 5% and 1% levels are indicated by "*", "**", and "***", respectively.

	Corporate Investment)			
	(1)	(2)	(3)	(4)
Government Net Debt Issuance	-0.211***	-0.200***	-0.157***	-0.165***
	(-3.854)	(-9.064)	(-5.814)	(-4.321)
Macroeconomic Variables				
T-Bill Return		0.183*	0.261***	0.307**
		(1.930)	(2.871)	(2.202)
BAA - AAA Yield Spread		-1.631***	-0.285	-0.530
		(-3.847)	(-0.596)	(-0.992)
Inflation		0.349***	0.238***	0.258***
		(7.562)	(3.407)	(3.243)
Equity Market Return		-0.006	-0.001	-0.001
		(-0.402)	(-0.057)	(-0.050)
Real GDP Growth		0.120**	0.025	0.018
		(2.426)	(0.446)	(0.321)
Firm Characteristics				
Market-to-Book Asset Ratio			2.723*	2.649*
			(1.789)	(1.718)
Profitability			0.445***	0.459***
			(3.995)	(3.586)
Cash Holdings				-0.007
				(-0.059)
Lagged Investment				-0.110
				(-1.013)
Trend	Yes	Yes	Yes	Yes
Obs	91	85	85	85

Table V

Cross-Sectional Heterogeneity

The table presents OLS coefficient estimates and t-statistics in parentheses of firm fixed effects regressions. The dependent variables are indicated above their corresponding results - corporate leverage, corporate net debt issuances, and corporate investment. For each dependent variable, we stratify the sample into two subsamples based on the upper and lower quartiles of the credit-risk/financial constraint distribution proxy. We use five proxies: firm size, earnings volatility (Earn Vol), the Whited-Wu (WW) and Hadlock-Pierce (HP) indices of financial constraints, and an estimated probability of default (Default Pr.). We separately estimate an OLS regression on each strata for each dependent variable. The control variables for corporate leverage are contemporaneous with the dependent variable and include macroeconomic variables (T-bill return, BAA-AAA, yield spread, inflation, equity market return, real GDP growth) and firm characteristics (firm profitability, firm asset intangibility, the market-to-book ratio, and real asset growth). The control variables for corporate net debt issuances and corporate investment include macroeconomic variables (T-bill return, BAA-AAA, yield spread, inflation, equity market return, real GDP growth) and firm characteristics (firm profitability and the market-to-book ratio). For these last two dependent variables all flow control variables are contemporaneous with the dependent variable; stock variables, interest rates, and returns are lagged one period. Newey-West standard errors assuming four non-zero lags are used to compute all t-statistics (in parentheses). Statistical significance at the 10%, 5% and 1% levels are indicated by "*", "**", and "***", respectively.

	Firm Size		Earn Vol		WW Index		HP Index		Default Pr.	
	Small	Big	Low	High	UnConst	Const.	Unconst.	Const.	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					Corporate Leverage					
Government Leverage	-0.039**	-0.096***	-0.096***	-0.123***	-0.103***	-0.053**	-0.137***	-0.040*	-0.112***	-0.071***
	(-2.059)	(-5.855)	(-5.113)	(-5.483)	(-6.197)	(-2.395)	(-7.832)	(-1.924)	(-9.221)	(-3.683)
Obs	39,309	46,158	30,386	28,626	38,268	35,758	43,411	39,146	47,049	41,586
					Corporate Net Debt Issuance					
Government Net Debt Issuance	-0.033	-0.098***	-0.105***	-0.049**	-0.086***	-0.038	-0.091***	-0.038*	-0.085***	-0.047**
	(-1.491)	(-7.589)	(-7.536)	(-2.292)	(-5.923)	(-1.561)	(-7.863)	(-1.707)	(-7.475)	(-2.124)
Obs	40,511	47,421	31,169	29,420	39,067	36,824	44,384	40,370	48,354	43,659
					Corporate Investment					
Government Net Debt Issuance	-0.047	-0.126***	-0.111***	-0.058***	-0.115***	-0.061*	-0.117***	-0.044	-0.124***	-0.063**
	(-1.619)	(-9.776)	(-8.373)	(-2.653)	(-8.407)	(-1.951)	(-10.082)	(-1.422)	(-12.429)	(-2.500)
Obs	39,820	46,896	30,843	29,177	38,742	36,380	43,987	39,684	47,875	42,958

Table VI

Intermediary Asset Composition and Government Leverage

The table presents OLS coefficient estimates and t-statistics in parentheses. Columns (1) and (2) regress the ratio of bankloans to total financial assets for US chartered depository institutions on the ratio federal debt held by the public to gdp. Columns (3) through (6) regress the ratio of the sum of corporate bonds and commercial paper to total financial assets for property and casualty and life insurance companies on the ratio federal debt held by the public to gdp. Macro control variables include: GDP growth, Stock Market Return, BAA-AAA corporate bond yield spread, and the return on the three month Treasury Bill. Firm characteristic control variables include: profitabilty, tangiblity, and the market-to-book equity ratio. All right hand side variables are contemporaneous with the dependent variable. All regressions are estimated in first differences. Newey-West standard errors assuming four non-zero lags are used to compute all t-statistics (in parentheses). Statistical significance at the 10%, 5% and 1% levels are indicated by "*", "**", and "***", respectively.

Panel A: Corporate Lending as a Fraction of Assets

	Change in (Corporate Lending / Assets)					
	Banks		Insurance		Public Pensions	
	(1)	(2)	(3)	(4)	(5)	(6)
Change in Government Leverage	-0.088***	-0.068***	-0.068**	-0.110***	-0.218**	-0.237**
	(-3.669)	(-2.917)	(-2.279)	(-2.829)	(-2.091)	(-2.420)
Macro Vars	No	Yes	No	Yes	No	Yes
Firm Controls	No	Yes	No	Yes	No	Yes
Obs	72	72	75	75	65	65

Panel B: Federal Government Lending as a Fraction of Assets

	Change in (Federal Government Lending / Assets)					
	Banks		Insurance		Public Pensions	
	(1)	(2)	(3)	(4)	(5)	(6)
Change in Government Leverage	0.283***	0.329***	0.302***	0.394***	0.118	0.174**
	(5.488)	(2.844)	(8.158)	(5.919)	(1.579)	(1.983)
Macro Vars	No	Yes	No	Yes	No	Yes
Firm Controls	No	Yes	No	Yes	No	Yes
Obs	76	76	75	75	65	65