A Century of Capital Structure: The Leveraging of Corporate America*

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Preliminary and Incomplete
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Current Draft: December 7, 2012

* We thank Andy Abel, Effi Benmelech, Joao Gomes, Boyan Jovanovich, Ken Singleton, Ilya Strebulaev; seminar participants at Duke University, Miami University, Notre Dame, Oklahoma University, University of British Columbia, University of Colorado, University of Illinois, University of Pennsylvania, University of Utah, Vanderbilt University, Yale University; and conference participants at the Financial Management Association and SITE for helpful comments. We also thank Ahn Dong and Jeremy Yoo for excellent research assistance. Roberts gratefully acknowledges financial support from an Aronson, Johnson and Ortiz Fellowship and Geewax-Terker Fellowship. A portion of this work was completed while Roberts was visiting the Graduate School of Business at Stanford University, to whom he is grateful for their hospitality. Graham: (919) 660-7857, john.graham@duke.edu, Leary: (314) 935-6394, leary@wustl.edu, Roberts: (215) 573-9780, mrrobert@wharton.upenn.edu.

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Abstract

We examine the determinants of aggregate corporate capital structure using a novel dataset of accounting and market information that spans most publicly traded firms over the last century. We show that the stability of nonfinancial aggregate leverage over this period reflects two opposing forces. First, regulated sectors, such as railroads, delevered and contracted in size. Second, unregulated sectors experienced a threefold increase in their debt-to-asset ratio from 8% in 1946 to 27% in 1970. This increase occurred in *all* unregulated sectors and was systemic, affecting firms of all sizes. The median firm in 1946 had no debt in its capital structure, but by 1970 had a debt-to-asset ratio in excess of 25%. Our analysis reveals that competition for investors' funds between the public and private sectors played an important role in explaining the increase in debt usage. Taxes, economic uncertainty, and financial market development play less important roles in driving this secular increase in leverage.

Corporate financial policy plays an important role in many real economic decisions including fixed business investment, inventory investment, research and development expenditures, product market strategy, and employment decisions. As such, corporate capital structure has received a great deal of attention from financial economists.[1] The bulk of this attention has focused on understanding cross-sectional variation in financial policy, in part because of readily available accounting data for large cross-sections of firms. Studies focusing on time-series variation have been confined to either relatively short panels or aggregate data, such as the flow of funds. These limitations are troubling because short time series exclude important variation in capital structure determinants, such as changes to the tax, legal, and institutional environment, and lead to imprecise estimates of the dynamic properties of financial policy. Likewise, aggregate data can mask heterogeneity in the cross-sectional distribution that is critical for understanding the mechanisms behind financial policy.

The goal of this paper is to shed light on the determination of corporate financial policy by overcoming these data limitations. Specifically, we analyze a unique dataset containing accounting and market information for U.S. nonfinancial publicly traded firms over the last century. This data enable us to examine secular changes to capital structure over a long horizon at both an aggregate and micro level. This combination provides new insight into the formation of corporate capital structures.

We begin by showing that the temporal stability of aggregate leverage suggested by previous studies (e.g., Miller (1977) and Frank and Goyal (2008)) is a result of two countervailing forces. First, the share of aggregate assets held by regulated industries (e.g., transportation and utility sectors) – typically the more highly levered sectors – declined from 40% during the 1930's and 1940's to less than 20% by 1990. Further, the leverage of the railroad sector fell from 44% in 1938 to 25% by 1950 as profits from the war effort were used to pay down debt in response to declining demand. Second, the aggregate leverage of *all* unregulated sectors increased nearly threefold during the period 1942 to 1970. In fact, the median firm in these unregulated industries went from a leverage ratio of zero in 1940 to over 25% by 1970. Thus, the apparent stability of aggregate leverage since 1945 is due in large part to the changing sectoral composition of the economy.

[1] See Hubbard (1998) and Stein (2003) for literature reviews of the link between investment and financing. See Harris and Raviv (1991), Frank and Goyal (2008), Parsons and Titman (2010), and Graham and Leary (2012) for reviews of the capital structure literature.

We then investigate the mechanisms behind capital structure formation, paying close attention to those responsible for the secular increase in leverage among unregulated industries. Specifically, we examine how variation in taxes (Miller (1977)), expected distress costs (Scott (1976)), transaction costs, and managerial incentives (Jensen and Meckling (1976)) relate to the observed variation in aggregate leverage and security issuance decisions. We also examine how competition for investor funds between the public and private sectors influences corporate capital structure (Friedman (1978) , McDonald (1980), Taggart (1981)). Our results can be summarized as follows.

In the aggregate, government leverage (i.e., the ratio of federal debt held by the public to GDP) is strongly negatively associated with corporate leverage. A one standard deviation increase in government leverage is associated with a one-quarter standard deviation decrease in aggregate corporate leverage. This marginal effect on capital structure is significantly larger than that of other macroeconomic factors, such as GDP growth, inflation, and the BAA-AAA corporate bond yield spread, as well as firm characteristics, such as profit margins, asset growth, and the market-to-book equity ratio. This leverage relation is driven by a negative relation between the net flows of debt capital from the government and from the corporate sector. However, there is no robust relation between the net flows of government debt and corporate equity. When the government issues debt, corporations issue less debt but do not change their equity policy. The result is a decline in leverage.

These results are robust to a variety of specification changes, alternative measures of leverage, and different subsamples. Of particular interest is a weakening of the leverage relationship since 1970. This weakening is due to greater international capital market integration, the result of which was a dramatic increase in the foreign holdings of US government debt and a relaxation of capital constraints on US financial intermediaries. Banks and insurance companies held the bulk of US treasuries in the first part of the century, substituting them for corporate loans and bonds on the asset side of their balance sheets. This tradeoff weakens in the second half of our sample when banks and insurance companies held smaller shares of US treasuries. Further, the negative relationship between government and corporate leverage is strongest among those firms whose debt securities are closest substitutes to treasuries.

Following Miller (1977), we next examine the role of taxes. During our sample period the corporate tax rate underwent 30 revisions ranging from a low of 10% in 1920 to a high of 52% in

the 1950s. Combined with variation in tax rates on dividends and capital gains, the tax incentive to issue debt varied significantly over the last 100 years. Despite the debt incentive created by increases in the corporate tax rate, we find little evidence that firms responded to this incentive with their financial policies. There is no immediate or short-run effect of tax changes on aggregate leverage or net debt issuance decisions. Estimates from a distributed lag model also fail to reveal a long-run effect even after allowing for a decade long lag. Where taxes have a more substantial impact on financial policy is in the first part of the century where firms substituted debt for preferred equity in response to increasing corporate tax rates.

We also document a decrease in economic uncertainty and cash flow volatility through the middle part of the century. Several proxies for volatility are significantly negatively associated with aggregate corporate leverage, suggesting a role for expected distress costs. However, this relationship loses significance once we control for government borrowing.

Financial institutions and markets changed dramatically over our sample period (Philippon (2010)). The proportion of corporate debt held by institutions increased from 23% in 1940 to almost 90% by 1950, as banks and insurance purchased corporate bonds to replace retiring government bonds used to fund the war. Yet, these shifts were largely unrelated to changes in corporate financial policy. We find little relation between nonfinancial corporate leverage and the share of debt (or debt net of equity) held by financial institutions. Likewise, growth in the income share of the financial sector bears little relation to the leverage changes experienced by nonfinancial corporations. Thus, the efficiency of financial intermediation, as captured by these metrics (Philippon (2010)), has had little direct effect on the secular change in corporate financial policy.

Finally, we note that changes in managerial incentives and styles are unlikely explanations for the secular increase in leverage (Jensen and Meckling (1976), Bertrand and Schoar (2004)). As noted by Frydman and Saks (2010), both the level and performance sensitivity of executive compensation was largely constant from the end of World War II through the mid-1970s – precisely when leverage ratios underwent their largest change. Only after 1980 did executive pay experience a significant increase in amount and sensitivity to performance, precisely as corporate leverage stabilized.

The remainder of the paper is as follows. Section I discusses our data and sample selection. We also provide a number of summary statistics. Section II examines trends in

corporate financial policy. We investigate the evolution of aggregate corporate leverage and net security issuances over the last century. We also examine leverage at the industry level in order to better understand the aggregate patterns. Section III examines the economic forces behind the variation in aggregate leverage. We focus on the role of government deficit financing, tax incentives, expected distress costs, and several additional hypotheses such as managerial incentives and the growth of financial markets and intermediaries. Section IV concludes.

I. Sample Selection and Summary Statistics

Our sample frame begins with all 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 Moody's Industrial and Railroad manuals. We exclude from much of our analysis firms whose capital structures are determined largely by regulatory requirements: financial firms, railroads, and utilities. However, we will have much to say about the latter two sectors just below. The result of this data effort is an unbalanced firm-year panel beginning in 1920 and ending in 2010.

Table 1 presents summary statistics for many of the aggregate and micro level measures used in our analysis. In addition to their descriptive value, these results provide a context for subsequent analysis.[2] Panel A presents results for our aggregate measures of firm characteristics and macroeconomic variables. Aggregate firm characteristics are computed as the ratio of sums over firms within each year. Panel B presents results for the firm-year panel. And, Panel C presents mean firm characteristics by decade.

II. Trends in Corporate Leverage

A. Aggregate Trends

[2] Appendix A discusses the details of our data sources and variable construction.

Figure 1 examines the long run trends in aggregate leverage. Panel A examines aggregate book leverage for unregulated sectors. Book leverage is defined as the ratio of total interest bearing debt divided by the total book value of assets. Apparent from Panel A are three periods of distinct corporate leverage behavior. From 1920 to 1945, leverage is fairly stable and relatively low, ranging from 9% to 14% during this quarter century. From 1946 to 1970 leverage increased steadily and significantly – nearly tripling – from approximately 9% in 1945 to over 27% in 1970. Since 1970, leverage has stabilized at this higher level, varying between 23% and 30% for the last 40 years.

Panels B and C show that this pattern is not unique to our sample or definition of leverage. Panel B presents the aggregate leverage of two alternative samples. The first sample uses data form the largest 500 firms each year. The composition of this sample varies less through time, thereby mitigating the impact of entry and exit. The second sample consists only of firms listed on the NYSE, which mitigates the impact of entry by firms listed on the AMEX (1962) and NASDAQ (1972). It also biases the sample towards larger, longer living firms. We see that the level and variation in both leverage series are similar to that found in Panel A.

Panel C presents aggregate leverage using different definitions. In addition to confirming the robustness of the patterns found in Panels A and B, these plots highlight several other aspects of financing over our sample period. The top left subpanel shows leverage defined as the sum debt and preferred stock divided by assets, and the sum of debt, preferred stock, and operating leases divided by assets. Clearly, preferred stock was a more important form of financing in the first half of the century. As such, some of the increase in leverage between 1920 and 1970 was due to a substitution away from preferred stock towards debt financing. Preferred stock accounted for more than 10% of assets in aggregate in 1920, but has been negligible during the last several decades. In contrast, the inclusion of operating leases, which are negligible prior to 1970, increases aggregate leverage by about 5% since the mid-1970s.[3]

Market leverage, defined as the ratio of total debt to the sum of total debt and the market capitalization of equity, experiences a delayed but steeper increase relative to our other measures of leverage. We also note a sharp decline in leverage coinciding with the bull market of the

[3] Data on operating leases is not available in the Moody's manuals. Since operating lease usage as reported in Compustat declines as we go back in time, we make the simplifying assumption that it is zero for all firms before 1950.

1990s. More generally, this measure exhibits significantly more year-to-year volatility because of variation that is dominated by stock prices as opposed to financial policy.

The bottom left subpanel shows the ratio of net debt (i.e., debt – cash) to assets. The increase is even starker in this figure because of a reduction in cash coinciding with an increase in debt usage following World War II. Finally, in the bottom right subpanel we normalize these debt measures by capital, defined as the sum of debt and book equity. The figure shows that the patterns are not driven by large changes in non-debt liabilities entering the denominator. They also show a shift in the maturity composition over time, though the distinction between short- and long- term debt is not only coarse but potentially misleading. As balance sheet measures, we cannot distinguish between a one year bond and a 30-year bond with one year to maturity. Nonetheless, the patterns emphasize the broader trend in leverage.

Because of the similarity of results across samples and leverage definitions, we focus our discussion on book leverage for the entire sample. Doing so avoids redundancy. Nonetheless, the majority of this analysis is repeated using many of the alternative samples and leverage definitions just discussed. We note when result differences or similarities have a material effect on our inferences.

B. Cross-Sectional and Sectoral Trends

Figure 2 examines the evolution of the cross-sectional leverage distribution by plotting the annual quartiles of leverage year-by-year. Evident from Panel A is that the change in aggregate leverage observed in Figure 1 reflects a broad-based shift in financial policy. All three quartile breakpoints move in tandem. Interestingly, the median firm was unlevered from the mid-1930s to the mid-1940s and at least a quarter of our sample firms were unlevered in each year from 1920 through 1950. Thus, the secular increase in leverage was associated with an increase in leverage across the entire distribution of firms and an increase in the propensity to use debt. Panel B shows that the decline in the median and first quartile of leverage since 1980 is driven by small firms, entering the sample via NASDAQ listings. When we restrict our attention to NYSE firms, all three quartile breakpoints remain fairly stable from 1970 through the end of the sample period.

Figure 3 shows that the aggregate leverage pattern is experienced in virtually every unregulated industry. We plot the aggregate industry leverage, where industry is defined by the Fama-French 12-industry classification.[4] Each subpanel in the figure plots the aggregate book leverage ratio for the indicated industry (solid line) and the aggregate book leverage ratio for all nonfinancial firms (dashed line) as a point of reference. Industry leverage is somewhat more volatile than aggregate leverage due in large part to smaller sample sizes, particularly in the first half of the century. What is most notable, though, is the striking similarity in the leverage time series across every industry. Each industry reveals a strong positive trend between 1945 and 1970. Further, this upward trend tends to taper off after 1970. Thus, the secular increase in leverage experienced in the middle half of the 20th century was an economy-wide phenomenon, at least among unregulated industries.

C. Net Flows of Debt and Equity

Figure 4 isolates the effects of financial policy on leverage by presenting the aggregate time series for the net flows of debt and equity. Panel A of Figure 4 plots net debt and net equity issuances scaled by lagged assets for each year.[5] To ease the interpretation of the figure, we plot a 5-year moving average. While both series exhibit a great deal of volatility, the increase in the relative use of debt financing can be seen after 1945. Equity issuances also increase, but never reach the heights of the late 1920s. More importantly, the leverage-increasing effect of net debt issuances is greater than the leverage-decreasing effect of net equity issuances at low levels of leverages, and particularly so for the very low levels in the pre-World War II era.

Also evident in Panel A is the correlation between debt and equity issuance, which is unsurprising if demand for all types of external of capital is driven by investment activity. In Panel B, we control for investment demand by plotting the fraction of investment financed with debt. That is, for the subsample of firms with positive investment we divide aggregate net debt issuance by aggregate investment.[6] For comparison, we also plot the aggregate book leverage

[4] This classification is an aggregate of SIC codes and can be found on Ken French's website at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/ftp/Siccodes12.zip.

[5] Net debt issuance for each firm is defined as the change in total balance sheet debt. Net equity issuance is defined, as in Fama and French (2005), as the split-adjusted change in shares outstanding multiplied by the average of the beginning and end of year stock price.

[6] Since statement of cash flow data is not available from the Moodys manuals, we calculate investment as the change in (gross) long-term assets plus the change in inventory from the balance sheet.

series. The figure highlights the increased use of debt financing through the first half of the sample period. External debt accounted for only 5 to 10% of investment in the 1920s and 1930s, but steadily increased to over 30% by the late 1960s. This shift toward a greater reliance on debt as a funding source appears to be at least one of the factors driving the increase in leverage.

D. Reconciling with other Leverage Aggregates

Previous studies examining aggregate leverage that use alternative data sources document a more temporally stable leverage process over the last century. (e.g., Sametz (1964), Wright (2004), and Frank and Goyal (2008)). In this subsection, we reconcile our data and findings with these earlier works.[7] As will become clear, the persistent stability of leverage found in previous studies is due to two countervailing forces at work in regulated and unregulated sectors of the economy. The analysis here highlights the importance of our micro-level data for understanding the mechanisms behind capital structure determination.

Panel A of Figure 5 presents three series. The first is book leverage from our sample of firms as shown in Panel A of Figure 1. The second series represented by the dotted line combines data from the flow of funds over the period 1945 to 2010 with data from the Historical Statistics of the United States (HSUS) from 1926 to 1944 to obtain a series that is more comparable in length to ours. In appendix A, we show that these two series coincide closely during the period of overlap, 1945 to 1997. We refer to this constructed series as the Flow of Funds for brevity.

The last series represented by the dots on the dashed line present the aggregate book leverage ratio computed using *all* firms in the Moody's Industrials manuals. This sample includes hundreds, sometimes thousands, of smaller firms that are not covered by CRSP because they did not trade on the NYSE, in addition to the large publicly traded firms that comprise our primary sample. These additional firms likely traded on AMEX or regional exchanges, of which there were many. Because of data collection costs, this additional data is only collected once a decade in years ending in "8," as indicated by the dots. A comparison of this more comprehensive series with our primary leverage series shows that smaller firms maintain a similar capital structure to that of large public firms, at least in the aggregate. It also shows that

[7] See Appendix A for more detail on the data sources, variable construction, and reconciliation.

the exclusion of non-NYSE firms does not appear responsible for any difference between our data and the Flow of Funds data.

Rather, the difference between our leverage series and the Flow of Funds is due to the exclusion of regulated industries, railroads and utilities in particular. Panel B of Figure 5 plots the leverage series for the transportation and utilities sector from HSUS and the leverage series for railroads as gathered from the Moody's Transportation manuals. The sector as a whole displays a remarkably stable capital structure that varies between approximately 40% and 50% for 70 years. However, this stability masks a large decline in leverage experienced by the railroads during the 1940s and 1950s. Railroads generated large profits during World War II due to their increased operating efficiency and their role as the primary mode of transportation to support the war effort. After the war, railroads also faced a bleak economic outlook. Demand for rail services declined significantly in the face of increased competition for passengers from cars and airplanes, and for freight from trucking. These forces led railroads to use their profits to reduce their debt burden and shrink their companies in tandem with their shrinking market shares.

Panel C of Figure 5 presents the distribution of total assets across sectors from the HSUS. Unfortunately, the HSUS combines the transportation and utilities sector but the plot is still informative. The share of assets for this sector declines from a peak of 43% in 1934 to 26% by 1950, despite significant growth in utilities and other forms of transportation. When we exclude the transportation and utilities sector, the aggregate leverage from the HSUS closely matches our data from Moody's. In fact, for each sector that HSUS collects data – e.g., Manufacturing, Wholesale & Retail Trade, Services – each of the HSUS sector level leverage series closely match the Moody's sector level leverage series. (See Appendix A for details.)

Thus, the capital structure experiences of regulated and unregulated industries were starkly different. While the former experienced little change over the last century, the latter underwent a dramatic leveraging. The net effect is a relatively stable aggregate capital structure that reflects these two countervailing forces. Why did regulated industries' leverage ratios remain both high and stable for so long? Similarly, why did leverage ratios in unregulated industries increase so dramatically when they did? A study of both questions is beyond the scope of any one paper. We focus attention on the latter because of the applicability of existing theory and for consistency with the existing capital structure literature. The former question requires an

investigation into the regulatory structures governing industries, such as railroads and utilities. We postpone this analysis to future research.

III. The Economic Forces Behind Leverage

A. The Role of Government

Why would fluctuations in the supply of US treasuries impact the financing behavior of corporations? Early work on the relation between government borrowing and aggregate leverage begins with Friedman (1978, 1986) and Miller (1977). Friedman finds that changes in the supply of treasuries change the relative return relations among US treasuries, corporate debt, and corporate equity. Empirically, he finds that increases in the supply of treasuries generate increases in the expected returns to debt relative to that of equity, suggesting that government debt financing will induce firms to tilt their financing away from debt and towards equity – both internal and external. Taggart (1981) and McDonald (1983) build on the arguments of Miller (1977) to show that changes in the supplies of other securities, such as treasuries, will induce changes in the quantity of corporate debt because of variation in personal tax rates across investors. In particular, McDonald shows that an increase in the supply of taxable bonds – e.g., treasuries – will reduce the equilibrium quantity of corporate debt because they act as a debt substitute.

More recently, 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. 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.

Finally, Greenwood, Hansen, and Stein (2012) build a preferred habitat model (Modigliani and Sutch (1965)) of debt markets that are segmented along the dimension of maturity. A limited supply of capital prevents arbitrageurs from completely eliminating any predictability in bond returns. Consequently, when the supply of long-term treasuries increases the expected return of long-term treasuries increases, which influences the debt maturity

decisions of firms. While framed in the context of debt maturity, one can also think of their model in the context the debt-equity decision.

A.1. Leverage and Net Security Issuances

Figure 6 plots corporate and government leverage over our sample period, where the latter is defined as the ratio of federal debt held by the public to gross domestic product (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 (see Figure A.4 in Appendix A). Focusing on the amount held by the public avoids the double counting of debt that arises from treasury holdings by government entities, such as the social security administration.

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 persisted until the mid-1990s. In 2008, public debt-to-GDP began another significant increase in response to the most recent recession and financial crisis.

A negative relation between the two series is apparent. As government leverage increased sharply from 1917 to 1945, corporate leverage experienced a less severe but nonetheless significant decline from 14% to 8% over this same period. From 1945 to 1970, as government debt fell, corporate leverage increased more than threefold to 27.6%. 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.

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

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

and

$$(2)\quad \Delta CL_t = a + b\Delta GL_t + \Gamma \Delta X_t + h_t.$$

Corporate leverage is denoted *CL*, government leverage *GL*, and control variables *X*. 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 ($\Delta CL = CL_t - CL_{t-1}$). We focus on corporate leverage, measured as the ratio of total debt to total assets. In our robustness tests below, we consider alternative measures of corporate leverage. Serial correlation in the error term of both equations is addressed with Newey-West standard errors assuming a two-period lag structure.

The estimates in Panel A 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. Looking at column (3) of Table 2, we see that a one percentage point increase in government leverage is associated with an 8.9 basis point decrease in corporate leverage. Combined with the summary information found in Panel A of Table 1, these estimates imply that a one standard deviation increase in government leverage (17.7%) leads to a 1.6% decline in corporate leverage. Relative to the annual standard deviation of corporate leverage (6.9%), this marginal effect is economically large.

The estimates also indicate that macroeconomic conditions play an important role in shaping corporate leverage. Corporate leverage is counter-cyclical: high and increasing when output growth is low and slowing. Inflation is positively associated with the level of corporate leverage, consistent with the findings of Frank and Goyal (2009). Higher inflation reduces the real cost of debt. Changes in the credit spread (BAA – AAA yield spread) are strongly negatively related to corporate leverage, while the rate of change in the credit spread has precisely the opposite effect. 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. Finally, the level of interest rates, as captured by the real yield to maturity on AAA-rated corporate bonds is positively related to the level of leverage.

Finally, firm characteristics play an important role in determining leverage, some more so than others. Profit margins have robust and significant negative association with leverage. While some have interpreted this result as evidence against tax-bankruptcy cost hypotheses (e.g., Fama and French (2002)), recent work has shown that this is a weak test because of the presence of adjustment costs (e.g., Leary and Roberts (2005) and Strebulaev (2008)). Rather, the negative association may simply be due to the downward drift in leverage cause by the accumulation of past earnings. Asset intangibility and the market-to-book ratio also reveal negative associations

with leverage, consistent with micro-level evidence and theories predicated on the importance of collateral (e.g., Stulz (1985) and debt overhang (Myers (1977)), respectively. However, these two associations disappear in the difference specifications.

Panel B of Table 2 presents the results of a host of additional robustness tests. The baseline model for this analysis includes all of the macroeconomic factors and firm characteristics found in columns (3) and (6) of Panel A. We also include a time trend in all level specifications. 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 show that the relation is robust to alternative measures of corporate leverage. To address the changing sample composition from entry and exit, the first row examines the ratio of debt-to-assets computed using the data from only the 500 largest (by asset value) firms in our sample each year. The next row defines corporate leverage as the ratio of "net debt" (debt – cash holdings) to assets. The third row looks at a market based measure of leverage by dividing debt by the sum of debt and the equity market capitalization of the firm. Finally, the fourth row normalizes corporate debt by GDP for consistency with the government leverage definition.

Rows five through seven show that the relation is robust to changes in the control variables. Lagging all right hand side variables has no effect on the levels specification, but the first difference specification is no longer significant – statistically or economically. Given the persistence in the levels of both leverage series, this finding is unsurprising as the differenced series are near white noise. Additional macroeconomic factors such as the unemployment rate and price of oil have little impact on the leverage relation.

Rows eight through 11 examine different subperiods of our sample. Excluding the years surrounding the end of World War II, 1942 – 1955, reduces statistical power but has little effect on the magnitudes of the estimates, which are slightly larger than those from the baseline specifications. A similar result is found when we exclude recession years, defined as all years in which more than one quarter was deemed a recession by the National Bureau of Economic Research. Splitting the sample in half has a more interesting effect on our results. Estimates from

the first half of the sample are highly statistically significant. However, those from the second half are insignificant and smaller, though not much in an economic sense. We will have more to say about the attenuation of the effect in the second half of our sample below.

The final five rows examine alternative samples beginning with a sample that includes railroads because of their importance to the economy in the first half of the 20th century. This inclusion has no impact on our findings. The next three rows examine aggregate data from the Historical Statistics of the United States (HSUS) for all nonfinancial firms, unregulated firms, and regulated firms. The results mimic those found with our data, though there are some differences in economic magnitudes. This similarity of results across regulated and unregulated is particularly interesting and re-emphasizes the subperiod results showing that the relation is not driven by the post-World War II years or in-sample trend.

Table 3 presents results for net issuance decisions. In particular, we estimate the following regressions of net debt and net equity issuances:

$$(3)\ \Delta CD_t = \alpha + \beta \Delta GD_t + \Gamma X_t + \eta_t ,$$

$$(4)\ \Delta CE_t = \alpha + \beta \Delta GD_t + \Gamma X_t + \eta_t .$$

where ΔCD_t is the change in corporate debt from *t-1* to *t* divided by total assets at *t-1*, ΔCE_t is dollar value of corporate net equity issuances 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*. The control variables in both equations (3) and (4) are denoted by X_t. These controls consist of both macroeconomic factors and firm characteristics found in Table II. We incorporate both levels and first differences of the control variables. Serial correlation in the error term of equations (3) and (4) is addressed by Newey-West standard errors assuming a two-period lag structure.

Columns (1) through (3) show a significant negative relation between corporate and government net debt issuing activity. A one percent increase in the relative flow of government debt is associated with a six to seven basis point reduction in the flow of corporate debt relative to assets. Columns (4) through (6) show that net equity issues also show a negative relation with government debt issues. However, this relation becomes statistically insignificant once we control for firm characteristics. Economically speaking, the magnitude of the coefficient is less than half that in the net debt issuance specification. Closer inspection reveals that the market-to-book equity ratio is largely responsible for the attenuation of the government issuance coefficient in the net equity issuance model. Finally, columns (7) through (9) show that the fraction of

investment funded by debt is also significantly negatively associated with net debt issuances by the government.

These findings reinforce the leverage results above. Government financing has a strong negative effect on the net flow of corporate debt but not on corporate equity. This relation between security issuances is behind the similar relation between corporate and government leverage. Together these results suggest that government debt crowds out corporate debt, and to a lesser extent equity, which leads to a significant impact on corporate capital structure.

A.2. The Role of Foreign Investors

Panel B of Table 2 shows that the relation between corporate and government leverage attenuates in the second half of the sample. In unreported results, the relation between net debt issuances of the government and corporate sector also attenuates in the second half of our sample. Figures 7 and 8 suggest why.

Panel A of Figure 7 shows that prior to 1970, the majority of US treasuries were held by US commercial banks and domestic households. Insurance companies and pension funds also held a nontrival fraction of US treasuries. Banks and insurance companies are particularly interesting because they are also responsible for intermediating a significant amount of nonfinancial corporate debt – banks via loans and insurance companies via bonds. Panels B and C show the inverse relationship between treasuries and bonds and loans, respectively, in the portfolios of insurance companies and banks. The graphs show the compositions of asset growth for these intermediaries due to growth in lending to the federal government versus lending to the private sector. Thus, banks and insurance companies substitute treasuries for loans and bonds over time. With limited intermediary capital, an increase in the supply of treasuries that is absorbed by banks and insurance companies must be met with a decline in lending to firms.

Figure 8 shows that foreign holdings of U.S. debt, both government and corporate, has increased dramatically over the last 40 years. The increase has been more dramatic for Treasury securities, especially since 1990. This increase represents an opening of global credit markets and expansion of the investor base for US securities. In essence, global credit market integration corresponds to an increase in the demand for US securities. To test this idea, modify the leverage and net debt issuance regressions from Tables 2 and 3. Specifically, we include two

additional variables: the fraction of US treasuries held by foreigners and the interaction of this variable with government leverage (net debt issuances). The results are presented in Table 4.

Columns (1) and (2) present the results for the level of leverage, columns (3) and (4) the change in leverage. We see that the level of government leverage is negatively correlated with corporate leverage, as before. We also note that in columns (2) through (4), the interaction term is positive and statistically significant in two of the three specifications. Columns (5) through (7) show similar results for net debt issuances by the corporate and public sectors. The small number of observations coupled with collinearity in the design matrix induced by the interaction term hampers statistical power. However, the results are largely consistent with increased foreign demand for US treasuries relaxing lending constraints on US financial institutions.

A.3. Cross-Sectional Heterogeneity

Table 5 presents the results from firm fixed-effect panel regressions that examine cross-sectional heterogeneity in the association between government and corporate leverage. With this analysis we can examine whether different types of firms' financial policies are more or less sensitive to fluctuations in the supply of treasuries. In light of the previous findings, a natural place to look for this heterogeneity is along the credit risk dimension. As banks and insurance companies substitute Treasury securities in and out of their portfolios, they should be most willing to do so with those corporate securities that are closest substitutes in terms of their risk-return profile (Friedman, 1986). In this sense, we would expect the demand for corporate debt from the largest, least risky borrowers to be most sensitive to Treasury supply.

In Table 5, we estimate the sensitivity of leverage and security issuance decisions at the firm level for various subsamples stratified by perceived issuer credit risk. We employ several proxies: firm size[8], age, probability of default estimated following Bharath and Shumway (2008)[9], and three financial constraints proxies used in prior studies (indices of Whited-Wu (2006) and Hadlock and Pierce (2011) and an indicator for dividend payers). Each year we sort firms by each measure and define the high (low) group to be firms in the upper (lower) quartile.

[8] Shivdasani and Zenner (2005) argue that firm size is the most important determinant of credit rating.
[9] To reduce endogeneity concerns, we modify equation (12) of Bharath and Shumway (2008) by replacing the firm-specific V/D ratio with the average V/D over the whole sample. Our measure then captures primarily cross-sectional variation in asset volatility.

The dependent variable in Panel A is book leverage (total debt to assets). For brevity, we focus on the coefficient on the government debt to GDP ratio, though the model also includes as control variables a time trend, the same macroeconomic variables used previously, firm fixed effects and the following firm characteristics: size (log of real assets) , profitability (ebit / assets), asset tangibility (PP&E / assets), and market-to-book assets. Across all proxies for credit risk, we find that the sensitivity of corporate to government leverage is greater in both magnitude and significance for those borrowers whose debt would be closer substitutes to government debt. In several cases, the relationship between leverage of smaller, riskier borrowers and government leverage is insignificant, while it is always significantly negative for larger, safer borrowers. This contrast is even more pronounced when we focus on the first part of our sample period, during which foreign holdings of Treasuries were minimal and relation between aggregate leverage and government borrowing was stronger.

Panels B and C repeat the analysis of Panel A, but with debt and equity security issuances as the dependent variables. Panel B shows that over the first half of the sample period, we see the same cross-sectional heterogeneity in the sensitivity of corporate to government debt issuances as with leverage – highly significant negative coefficients for larger, safer firms and smaller, mostly insignificant coefficients for smaller, riskier firms. Cross-sectional differences are weaker over the full sample period, but qualitatively similar for four out of the six proxies. The results for equity issuances (Panel C), however, are quite different. Coefficients on government net debt issuance are either insignificant or positive in virtually every subsample. As such, there is no discernible cross-sectional pattern. This is reassuring for two reasons. First, since equity is a more distant substitute for Treasury securities, we would expect a weaker relationship (as seen in Table 3). Second, it helps to rule out an alternative explanation based on omitted demand factors. That is, if the overall effect of government leverage or the cross-sectional patterns seen in Panels A and B were driven by correlation between government borrowing and omitted investment demand, we would expect to see an effect on demand for all forms of external capital. However, the effect seems to be concentrated in debt securities, and within debt securities, those that are closest substitutes for government debt.

B. Tax Incentives

The tax deductibility of interest creates an incentive for firms to issue debt rather than equity, all else equal. While this incentive is mitigated by taxation at the personal level, the prevailing rates during the last century have typically been such that the after tax cost of debt is less than equity on a certainty-equivalent basis (Graham (2003)). However, a challenge in identifying the effect of taxes on capital structure is finding observable, exogenous variation in corporate marginal tax rates. This challenge has forced studies to either estimate tax rates via simulation (e.g., Graham (1996)), or focus on relative differences in debt usage created by tax law changes (e.g. Givoly et al., 1992, Heider and Ljungqvist, 2012, Perez-Gonzalez (2012)). In this section, we exploit the many large tax rate changes over our sample period to better understand the relation between debt and taxes.

B.1. Leverage and Taxes

Panel A of Figure 9 displays the time series of (top) corporate tax rates along with our aggregate book leverage series, as well as a measure of the debt tax incentive net of personal taxes.[10] The statutory corporate tax rate underwent 30 changes during the last century. Rates were quite low at the start of our sample period, staying below 15% from 1920 until the late 1930s. By the mid-1950s, however, the corporate tax rate exceeded 50%. Tax rates remained near 50% until the mid-1980s, and have been steady near 35% since.

Casual inspection of the figure suggests a positive relation between corporate taxes (or the net tax incentive) and leverage, particularly in the mid-20th century. Indeed, several past authors have interpreted this visual association as a casual one (Hickman (1953) and Sametz (1963)). Further suggestive evidence of this relation can be found in Panel B of Figure 7. This panel plots the corporate tax rate series with the ratio of debt to total fixed-charge finance, defined as debt plus preferred stock. As noted earlier, preferred stock's popularity declined significantly from the start of the 20th century, quite possibly as a consequence of the changing

[10] Following Taggart (1981), we define the net debt tax incentive as $1 - (1-t_c)/(1-t_p)$, where t_c is the corporate tax rate and t_p the lowest personal tax rate. This formula derives from Miller (1977), with the simplifying assumption that the effective tax rate on income to equity holders is zero. We use the lowest personal tax rate because the highest reached levels during the middle of the century that few if any investors actually paid. (The top personal rate exceeded 90% for 16 out of the 20 years from 1944 through 1963).

tax environment, as argued by Sametz (1963). Indeed, the debt-to-fixed charge finance ratio shows an even more dramatic rise than debt-to-assets, rising from 50 – 55% in the pre-war period to more than 90% by 1970. Further, the unconditional correlation between the tax rate and the debt-to-fixed charge finance series, 0.68, is even stronger than that between leverage and the tax rate, 0.39.

In Table 6 we examine this relation more carefully by adding measures of the corporate tax rate to our aggregate leverage regressions from Table 2. As before, we estimate the regressions both in levels, controlling for a time trend, and in first differences. To ease the presentation, we report only the coefficient estimates on the tax variables and government leverage. We report the latter to emphasize the robustness of our previous findings to these alternative specifications. The macroeconomic control variables include the real rate of return on AAA-rated corporate bonds, the BAA-AAA yield spread, the rate of inflation, the return on the aggregate stock market, and real GDP growth. The firm characteristic control variables include the return on assets, the ratio of tangible assets to total assets, and the market-to-book ratio. We use both debt to assets (Panel A) and debt to total fixed-charge finance (Panel B) as dependent variables.

Column (1) of Panel A indicates, as expected, a significant positive relationship between tax rates and aggregate leverage when we do not control for a time trend. However, the coefficient becomes insignificant once we include any controls (column 2) or convert all variables to first differences (column 5). Thus, we cannot reject the hypothesis that the series are correlated because they share a common trend as opposed to a causal relationship.

In columns 3 and 6, we account for the possibility of a delayed reaction to the tax law change using a distributed lag model. That is, if recapitalization is costly, firms' leverage may not respond immediately to an increase in tax rates, but may still affect their choice of security the next time they raise external capital. In both the level and first-difference regressions, we find a positive long-run effect, but it is not statistically different from zero. Columns 4 and 7 present results from a distributed lag model using a measure of net tax incentives to issue debt. The results with are very similar to those obtained with the corporate tax rate.

In Panel B, we show stronger evidence of a relationship between corporate tax rates and the choice between debt and preferred stock financing. The coefficient on the tax rate remains significant after controlling for a time trend, macroeconomic variables (including government

borrowing), and firm characteristics. While the results in first differences are somewhat weaker than for levels, the long run effect is highly significant even in first differences. Economically, a one percentage point increase in tax rate is associated with an increase of 30 basis points in the ratio of debt to fixed charge finance. The total increase in tax rates between the late 1930s and early 1950s was about 37%. This would translate into an increase of about 11% in the D/(D+P) ratio, almost a third of the total increase in the ratio over that time span.

B.2. Security Issuance Decisions and Taxes

In Table 7, we investigate the extent to which corporate tax rates influence aggregate debt and equity issuance decisions. We estimate models similar to those in Table III, with the addition of a measure of the corporate tax rate. The results are not substantially supportive of a role for taxes in influencing issuance decisions in aggregate. Without controlling for aggregate firm characteristics or macroeconomic factors (other than government borrowing), we do find a significant positive association between tax rates and debt issuance (column 1) and between tax rates and the use of debt to fund investment (debt issuance scaled by investment for those firms with positive investment, column 7). However, when the macro and firm characteristic controls are added, both relationships become insignificant. In columns 3 and 9, we allow for a delayed response of financing activity to tax rate changes with a distributed lag model, but again find no significant effect. We do find some evidence that firms issue less external equity when tax rates are high (columns 5-6). On the whole, though, tax rates do not appear to be a significant driver of aggregate debt issuance activity.

C. Expected Default Costs

In traditional capital structure theories, the tax benefits of debt are offset by the expected costs of financial distress (e.g. DeAngelo and Masulis, 1980). In this section, we examine the extent to which the increase in aggregate leverage in the middle of the century was associated with changes in expected distress costs. In particular, we relate leverage to measures of aggregate uncertainty, which proxy for the probability of default for a given level of debt.

Figure 10 plots aggregate leverage (dashed line) along with three measures of uncertainty. The first (upper left plot) is the cross-sectional average of the within-firm standard deviation of return on assets, using (up to) the previous ten years of data.[11] This captures the average volatility of firm-level cash flows. The figure shows visual evidence that the increase in leverage coincided with a marked reduction in earnings volatility. While the decline in volatility appeared to start after the initial increase in leverage, the pattern is quite similar, with a higher and relatively stable level prior to 1950 and a lower and moderately increasing level post 1970.

Similar patterns are also seen in the next two measures, both of which are constructed following Bansal, Coleman and Lundblad (2010), who propose two proxies for aggregate uncertainty. The first is conditional GDP growth volatility, based on a GARCH model of the annual real GDP growth rate. The second is an estimate of the market risk premium, defined as the fitted values from the following return predictability regression:

$$Ret_{mkt,t+1} = \alpha_0 + \alpha_1 MktDividendYield_t + \alpha_2 TermSpread_t + \alpha_3 TbillRate_t + \epsilon_{t+1}$$

Bansal et al (2010) include this measure to capture risk compensation associated with economic uncertainty. While both of these measures are more volatile than the average earnings volatility, they both exhibit a similar decline between approximately 1950 and 1970 before stabilizing at a lower level after 1970.

In Table 8 we estimate similar aggregate leverage regressions as in Tables 2 and 6, including these three measures of uncertainty as explanatory variables. In Panel A, we see that the level of leverage is negatively correlated with all three measures of uncertainty when controlling for a time trend. Both the earnings volatility and GDP growth volatility measures remain significantly negatively related to leverage after controlling for our set of macroeconomic and firm characteristic controls (columns 2 and 8). However, this is in part due to their correlation with the government debt to GDP ratio. Once we control for government leverage (columns 3 and 9), both relationships lose significance. Further, Panel B shows that none of these relationships are significant in first differences. Ultimately, while the decline in volatility over the middle part of the century suggests an increase in optimal leverage ratios, our proxies for uncertainty have limited independent explanatory power.

[11] Return on assets is calculated as earnings before interest and taxes divided by total book assets. If fewer than 10 past years of data are available, we use all available previous years, but we require at least 4 years of data to calculate the standard deviation.

D. Alternative Mechanisms

D.1. Financial Institution and Market Development

Financial intermediaries play an important role in facilitating access to capital by mitigating information asymmetry and agency costs ((Diamond 1984, Leland and Pyle 1977). As a result, differences in the levels of development of financial markets across countries have been linked to differences in how firms finance their activities (Demirguc-Kunt and Maksimovic, 1996). Meanwhile, the size and complexity of the financial services sector in the U.S. has grown dramatically over the past century (Phillipon, 2008, 2012). In this section, we explore the extent to which development of U.S. capital markets, and growth in financial intermediation in particular, is associated with changes in our sample firms' corporate capital structures over time.

Panel A of Figure 11 plots the share of corporate bonds and equity held through intermediaries over time. The series combine data from Goldsmith (1958) from 1920 through 1944 with US flow-of-funds data from 1945 through 2010. The share of equities held through intermediaries (largely investment companies and pension funds) has steadily increased over the latter half of the century, from 5% in 1945 to almost 60% by 2010. By contrast, the share of bonds held by intermediaries changed dramatically over a short period, between the late 1930s and early 1950s. In 1939, only 24% of bonds were held through intermediaries.[12] However, this fraction ballooned to over 80% by 1950 and over 90% by 1955. Thus, the share of bonds held by intermediaries increased sharply relative to that of equity in the 1940s. To the extent that intermediaries perform valuable information gathering and monitoring roles, this may have altered the relative costs of raising debt and equity capital for firms.

Panels B and C of Figure 9 plot our aggregate leverage series along with two measures of the size of the financial sector from Phillipon (2012): the income share of the finance sector and his estimate of the level of output of the financial sector from business credit and equity issuance.[13] Both measures of the size of the financial sector appear to follow a similar time-series pattern as that of aggregate leverage, declining through the depression years and steadily

[12] Goldsmith (1958) includes the following classes of intermediaries: Commercial Banks, Mutual Savings Banks, Insurance companies, Pension & Retirement Funds and Investment Companies.
[13] We thank Thomas Phillipon for sharing this data, which can be found on his website at website: http://pages.stern.nyu.edu/~tphilipp/research.htm

rising post-WW II. However, the financial sector (particularly the income share) continues to grow in the last two decades even as aggregate leverage has leveled off. This is potentially consistent with the findings of Demirguc-Kunt and Maksimovic (1996) who conclude that "initial improvements in the functioning of a developing stock market produce a higher debt-equity ratio for firms and thus more business for banks. In stock markets that are already developed, further development leads to a substitution of equity for debt financing." We investigate this relationship more formally below.

Table 9 repeats the aggregate leverage regressions of Tables 2 and 5 with the addition of our measures of the intermediary shares of bonds and equity (Panel A) and Phillipon's financial sector size measures (Panel B). Consistent with Figure 9, the intermediary share of debt (column 1 of Panel A) and both measures of financial sector size (columns 1 and 4 of Panel B) are positively correlated with aggregate leverage. However, the intermediary share relationships are not robust to controlling for a time trend or taking first differences. Thus, it is difficult at this point to say more beyond noting that these series share common trends. On the other hand, aggregate leverage continues to be positively correlated with Phillipon's measure of the output of the finance sector (based on business credit and equity issuance activity), after controlling for the time trend as well as macro and firm level variables.

Table 10 investigates the link between security issuance activity and financial market development proxies. From Panel A, we see some evidence that firms issue more debt (column 1) and finance a greater proportion of their investments with debt (column 5) as the share of bonds held by intermediaries grows. However, in both cases, the coefficient becomes insignificant when we control for our full set of firm level and macroeconomic controls. In Panels B and C, the results suggest that firms issue more equity relative to assets, but not more debt, as the financial sector grows, consistent with the findings of Demirguc-Kunt and Maksimovic (1996). While our initial evidence is suggestive of an association between corporate financing choices and growth of the financial sector, and of financial intermediation, further research is needed to understand this relationship more fully.

IV. Conclusions

We document a substantial shift in corporate financial policy in US firms over the past century. While leverage of the regulated sector has remained quite stable over time, leverage of unregulated firms has increased significantly. Because this increase occurred prior to 1970, many empirical studies relying on more recent data miss important time-series variation in capital structures. We find that competition for investor capital, primarily from the government, is an important determinant of variation in aggregate leverage. Taxes, volatility and development of financial markets all appear to have moved in a direction to encourage increased reliance on debt financing. However, statistically these factors seem to play more limited roles. We hope that future research to more fully understand the causes of this secular rise in corporate leverage can deepen our understanding of the key market frictions driving financial policies.

References

Baker, Malcolm, 2009, Capital market driven corporate finance, in *Annual Reviews of Financial Economics*, ed. Andrew Lo and Robert Merton.

Baker, Malcolm and Jeffrey Wurgler, 2002, Market timing and capital structure. *Journal of Finance*, 57: 1-30

Elmendorf, Douglas W. and N. Gregory Mankiw, 1998, Government Debt, ed. Michael Woodford, in *Handbook of Macroeconomics*, Vol 1C, Elsevier, Amsterdam.

Frank, Murray and Vidhan Goyal, 2008, Tradeoff and pecking order theories of debt, in *The Handbook of Corporate Finance: Empirical Corporate Finance*, ed. Espen B. Eckbo, Vol. 2, Elsevier, Amsterdam.

Frank, Murray and Vidhan Goyal, 2009, Capital structure decisions: Which factors are reliably important? *Financial Management* 37, 137 - .

Frankel, Jeffrey A., 1985, Portfolio crowding-out, Empirical estimated, *Quarterly Journal of Economics* 100, 1041-1065.

Friedman, Benjamin M., 1982, The changing roles of debt and equity in financing U.S. capital formation, in *Debt and Economic Activity in the United States*, ed. Benjamin Friedman, University of Chicago Press, Chicago, IL.

Friedman, Benjamin M., 1986, Implications of government deficits for interest rates, equity returns, and corporate financing, in *Financing Corporate Capital Formation*, ed. Benjamin Friedman, University of Chicago Press, Chicago, IL.

Graham, John R. and Mark T. Leary, 2011, A review of empirical capital structure research and directions for the future, in *Annual Review of Financial Economics*, ed. Andrew Lo and Robert Merton.

Hanson, Samuel, Robin Greenwood, and Jeremy Stein, 2010, A gap-filling theory of corporate debt maturity choice, forthcoming *Journal of Finance*.

Hubbard, R. Glenn, 2011, Consequences of government deficits and debt, Working Paper.

Harris, Milton and Artur Raviv, 1991,

Kaplan, Steven and Per Stromberg, 2009, Leveraged buyouts and private equity, *Journal of Economic Perspectives* 2009, 1-27.

Leary, Mark, 2009, Bank Loan Supply, Lender Choice, and Corporate Capital Structure. *Journal of Finance*, 64: 1143-1185.

Lemmon, Michael, Michael R. Roberts and Jaime Zender, 2008, Back to the beginning: Persistence and the cross-section of corporate capital structures, *Journal of Finance* 63, 1575-1608.

Lemmon Michael and Michael R. Roberts, 2010, The Response of Corporate Financing and Investment to Changes in the Supply of Credit. *Journal of Financial and Quantitative Analysis*, 45: 555-587.

Myers, Stewart, 1977, Determinants of corporate borrowing, *Journal of Financial Economics* 5, 147-175.

Papke, Leslie and Jeffrey Wooldridge, 1996, Fraction response…

Rajan, Raghuram and Luigi Zingales, 1995, What do we know about capital structure: Some evidence from international data. *Journal of Finance* 50: 1421-1460.

Stulz, Rene, 1985, An analysis of secured debt, *Journal of financial Economics* 14, 501-521.

Taggart, Robert A., 1981, *Secular patterns in corporate finance,* NBER Working Paper.

Taggart, Robert A., 1986, Have U.S. corporations grown financially weak? in *Financing Corporate Capital Formation*, ed. Benjamin Friedman, University of Chicago Press, Chicago, IL.

Taylor, Allison and Alicia Sansome, 2007, *The Handbook of Loan Syndications and Trading*, McGraw-Hill.

Tobin, James, 1961, Money, capital and other stores of value, *American Economic Review* 51, 26-37.

Tobin, James, 1969, A general equilibrium approach to monetary theory, *Journal of Money, Credit and* Banking 1, 354-371.

Appendix A: Data Sources, Sample Construction and 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 Comparing data sources for aggregate leverage

We first compare our combined Moody's / Compustat data to other sources of aggregate corporate leverage data. Some prior authors (e.g., Frank and Goyal (2008)) study long-term leverage trends using aggregate balance sheet data from U.S. Flow of Funds, which is limited because it begins in 1945. However, the Census Bureau reports in *Historical Statistics of the United States* (HSUS) aggregate balance sheet data based on corporate tax returns over the period from 1926 through 1997. As seen in Figure A.1, the two data sources provide similar leverage series (based on long-term debt to assets) during the period of overlap. Using the HSUS data then allows us to extend the data used by Frank and Goyal (2008) and others back to almost the start of our sample period for comparison with our Moody's / Compustat (Moody's) data, as discussed in section II.D and shown in Figure 5.

In addition to aggregate data, HSUS also reports aggregate balance sheets by broad industry sector. This allows a finer comparison with our Moody's data and helps uncover the source of the differences. Figure A.2 shows that at the individual sector level, there is substantial agreement between the leverage series based on Moody's and HSUS data. This suggests that differences in the overall aggregate series result from differences in industry composition. Figure A.3 demonstrates that this difference stems primarily from the inclusion or exclusion of regulated industries. The long-dash line shows the time series of aggregate long-term debt to capital from HSUS data for SIC codes 4000-4999, which includes utilities, transportation, and telecommunications. For this sector, leverage has been very stable over the whole sample period, exhibiting no trend. The short-dash and solid lines show aggregate leverage for all other non-financial industries from, respectively, HSUS and our sample. Two features are noteworthy. First, consistent with the industry plots, the HSUS and Moody's series excluding transportation and utilities are quite similar. Second, in the beginning of the sample period, leverage among transportation, communications and utilities firms is about four times as large as that in all other

non-financial industries. By the 1990s, however, most of this difference has been eroded due to the change in capital structures among the non-regulated firms.

A.2 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.3 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 Governement = 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

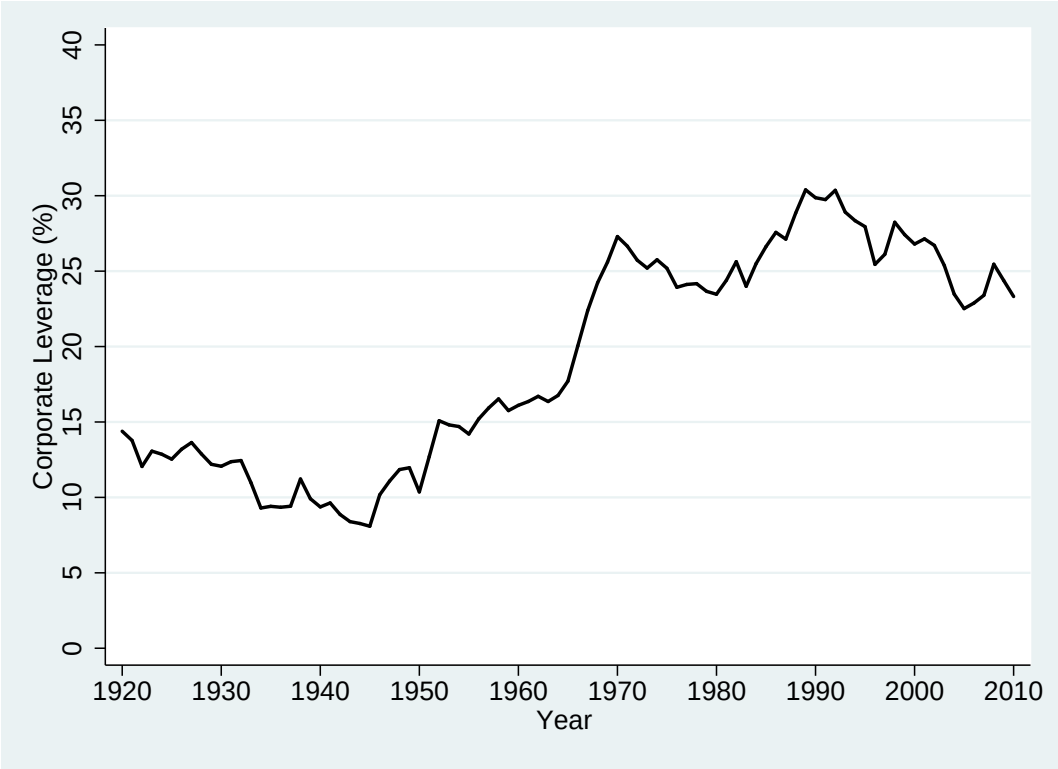
Intangible Assets = [Total Assets – (Net PP&E + cash and marketable securities + accounts receivable + inventories)] / Total Assets

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

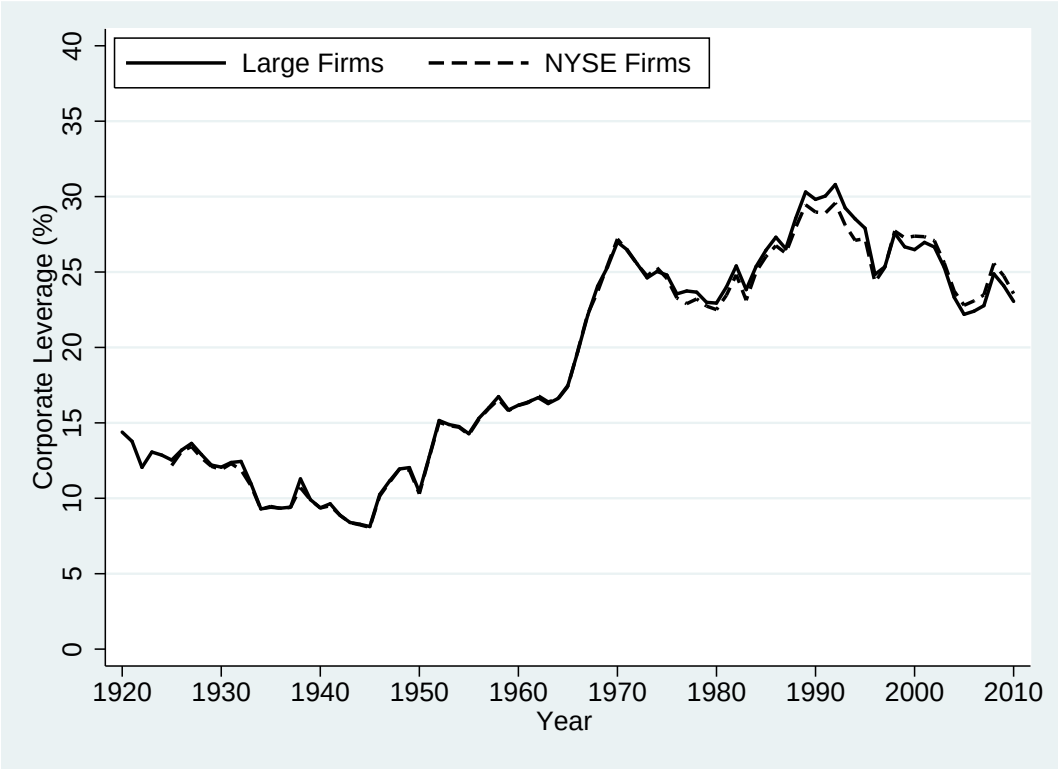
Figure 1
Aggregate Corporate Leverage Through Time

Panel A: Total Debt to Assets

The figure presents the annual ratio of aggregate total debt (short term plus long term) to aggregate book value assets. The sample includes all firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. Financial firms, utilities and railroads are excluded.

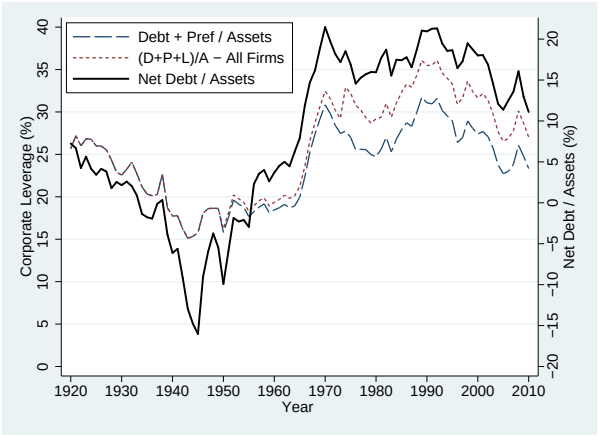


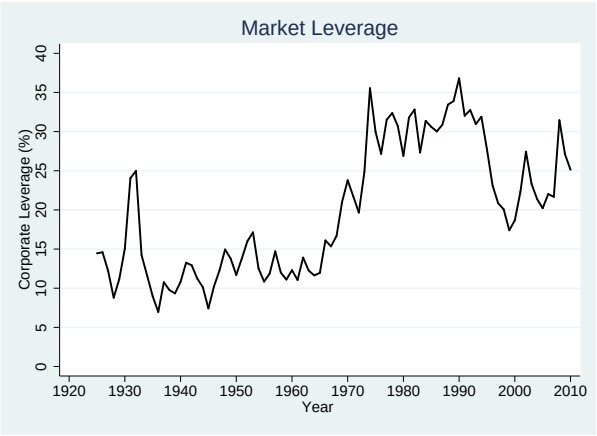
Panel B: Alternative Samples

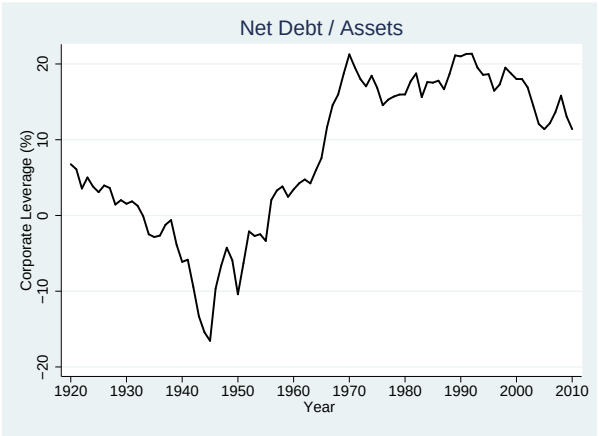


Panel C: Alternative Leverage Measures

The figure shows aggregate book (solid line) and market (dashed line) leverage ratios for all firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. Aggregate book leverage is defined each year as the cross-sectional sum of total debt (short-term plus long-term) divided by the sum of total assets. Aggregate market leverage is defined each year as the cross-sectional sum of total debt (short-term plus long-term) divided by the sum of market capitalization, where market capitalization is the book value of debt plus the market value of equity. $D + P + L$ is the sum of total debt, preferred stock, and the present value of operating leases. Net Debt is total debt minus cash and marketable securities.







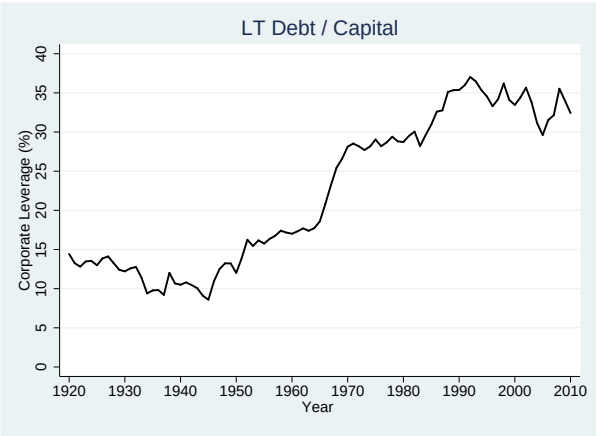
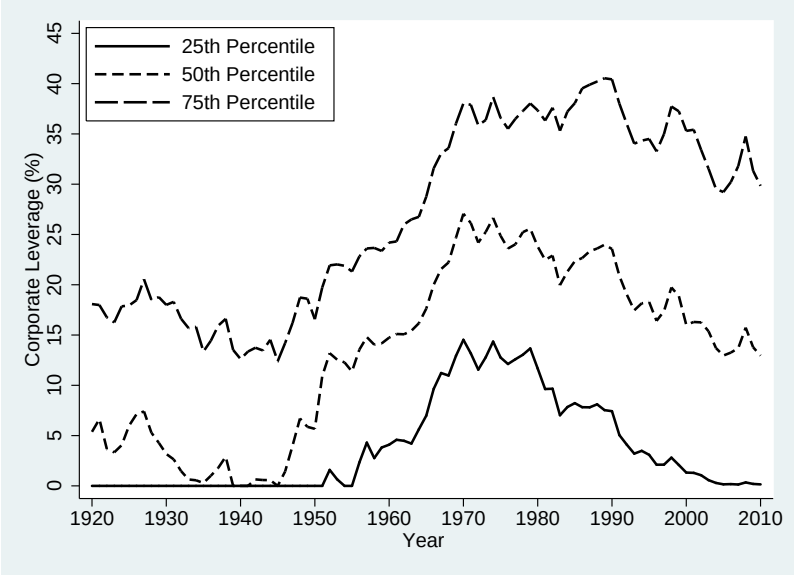


Figure 2
Corporate Leverage: Cross-sectional Distribution

The figure presents, for each year from 1920 to 2010, the cross-sectional median and first and third quartiles of the ratio of total debt (short term plus long term) to book value assets. The sample includes all firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. Financial firms, utilities and railroads are excluded.

Panel A: Full Sample



Panel B: NYSE Firms

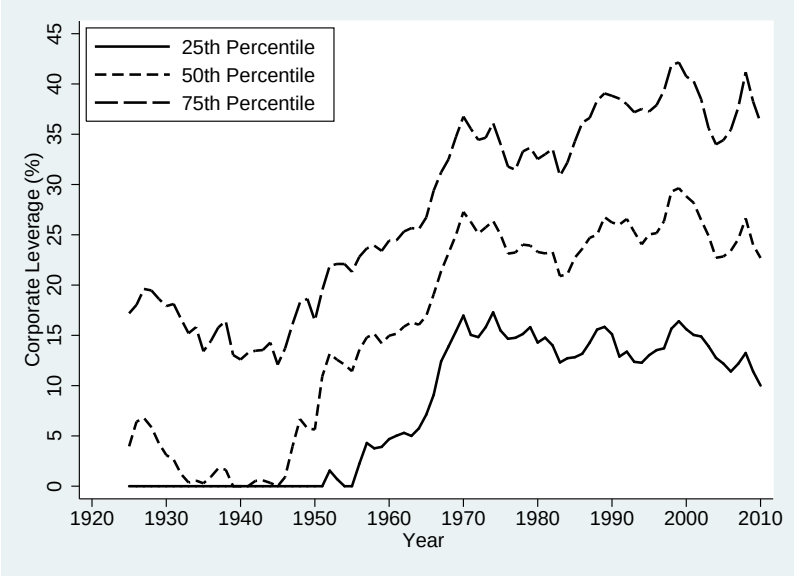
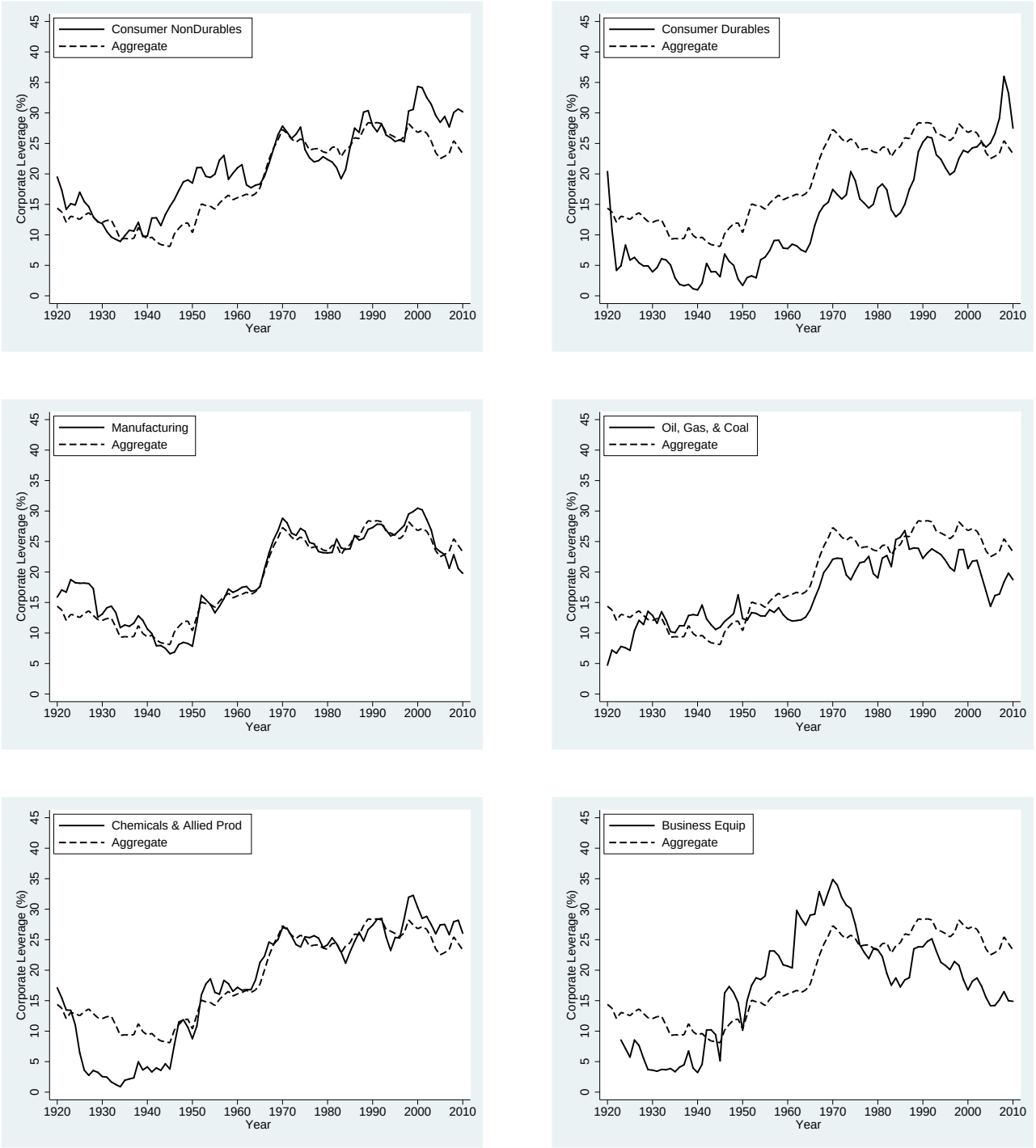
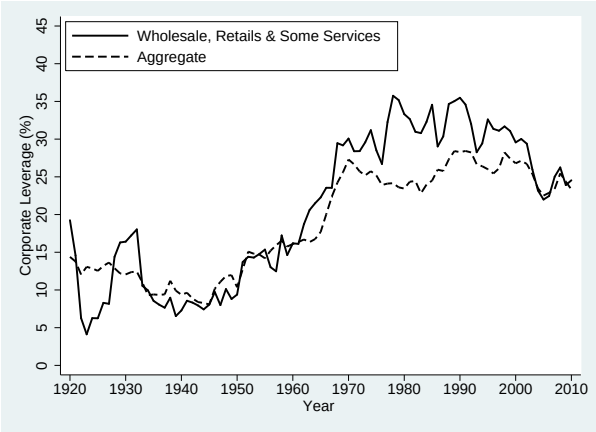
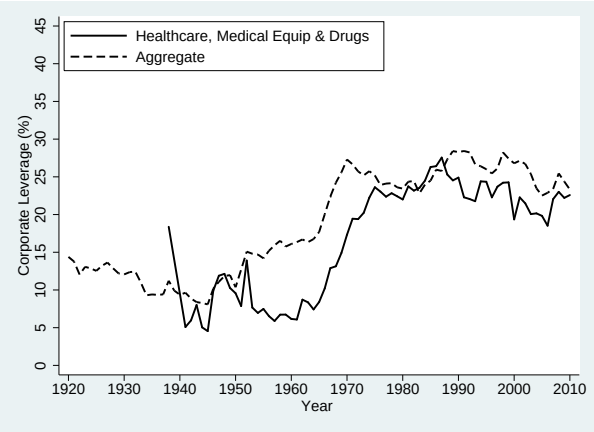


Figure 3
Industry Leverage

The solid line presents the asset value-weighted average leverage ratio for each of the 12 Fama and French industry classifications. The dashed line presents the value-weighted average leverage ratio for all NYSE-listed industrial firms. Industry-years with fewer than 10 firms are excluded.




Wholesale, Retails & Some Services
Aggregate
Corporate Leverage (%)
0
5
10
15
20
25
30
35
40
45
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
Year


Healthcare, Medical Equip & Drugs
Aggregate
Corporate Leverage (%)
0
5
10
15
20
25
30
35
40
45
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
Year

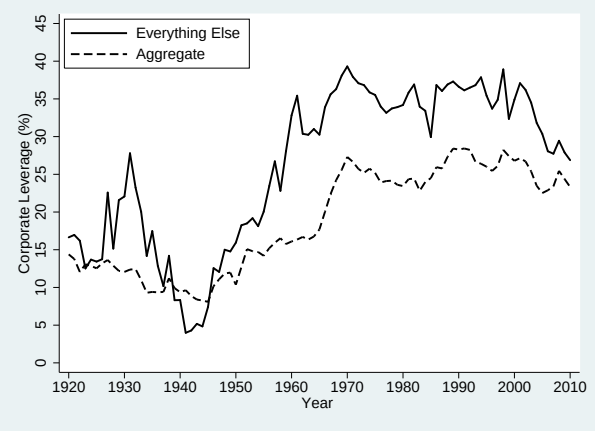
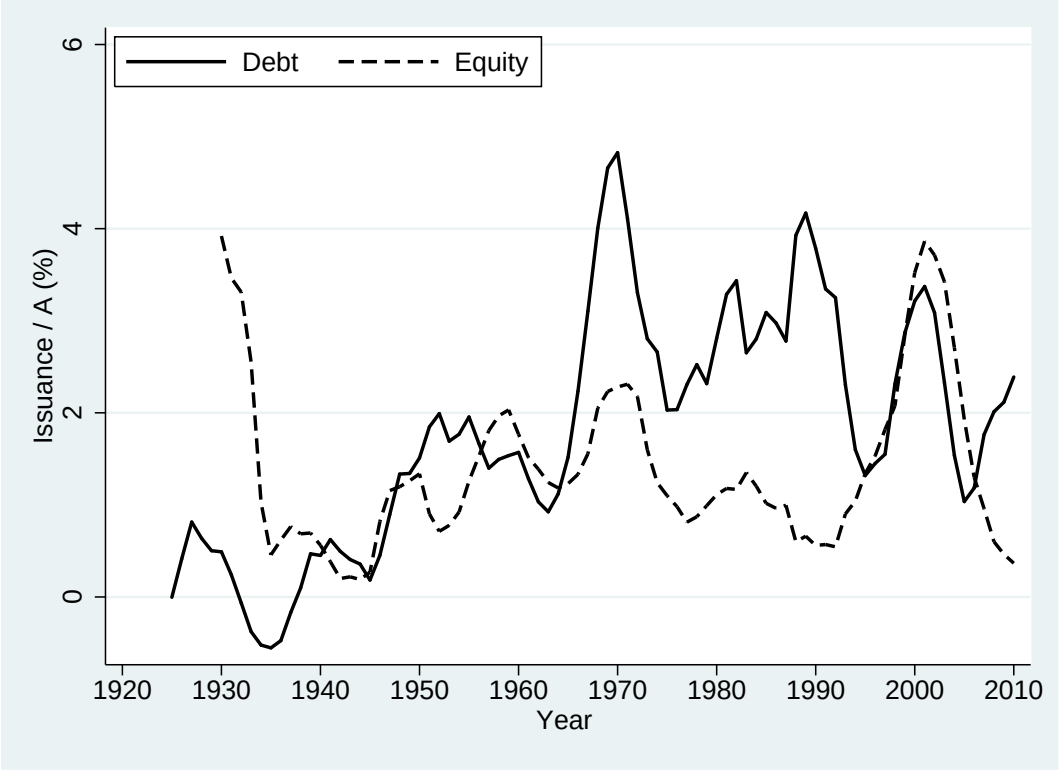

Everything Else
Aggregate
Corporate Leverage (%)
0
5
10
15
20
25
30
35
40
45
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
Year

Figure 4
Aggregate Security Issuance

Aggregate net debt issuance is defined each year as the sum of the change in balance sheet debt across firms divided by the sum of lagged book assets. Net equity issuance is defined as the split-adjusted change in shares outstanding times the average of the beginning and end-of-year stock price.

Panel A: Net Debt and Equity Issuance (% of Assets) – 5 yr MA



Panel B: Debt Issuance / Investment (5 yr MA)

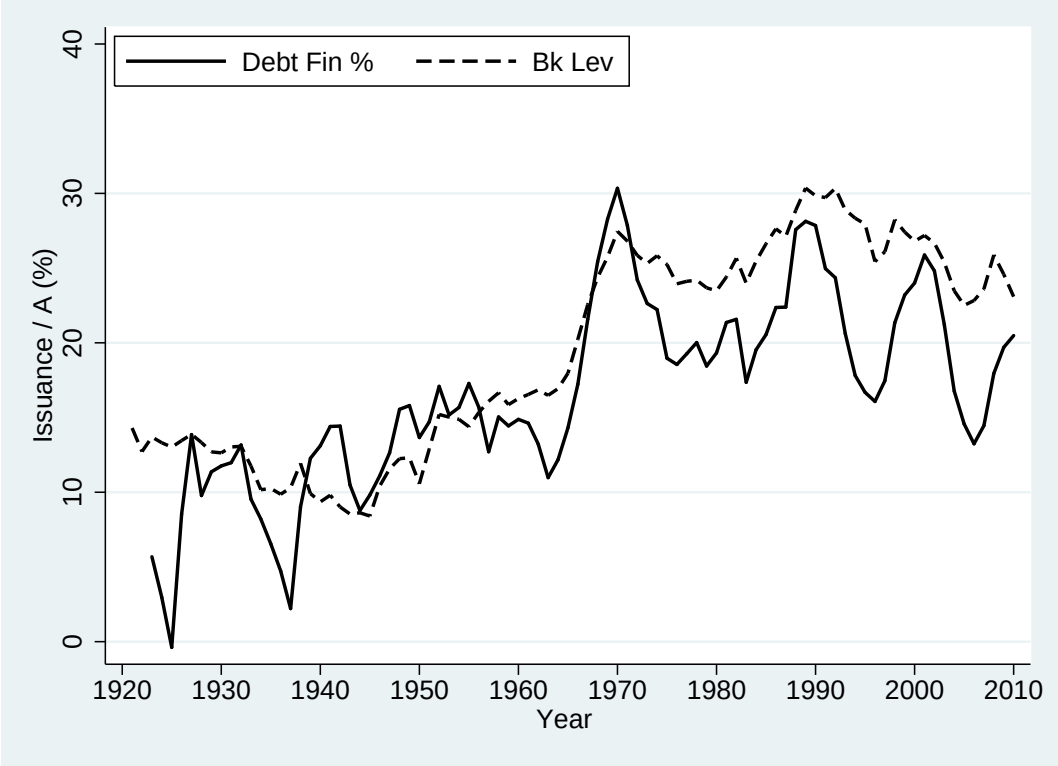
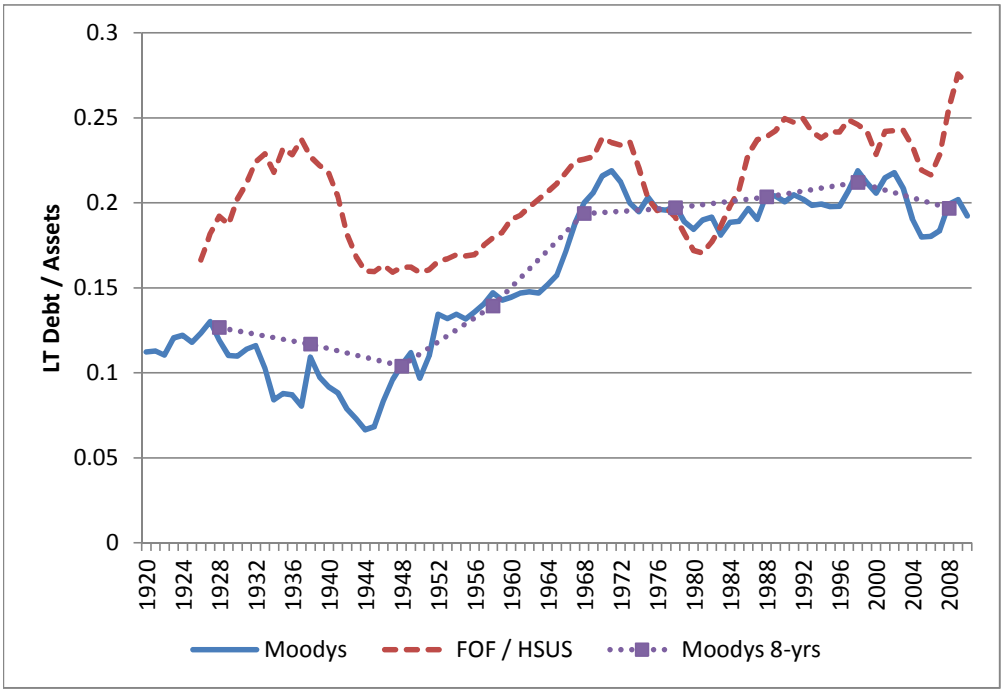


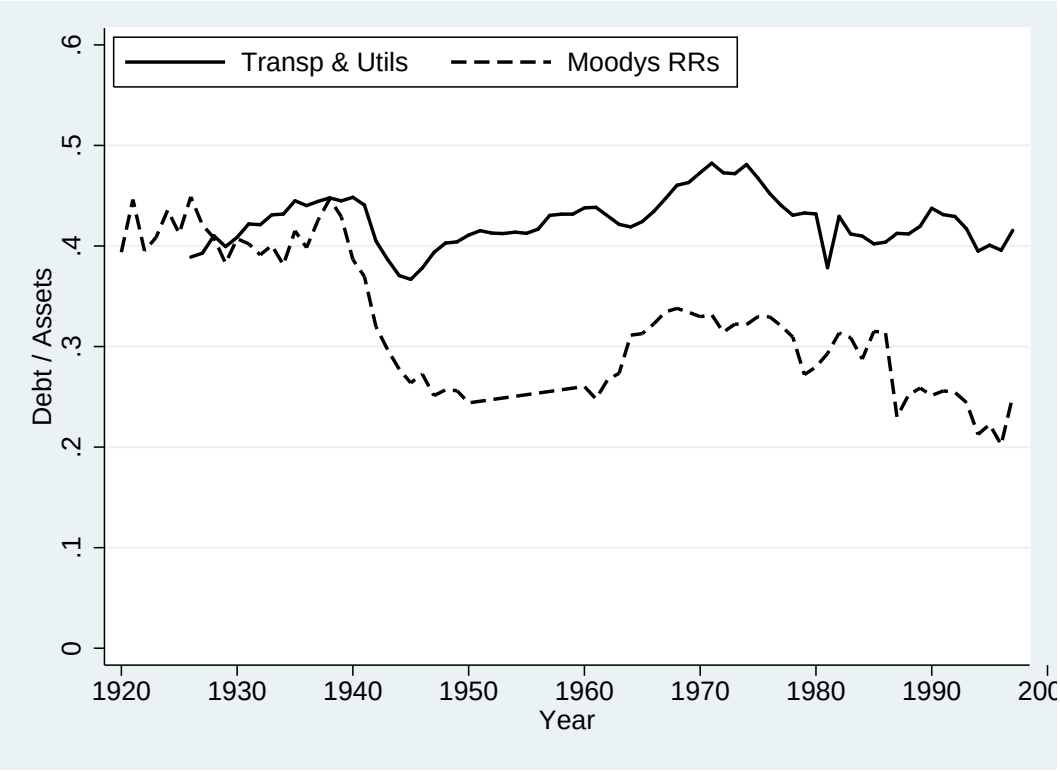
Figure 5
Comparing Aggregate Leverage Series

In Panel A, the solid line is the aggregate ratio of long-term debt to assets for our sample of firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. The squares represent an expanded sample collected once every decade that includes all firms listed in the Moody's Industrial Manuals. The dashed line is aggregate long-term debt to assets from the *Historical Statistics of the United States* (*HSUS*) prior to 1945 and from US Flow-of-Funds after 1945. In Panel B, the solid line is aggregate debt to assets for the Transportation, communications, and utilities sector from *HSUS*. The dashed line is aggregate leverage for all railroads listed in both CRSP and the Moody's Transportation manuals (prior to 1950) or Compustat (post-1950). Panel C plots the percentage of total assets in each industry sector each year for the *HSUS* data.

Panel A: Moodys vs. Flow-of-Funds



Panel B: Leverage of Regulated Industries



Panel C: Asset-weighted Industry Composition (HSUS data)

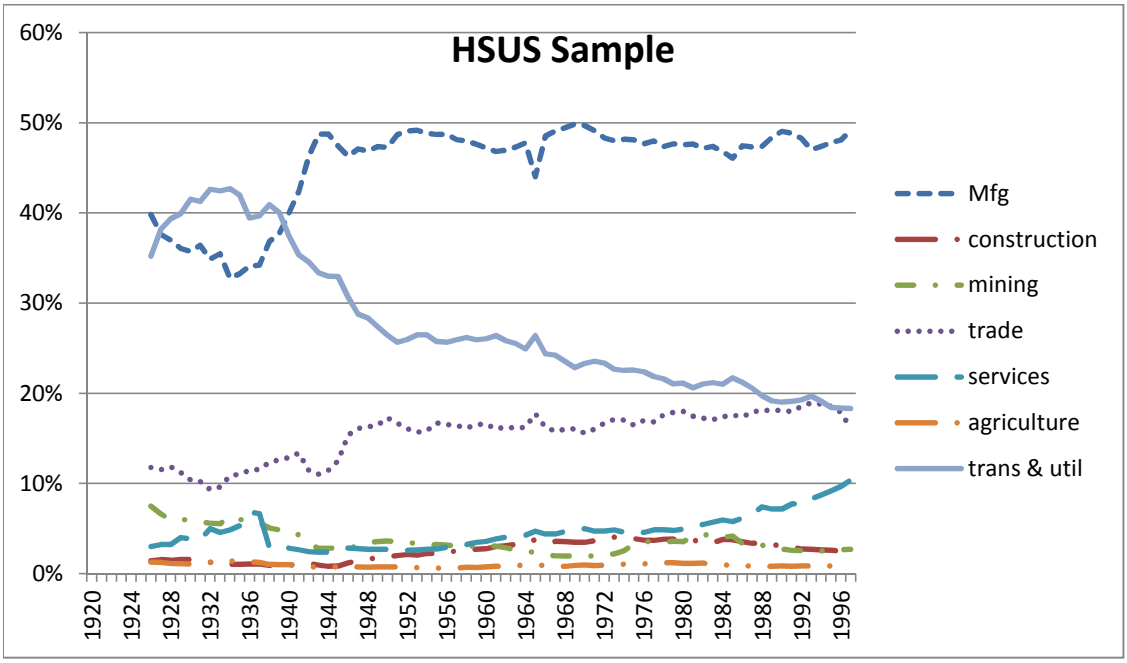


Figure 6

Corporate Leverage and Government Borrowing

Corporate leverage is the ratio of total debt to total assets. Government leverage is the ratio of federal debt held by the public to GDP. Panel A: Corporate D/A Ratio

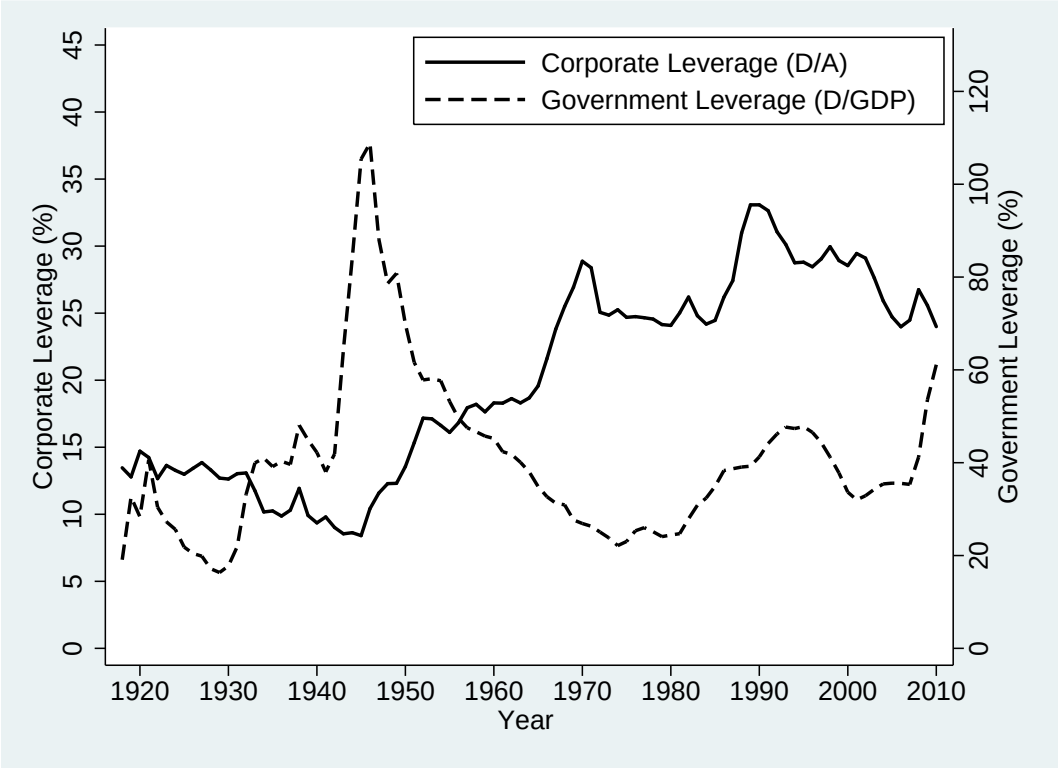
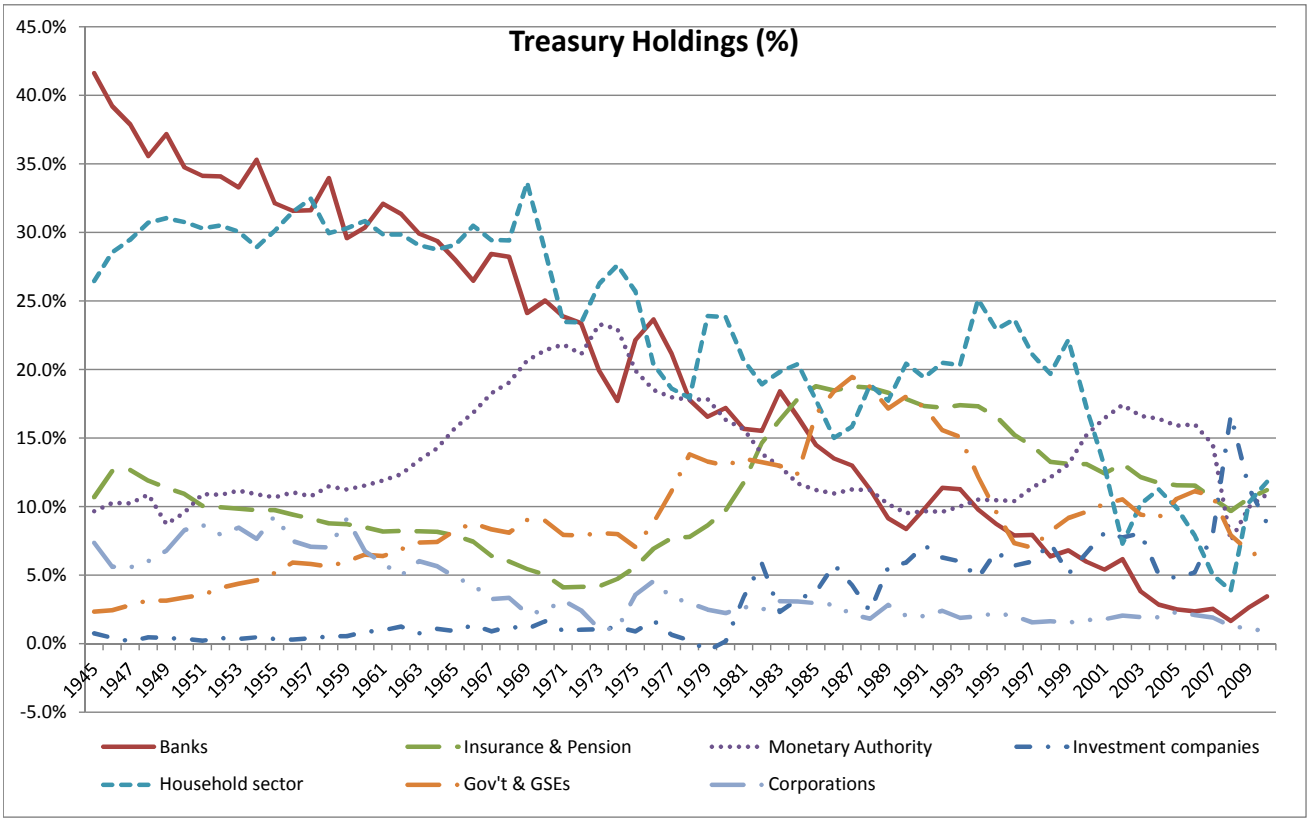


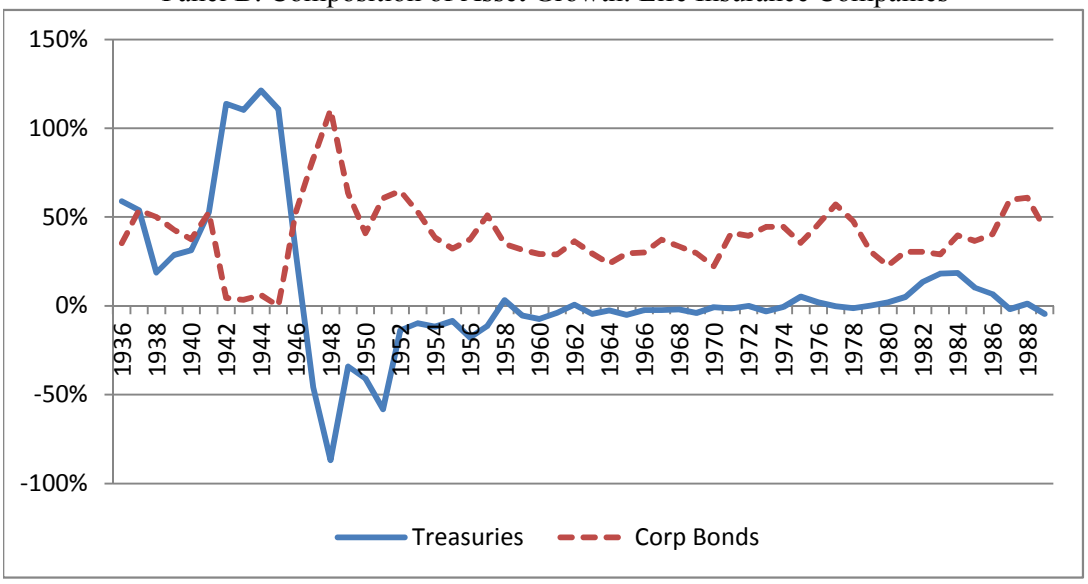
Figure 7
Allocation of Government and Corporate Debt

Data in Panel A is from the US Flow-of-Funds. The plot shows the proportion of US Treasury securities held by each class of investor. In Panels B and C, the solid line plots the change in holdings of US Treasury securities as a percent of the total change in assets. The dashed line plots the change in holdings of corporate bonds (Panel B) or the sum of corporate bonds and loans (Panel C), scaled by the change in total assets. Data in Panel B is from the *Life Insurance Factbook*. Data in Panel C is from Flow-of-Funds.

Panel A: Holdings of US Treasury Securities



Panel B: Composition of Asset Growth: Life Insurance Companies



Panel C: Composition of Asset Growth: Commercial Banks

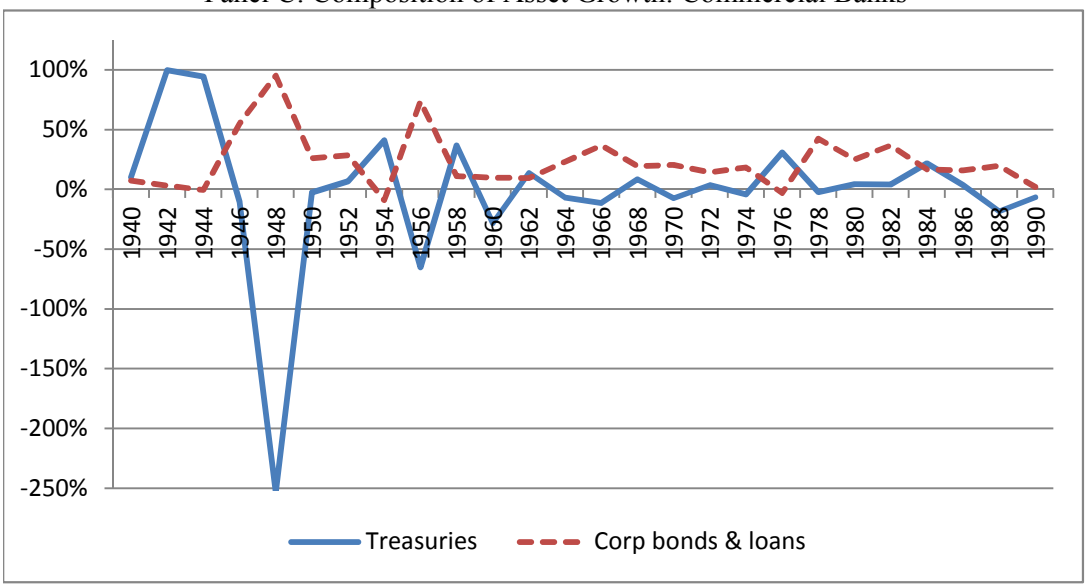


Figure 8
Foreign Holdings of US Debt Securities

The figure displays the percentage of US Treasury securities (solid line) and US corporate bonds (dashed line) held by the rest of the world, as reported in the US Flow-of-Funds data.

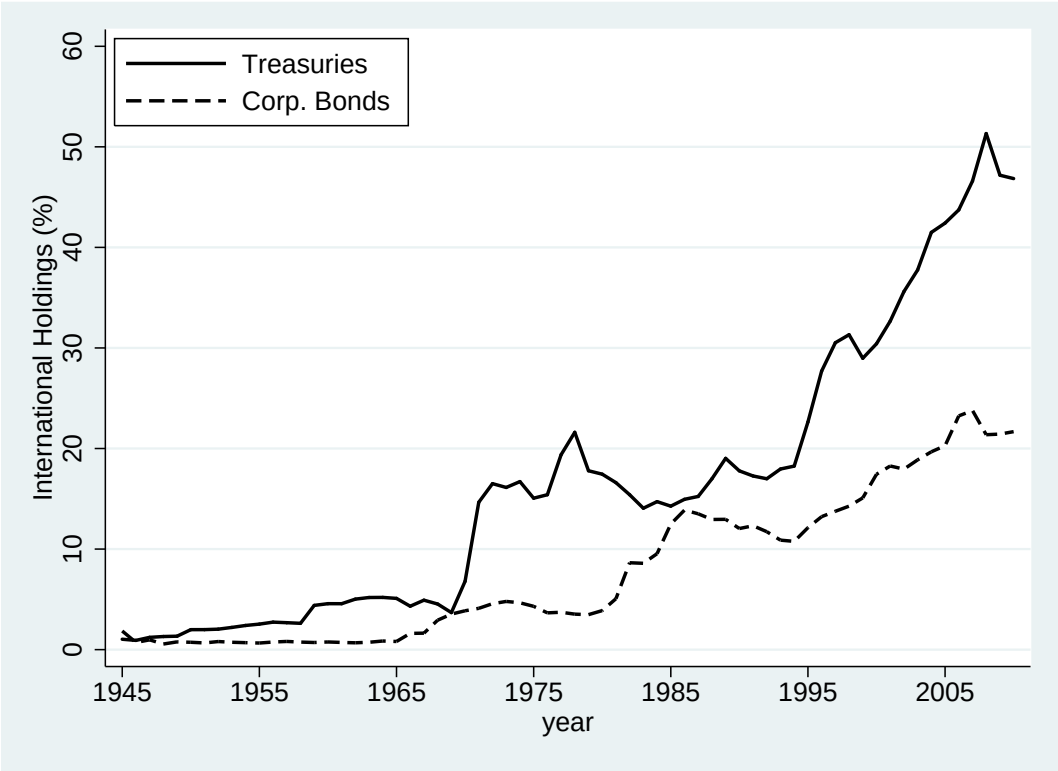
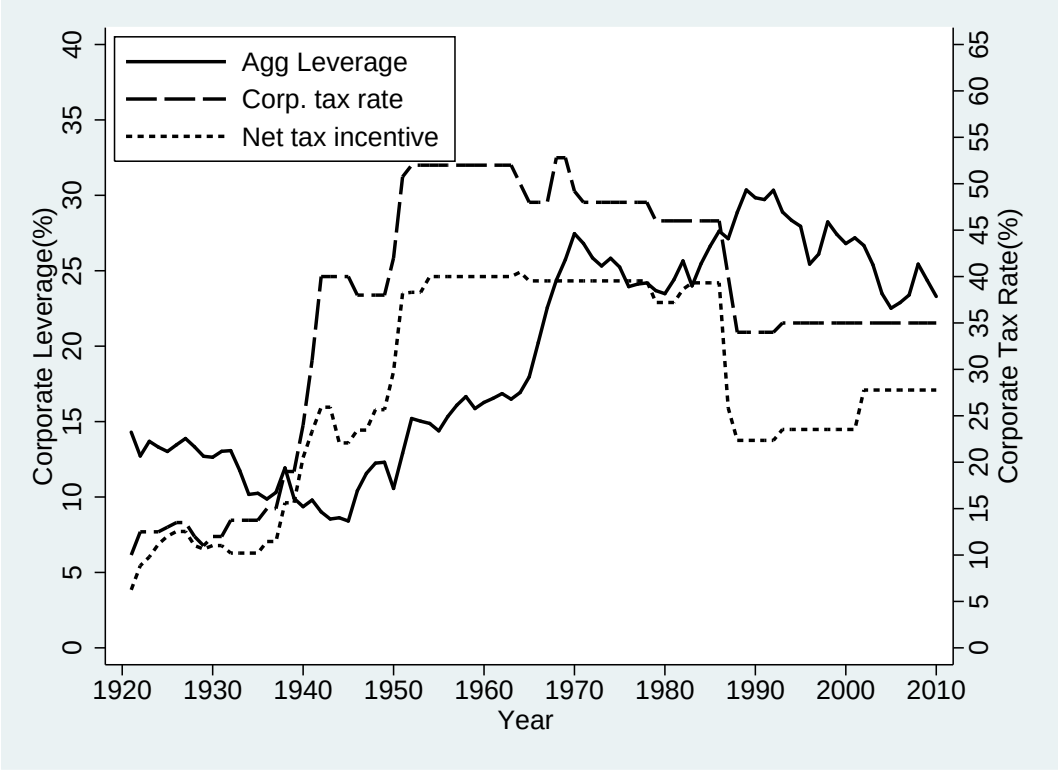


Figure 9
Leverage and Corporate Tax Rates

Corporate leverage is the ratio of total debt to total assets. $D/(D+P)$ is the ratio of total debt to the sum of total debt plus preferred stock. Net tax incentive is defined following Taggart (1981) as $1-(1-t_c)/(1-t_p)$, where t_c is the corporate tax rate and t_p the lowest personal tax rate.

Panel A: Aggregate D/A Ratio



Panel B: Debt to Total Fixed Charge Capital

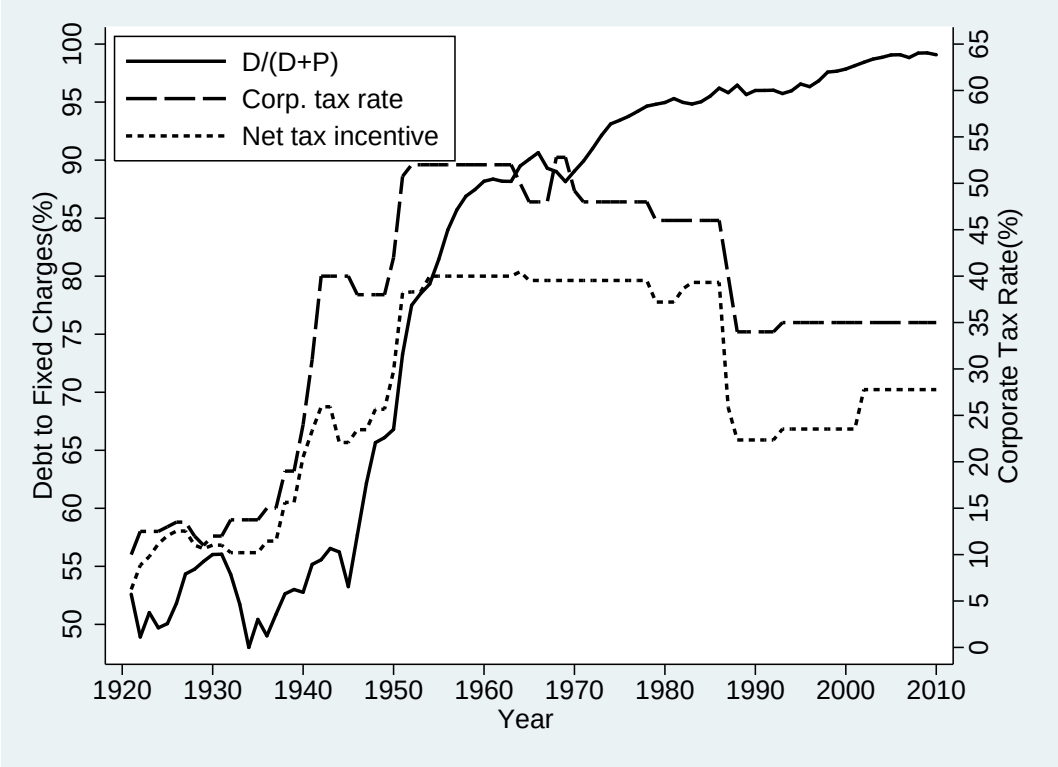
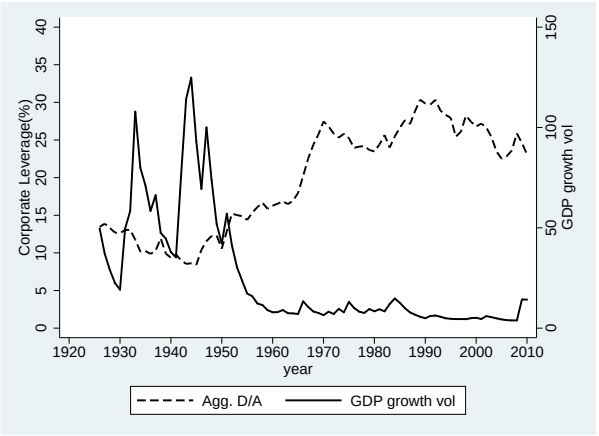


Figure 10
Aggregate Leverage and Volatility Measures

Corporate leverage is the ratio of total debt to total assets. Government leverage is the ratio of federal debt held by the public to GDP.



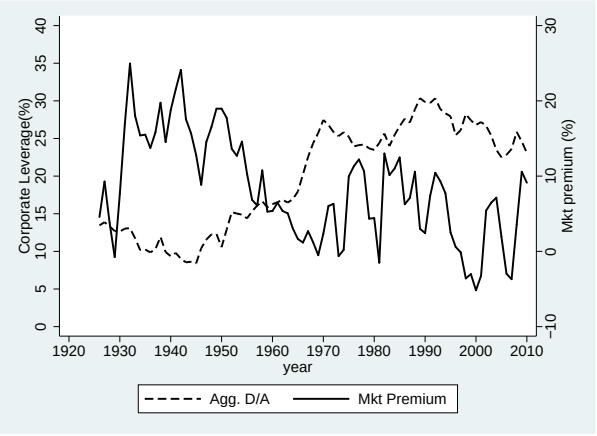
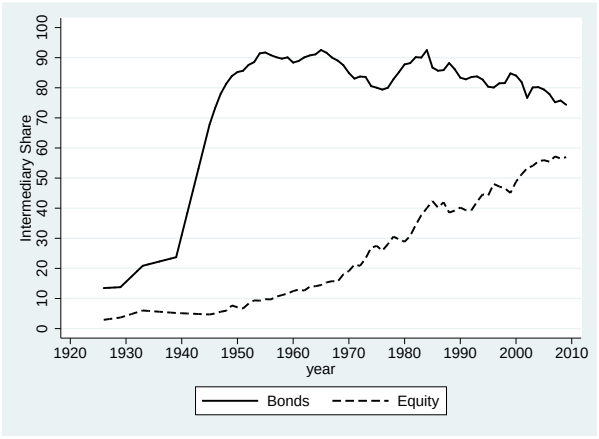
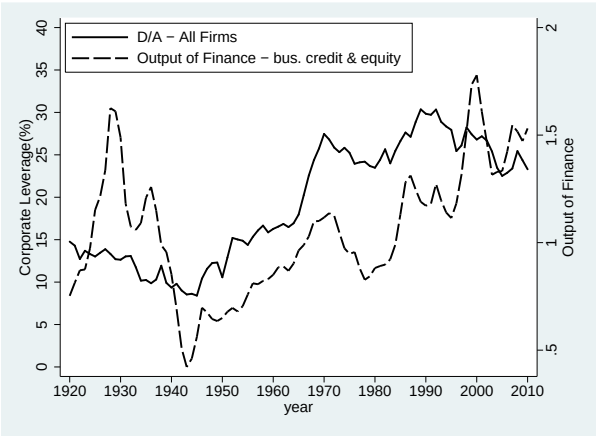


Figure 11
Intermediation, Financial Market Development and Corporate Leverage

Data in Panel A are from Goldsmith (1958) prior to 1945 and US Flow-of-Funds after 1945. Measures of financial sector output in panels B and C (dashed lines) are from Phillipon (2012). Panel B plots aggregate corporate leverage from our Moodys / Compustat sample along with Phillipon's estimate of the business credit and equity component of financial sector output. Panel C plots the same leverage series against Phillipon's value-added based measure of the income share of the financial sector.





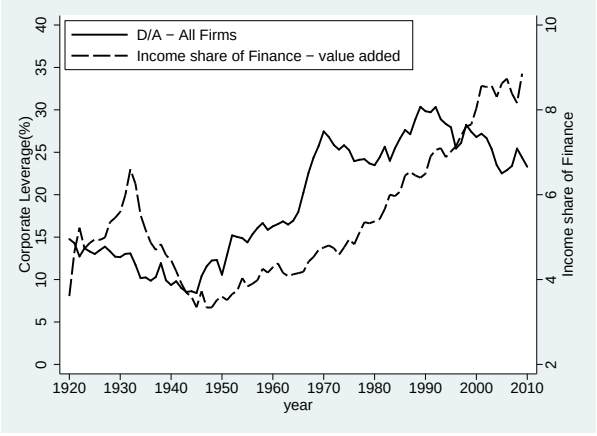


Table 1

Summary Statistics

Panel A: Annual Aggregate Summary Statistics

The sample includes all firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. Financial firms, utilities and railroads are excluded.

	count	mean	sd	min	max	ar(1)
Firm Characteristics						
Debt / Assets (%)	91	19.34	6.93	8.41	30.36	0.983
Debt/(Debt + Mkt Equity) (%)	86	20.10	8.14	7.59	36.69	0.898
(Debt - Cash)/ Assets (%)	91	8.07	9.93	-16.03	21.47	0.971
EBIT / Assets (%)	91	9.99	2.98	1.83	17.54	0.807
Intangible Assets / Assets (%)	91	15.80	9.85	5.88	38.37	0.997
Mkt Assets / Book Assets	86	1.27	0.25	0.57	1.90	0.798
Avg. Book Assets ($mm)	91	682	1,061	42	4,908	0.999
Investment / Assets (%)	91	7.29	5.61	-6.42	19.64	0.684
Macroeconomic Factors						
Real AAA rate (%)	91	2.99	4.38	-11.77	16.90	0.558
BAA - AAA Yield Spread (%)	91	1.19	0.69	0.37	4.26	0.838
Inflation (%)	91	2.92	4.44	-10.94	15.63	0.564
Mkt Return (%)	85	0.12	0.21	-0.44	0.58	0.010
GDP growth (%)	91	3.40	5.41	-13.00	18.52	0.409
Corp. Tax Rate (%)	91	36.18	13.86	10.00	52.80	0.990
Govt Debt / GDP (%)	91	40.79	17.71	16.34	108.82	0.943

Panel B: Panel Data Summary Statistics

The sample includes all firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. Financial firms, utilities and railroads are excluded.

	count	mean	sd	min	max
Debt / Assets (%)	216,128	21.86	20.16	0.00	89.20
Debt/(Debt + Mkt Equity) (%)	207,858	25.22	25.56	0.00	95.61
(Debt - Cash)/ Assets (%)	213,852	6.58	31.80	-77.45	82.96
EBIT / Assets (%)	208,945	4.07	17.65	-76.51	31.26
Intangible Assets / Assets (%)	208,298	16.92	17.61	-193.37	100.00
Mkt Assets / Book Assets	202,103	1.69	1.34	0.36	10.76
Book Assets ($mm)	216,175	1,166	7,195	0.001	360,297
Investment / Assets (%)	190,879	0.17	0.56	-0.71	3.62

Panel C: Averages by Decade – Full Sample

	# obs	Debt / Assets (%)	(Debt - Cash)/ Assets (%)	Debt/(Debt + Mkt Equity) (%)	EBIT / Assets (%)	Intang. / Assets (%)	Mkt Assets / Bk Assets	Avg. Book Assets ($mm)	Invest/ Asset (%)
1921 - 1930	1,402	10.90	20.14	0.67	7.68	15.36	1.20	63	0.10
1931 - 1940	3,569	10.06	19.60	-3.98	6.99	12.10	1.13	57	0.00
1941 - 1950	5,929	9.30	14.81	-10.86	13.46	6.59	1.06	81	0.12
1951 - 1960	6,087	14.69	19.72	-0.38	11.71	5.92	1.17	177	0.11
1961 - 1970	12,216	21.78	22.65	11.55	10.54	9.32	1.61	236	0.19
1971 - 1980	27,673	26.33	35.54	17.18	10.37	10.40	1.26	343	0.16
1981 - 1990	35,572	25.81	27.40	11.79	1.97	14.00	1.70	643	0.21
1991 - 2000	44,519	22.41	23.70	5.42	0.42	20.99	1.99	1,232	0.25
2001 - 2010	35,951	19.84	21.71	-1.28	-0.00	27.80	1.90	3,437	0.11
Total		21.84	25.20	6.55	4.07	16.95	1.69	1,201	0.18

Table 2

Aggregate Corporate Leverage and Government Debt

The sample includes all firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. The table presents results of OLS regressions of aggregate corporate book leverage (Debt-to-Assets) on government leverage (Debt-to-GDP). The regressions are run in both levels and first differences. Newey-West standard errors assuming two non-zero lags are used to compute all t-statistics (in parentheses). Panel B presents only the coefficient estimates and t-statistics for the *Government Leverage* variable. Statistical significance at the 1%, 5% and 10% levels are indicated by ***, ** and *, respectively.

Panel A: Main Specifications

	Levels			First Differences		
	(1)	(2)	(3)	(4)	(5)	(6)
Government Leverage	-0.121***	-0.067***	-0.089***	-0.026*	-0.058***	-0.065***
	(-6.90)	(-2.71)	(-3.65)	(-1.81)	(-3.75)	(-3.38)
Macroeconomic Factors						
Real AAA rate		0.948***	0.486*		0.019	0.048
		(3.34)	(1.87)		(0.10)	(0.25)
BAA - AAA Yield Spread		-1.772***	-2.820***		0.564**	0.295
		(-4.09)	(-4.05)		(2.11)	(0.76)
Inflation		0.845***	0.507**		0.019	0.077
		(3.15)	(2.08)		(0.10)	(0.40)
Market Return		0.081	0.324		0.103	-0.225
		(0.10)	(0.33)		(0.32)	(-0.43)
Real GDP Growth		-0.145***	-0.113**		-0.100***	-0.080***
		(-3.05)	(-2.37)		(-4.43)	(-3.46)
Firm Characteristics						
Profitability			-0.703***			-0.201**
			(-3.49)			(-2.13)
Intangible Assets			-0.200***			0.002
			(-2.67)			(0.02)
Market-to-Book Assets			-2.267			0.265
			(-1.30)			(0.30)
Trend	Yes	Yes	Yes	No	No	No
Observations	93	85	85	92	84	84
R^2	0.837	0.919	0.938	0.019	0.310	0.355

Panel B: Robustness Tests

	Levels	Differences
Alternate measures of corporate leverage		
Debt-to-Assets (500 Largest Firms)	-0.084***	-0.063***
	(-3.39)	(-3.29)
Net Debt-to-Assets	-0.228***	-0.161***
	(-5.56)	(-4.59)
Debt-to-Market Value	-0.083***	-0.067**
	(-3.54)	(-2.26)
Debt-to-GDP	-0.051***	-0.028**
	(-3.77)	(-2.48)
Changes to the X-Variables		
One-year Lags	-0.065***	-0.006
	(-3.18)	(-0.51)
Oil price	-0.097***	-0.064***
	(-5.62)	(-3.51)
Unemployment Rate	-0.088***	-0.061***
	(-3.61)	(-3.48)
Subperiods		
Excl. WW II years (1942 - 1955)	-0.091*	-0.074**
	(-1.90)	(-2.29)
First Half	-0.075***	-0.057***
	(-4.16)	(-3.14)
Second Half	0.067	-0.058
	(1.14)	(-0.90)
Excl. recession years	-0.083***	-0.078
	(-2.83)	(-1.63)
Alternate samples		
Including Railroads	-0.083***	-0.054***
	(-2.98)	(-3.04)
HSUS data – all nonfinancial	-0.068***	-0.047**
	(-7.51)	(-2.54)
HSUS data – unregulated	-0.049***	-0.030**
	(-6.85)	(-2.48)
HSUS data – regulated	-0.123***	-0.079***
	(-5.24)	(-3.80)

Table 3

Aggregate Debt and Equity Issuance Regressions: Government Debt

The sample includes all firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. Financial firms, utilities and railroads are excluded. The dependent variable in columns 1 - 3 (4 - 6) is the aggregate debt (equity) issuances scaled by lagged aggregate book assets. The dependent variable in columns 7 - 9 is aggregate debt issuance scaled by total investment for those firms with positive investment. Investment is defined as the change in the sum of gross long-term assets and inventory. The table presents results of OLS regressions of the issuance variables on aggregate firm characteristics and macroeconomic variables. Newey-West standard errors assuming two 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.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Debt Iss.	Debt Iss.	Debt Iss.	Eq. Iss.	Eq. Iss.	Eq. Iss.	DI/Invest	DI/Invest	DI/Invest
Government Net Debt Iss.	-0.074***	-0.073***	-0.058**	-0.074***	-0.016	-0.033	-0.268**	-0.264*	-0.241*
	(-3.72)	(-3.35)	(-2.27)	(-2.77)	(-0.90)	(-1.60)	(-2.01)	(-1.96)	(-1.70)
Macro vars (level)	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Firm controls (level)	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Macro vars (1st diff)	No	No	Yes	No	No	Yes	No	No	Yes
Firm controls (1st diff)	No	No	Yes	No	No	Yes	No	No	Yes
Observations	91	84	84	85	84	84	91	84	84
R^2	0.067	0.501	0.632	0.118	0.376	0.458	0.024	0.411	0.563

Table 4

Foreign Holdings of Government Debt

The sample includes all firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. Financial firms, utilities and railroads are excluded. The dependent variable is the aggregate corporate debt to book assets ratio in columns 1 - 2, the change in aggregate debt to book assets in columns 3 - 4, and aggregate net debt issuance scaled by lagged aggregate book assets in columns 5 - 7. Newey-West standard errors assuming two 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.

	Levels		First Differences				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Book Lev	Book Lev	Book Lev	Book Lev	Debt Iss.	Debt Iss.	Debt Iss.
Government Leverage	-0.075**	-0.190***	-0.042	-0.108***			
	(-2.13)	(-3.75)	(-1.56)	(-3.36)			
Govt Lev x For. Holding	-0.002	0.005*	0.042***	0.019			
	(-0.87)	(1.91)	(2.78)	(1.18)			
Intl Holdings of US Debt / Total Fed Debt (%)	-0.326***	-0.310***	-0.089	-0.025			
	(-3.05)	(-2.89)	(-1.06)	(-0.33)			
Government Net Debt Iss.					-0.160**	-0.255**	-0.075
					(-2.06)	(-2.08)	(-0.52)
Govt Net Debt Iss. x Chng. For. Holding					0.034	0.114***	0.061*
					(1.23)	(2.95)	(1.78)
Chng. For. Holding					-0.523**	-0.413**	0.009
					(-2.25)	(-2.41)	(0.03)
Macro vars (level)	No	Yes	No	Yes	No	Yes	Yes
Firm controls (level)	No	Yes	No	Yes	No	Yes	Yes
Macro vars (1st diff)	No	No	No	No	No	No	Yes
Firm controls (1st diff)	No	No	No	No	No	No	Yes
Trend	Yes	Yes	No	No	Yes	Yes	Yes
Observations	66	66	65	65	65	65	65
R^2	0.869	0.911	0.060	0.911	0.088	0.336	0.459

Table 5

Corporate Leverage and Government Debt: Cross-sectional heterogeneity

The sample includes all firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. Financial firms, utilities and railroads are excluded. The dependent variable is total debt divided by book assets. The table presents results from panel regressions including firm fixed-effects. Standard errors are adjusted for firm-level clustering. Statistical significance at the 1%, 5% and 10% levels are indicated by ***, ** and *, respectively.

Panel A: Debt / Assets

	(1) Large Firms	(2) Small Firms	(3) Old Firms	(4) Young Firms	(5) Low Def prob	(6) High Def prob	(7) Low WW	(8) High WW	(9) Low HP	(10) High HP	(11) Dividend Payers	(12) Non Payers
Full sample period												
Government Leverage	-0.060***	-0.015	-0.070***	-0.015	-0.064***	-0.051***	-0.048***	-0.027*	-0.067***	-0.006	-0.077***	-0.028*
	(-5.04)	(-1.10)	(-6.28)	(-0.85)	(-7.20)	(-3.72)	(-3.94)	(-1.66)	(-5.42)	(-0.41)	(-11.63)	(-1.83)
Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro vars	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45194	41794	54476	24162	47910	43401	39546	36441	44613	39897	81360	94988
Adjusted R^2	0.700	0.580	0.615	0.833	0.715	0.579	0.678	0.598	0.661	0.608	0.664	0.631
First Half												
Government Leverage	-0.035***	-0.009	-0.055***	0.002	-0.041***	-0.031**	-0.044***	-0.016	-0.038***	-0.020	-0.039***	-0.033
	(-2.79)	(-0.56)	(-4.42)	(0.10)	(-4.05)	(-2.01)	(-2.92)	(-0.77)	(-3.32)	(-1.39)	(-5.72)	(-0.77)
Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro vars	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5418	5188	6000	4027	8574	5002	4090	3978	5149	4912	18441	2611
Adjusted R^2	0.702	0.613	0.651	0.708	0.695	0.583	0.723	0.629	0.675	0.698	0.630	0.662

Panel B: Debt Issuance

	(1) Large Firms	(2) Small Firms	(3) Old Firms	(4) Young Firms	(5) Low Def prob	(6) High Def prob	(7) Low WW	(8) High WW	(9) Low HP	(10) High HP	(11) Dividend Payers	(12) Non Payers
Full sample period												
Government Net Debt Iss.	-0.162***	-0.094***	-0.141***	-0.115***	-0.144***	-0.147***	-0.152***	-0.135***	-0.155***	-0.080**	-0.128***	-0.240***
	(-9.38)	(-3.27)	(-8.88)	(-2.76)	(-9.16)	(-4.97)	(-8.14)	(-4.10)	(-9.91)	(-2.49)	(-12.98)	(-6.60)
Macro vars	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45194	41794	54476	24162	47910	43401	39546	36441	44613	39897	81360	94988
Adjusted R^2	0.088	0.135	0.042	0.304	0.222	0.089	0.102	0.086	0.058	0.151	0.115	0.074
First Half												
Government Net Debt Iss.	-0.098***	-0.008	-0.087***	-0.069**	-0.089***	-0.036	-0.076***	-0.011	-0.092***	-0.010	-0.076***	-0.064
	(-5.40)	(-0.25)	(-5.00)	(-2.13)	(-5.75)	(-1.14)	(-3.39)	(-0.30)	(-5.74)	(-0.29)	(-7.06)	(-0.60)
Macro vars	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5418	5188	6000	4027	8574	5002	4090	3978	5149	4912	18441	2611
Adjusted R^2	0.045	0.160	0.045	0.056	0.115	0.075	0.097	0.108	0.069	0.167	0.079	0.059

Panel C: Equity Issuance

	(1) Large Firms	(2) Small Firms	(3) Old Firms	(4) Young Firms	(5) Low Def prob	(6) High Def prob	(7) Low WW	(8) High WW	(9) Low HP	(10) High HP	(11) Dividend Payers	(12) Non Payers
Full sample period												
Government Net Debt Iss.	-0.011	0.118***	0.025*	-0.047	-0.023*	-0.006	-0.015	0.053	0.003	0.126***	0.014*	-0.081
	(-0.76)	(3.14)	(1.71)	(-1.02)	(-1.71)	(-0.14)	(-1.03)	(1.23)	(0.26)	(3.03)	(1.90)	(-1.56)
Macro vars	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	44604	40176	53700	23489	47164	42128	39073	35213	44087	38333	80399	92227
Adjusted R^2	0.159	0.365	0.216	0.437	0.469	0.287	0.194	0.339	0.117	0.349	0.224	0.276
First Half												
Government Net Debt Iss.	-0.005	-0.004	-0.004	-0.037*	-0.018	-0.010	-0.008	0.000	-0.001	-0.026	-0.004	-0.008
	(-0.49)	(-0.18)	(-0.40)	(-1.71)	(-1.57)	(-0.41)	(-0.71)	(0.01)	(-0.15)	(-1.36)	(-0.54)	(-0.06)
Macro vars	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5387	5107	5949	4004	8517	4929	4080	3931	5129	4849	18306	2566
Adjusted R^2	0.066	0.187	0.082	0.121	0.064	0.021	0.103	0.091	0.075	0.145	0.082	0.121

Table 6

Aggregate Leverage Regressions: Tax incentives

The sample includes all firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. Financial firms, utilities and railroads are excluded. The table presents results of OLS regressions of aggregate corporate leverage on aggregate firm characteristics and macroeconomic variables. Firm characteristics include return on assets, the ratio of intangible to total assets, and the ratio of market to book value assets. Macroeconomic variables include the real rate on AAA corporate debt, the BBB - AAA yield spread, inflation, real GDP growth, and the value-weighted market return. *Long-run tax effect* represents the sum of the first 8 lags of the corporate tax rate or tax incentive variable. See the appendix for all variable definitions. The dependent variable in Panel A is the aggregate ratio of total debt to total assets, and in Panel B is the aggregate ratio of debt to the sum of debt and preferred stock. The regressions are run in both levels and first differences. Newey-West standard errors assuming two 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: Debt / Assets

	Levels				First Differences		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Corp. Tax Rate	0.237***	-0.052	-0.051		-0.008	-0.036	
	(4.65)	(-0.85)	(-0.51)		(-0.16)	(-0.58)	
Net Tax Incentive				-0.079			0.027
				(-1.04)			(0.83)
Long-run tax effect			0.050	-0.047		0.081	0.032
			0.587	-0.459		0.793	0.283
Government Leverage	-0.175***	-0.091***	-0.055**	-0.095***	-0.064***	-0.064***	-0.067***
	(-6.37)	(-3.74)	(-2.31)	(-4.39)	(-3.35)	(-3.27)	(-3.03)
Macro vars	No	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Trend	No	Yes	Yes	Yes	No	No	No
Observations	91	85	83	83	84	82	82

Panel B: Debt / (Debt + Preferred)

	Levels				First Differences		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Corp. Tax Rate	1.012***	0.300***	0.077		0.111	0.005	
	(9.65)	(3.40)	(1.10)		(1.21)	(0.06)	
Net Tax Incentive				0.147			0.101
				(1.48)			(1.29)
Long-run tax effect			0.580***	0.532***		0.551***	0.594***
			7.426	3.555		5.377	3.302
Government Leverage	-0.343***	-0.221***	-0.171***	-0.154***	-0.164***	-0.177***	-0.145***
	(-4.34)	(-6.89)	(-7.98)	(-4.56)	(-3.76)	(-4.85)	(-4.14)
Macro vars	No	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Trend	No	Yes	Yes	Yes	No	No	No
Observations	91	85	83	83	84	82	82

Table 7

Aggregate Debt and Equity Issuance Regressions: Tax Incentives

The sample includes all firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. Financial firms, utilities and railroads are excluded. The dependent variable in columns 1 - 3 (4 - 6) is the aggregate debt (equity) issuances scaled by lagged aggregate book assets. The dependent variable in columns 7 - 9 is aggregate debt issuance scaled by total investment for those firms with positive investment. The table presents results of OLS regressions of the issuance variables on the same aggregate firm characteristics and macroeconomic variables included in Table 2. *Long-run tax effect* represents the sum of the first 8 lags of the tax incentive variable. Newey-West standard errors assuming two 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.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Debt Iss.	Debt Iss.	Debt Iss.	Eq. Iss.	Eq. Iss.	Eq. Iss.	DI/Invest	DI/Invest	DI/Invest
Net Tax Incentive	0.077***	0.004	-0.034	-0.014	-0.094*	0.083*	0.387***	0.103	0.204
	(4.67)	(0.11)	(-0.35)	(-0.65)	(-1.90)	(1.68)	(3.04)	(0.52)	(0.33)
Long-run tax effect			0.041			-0.120***			0.234
			1.094			-2.890			1.119
Government Net Debt Iss.	-0.068***	-0.057*	-0.046	-0.076***	0.021	-0.000	-0.251**	-0.304*	-0.201
	(-4.38)	(-1.96)	(-1.37)	(-2.71)	(0.72)	(-0.01)	(-2.27)	(-1.77)	(-1.05)
Macro vars (level)	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Firm controls (level)	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Macro vars (1st diff)	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Firm controls (1st diff)	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	90	84	82	85	84	82	90	84	82

Table 8

Aggregate Leverage Regressions: Expected Distress Costs

The sample includes all firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. Financial firms, utilities and railroads are excluded. The table presents results of OLS regressions of aggregate corporate book leverage on aggregate firm characteristics and macroeconomic variables. The regressions are run in both levels (Panel A) and first differences (Panel B). Newey-West standard errors assuming two 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: Levels

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GDP growth vol.			Mkt Risk Premium			Earnings vol.		
Volatility	-0.079***	-0.050***	0.004	-0.181**	-0.107	0.018	-2.897***	-1.945**	-0.951
	(-4.52)	(-2.91)	(0.19)	(-2.29)	(-1.20)	(0.24)	(-3.42)	(-2.34)	(-1.32)
Government Leverage			-0.095***			-0.093***			-0.075***
			(-2.88)			(-3.69)			(-2.97)
Corp. Tax Rate			-0.052			-0.049			-0.041
			(-0.88)			(-0.81)			(-0.65)
Macro vars	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Firm controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	85	85	85	85	85	85	91	85	85
Adjusted R^2	0.821	0.927	0.938	0.785	0.918	0.938	0.804	0.929	0.941

Panel B: First Differences

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GDP growth vol.			Mkt Risk Premium			Earnings vol.		
Volatility	-0.007	-0.004	0.006	0.033	-0.009	-0.017	-0.287	0.454	0.538
	(-1.18)	(-0.58)	(0.77)	(1.52)	(-0.29)	(-0.56)	(-0.40)	(0.64)	(0.90)
Government Leverage			-0.070***			-0.067***			-0.067***
			(-3.37)			(-3.42)			(-3.48)
Corp. Tax Rate			-0.013			-0.006			-0.011
			(-0.26)			(-0.12)			(-0.22)
Macro vars	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Firm controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	84	84	84	84	84	84	90	84	84
Adjusted R^2	0.006	0.276	0.358	0.016	0.275	0.357	0.003	0.279	0.362

Table 9

Aggregate Leverage Regressions: Financial Market Development

The sample includes all firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. Financial firms, utilities and railroads are excluded. The table presents results of OLS regressions of aggregate corporate book leverage on aggregate firm characteristics and macroeconomic variables. The regressions are run in both levels and first differences. In Panel A, *Interm. Share Debt (Equity)* is the proportion of corporate bonds (equities) outstanding held through financial intermediaries. In Panel B, *Income share of finance* and *Output of Finance* are the variables e_finshv_ndnf and fin_bus from Phillipon (2012), respectively. Newey-West standard errors assuming two 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: Intermediary Holdings of Debt and Equity

	Levels			First Differences	
	(1)	(2)	(3)	(4)	(5)
	Book Lev	Book Lev	Book Lev	Book Lev	Book Lev
Interm. Share Debt	0.057***	-0.000	0.050	-0.054	0.008
	(2.68)	(-0.00)	(1.18)	(-1.22)	(0.14)
Interm. Share Equity	0.279***	0.044	-0.376**	-0.010	-0.009
	(6.18)	(0.18)	(-2.20)	(-1.16)	(-0.91)
Government Leverage			-0.102***		-0.064***
			(-4.43)		(-3.11)
Corp. Tax Rate			-0.141*		-0.025
			(-1.94)		(-0.42)
Macro vars	No	No	Yes	No	Yes
Firm controls	No	No	Yes	No	Yes
Trend	No	Yes	Yes	No	No
Observations	88	88	84	87	83

Panel B: Size of the Financial Sector

	Levels					
	(1)	(2)	(3)	(4)	(5)	(6)
	Book Lev	Book Lev	Book Lev	Book Lev	Book Lev	Book Lev
Income share of Finance	2.882***	0.183	-2.705**			
	(6.22)	(0.34)	(-2.48)			
Output of Finance				11.840***	3.148*	8.438***
				(3.94)	(1.82)	(2.97)
Government Leverage			-0.111***			-0.054**
			(-4.57)			(-2.44)
Corp. Tax Rate			-0.078			0.031
			(-1.26)			(0.51)
Macro vars	No	No	Yes	No	No	Yes
Firm controls	No	No	Yes	No	No	Yes
Trend	No	Yes	Yes	No	Yes	Yes
Observations	90	90	84	91	91	85

Table 10

Aggregate Debt and Equity Issuance Regressions: Financial Market Development

The sample includes all firms in the CRSP data base that are also covered either in Compustat or the Moody's Industrial Manuals. Financial firms, utilities and railroads are excluded. The dependent variable in columns 1 - 2 (3 - 4) is the aggregate debt (equity) issuances scaled by lagged aggregate book assets and in columns 5 - 6 is the ratio of aggregate debt issuance to aggregate investment for those firms with positive investment. The table presents results of OLS regressions of the issuance variables on aggregate firm characteristics and macroeconomic variables. Newey-West standard errors assuming two 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: Intermediary Holdings of Debt and Equity

	(1)	(2)	(3)	(4)	(5)	(6)
	Debt Iss.	Debt Iss.	Eq. Iss.	Eq. Iss.	DI/Invest	DI/Invest
Interm. Share Debt	0.030***	0.019	-0.003	-0.031	0.110**	0.069
	(3.99)	(0.77)	(-0.28)	(-1.28)	(2.57)	(0.51)
Interm. Share Equity	0.012	0.034	0.004	-0.087	0.103	0.401
	(0.93)	(0.71)	(0.30)	(-1.54)	(1.51)	(1.32)
Government Net Debt Iss.		-0.057		0.033		-0.326
		(-1.46)		(1.04)		(-1.46)
Corp. Tax Rate		-0.040		-0.009		-0.160
		(-0.73)		(-0.23)		(-0.56)
Macro vars	No	Yes	No	Yes	No	Yes
Firm controls	No	Yes	No	Yes	No	Yes
Macro vars (1st diff)	No	Yes	No	Yes	No	Yes
Firm controls (1st diff)	No	Yes	No	Yes	No	Yes
Observations	88	83	84	83	88	83

Panel B: Output of the Financial Sector (bus. credit and equity)

	(1)	(2)	(3)	(4)	(5)	(6)
	Debt Iss.	Debt Iss.	Eq. Iss.	Eq. Iss.	DI/Invest	DI/Invest
Output of Finance	0.858	1.408	1.901**	2.539**	7.228**	6.416
	(1.21)	(1.07)	(2.26)	(2.20)	(2.04)	(0.82)
Government Net Debt Iss.		-0.023		0.027		-0.076
		(-0.82)		(1.10)		(-0.52)
Corp. Tax Rate		0.013		-0.046*		0.113
		(0.50)		(-1.86)		(0.62)
Macro vars	No	Yes	No	Yes	No	Yes
Firm controls	No	Yes	No	Yes	No	Yes
Macro vars (1st diff)	No	Yes	No	Yes	No	Yes
Firm controls (1st diff)	No	Yes	No	Yes	No	Yes
Observations	91	84	85	84	91	84

Panel C: Income Share of the Financial Sector

	(1) Debt Iss.	(2) Debt Iss.	(3) Eq. Iss.	(4) Eq. Iss.	(5) DI/Invest	(6) DI/Invest
Income share of Finance	0.111	-0.274	0.106	1.777**	1.116*	-3.878
	(0.85)	(-0.37)	(0.78)	(2.65)	(1.67)	(-1.10)
Government Net Debt Iss.		-0.038		0.022		-0.170
		(-1.52)		(1.01)		(-1.24)
Corp. Tax Rate		-0.008		-0.074**		0.004
		(-0.29)		(-2.63)		(0.02)
Macro vars	No	Yes	No	Yes	No	Yes
Firm controls	No	Yes	No	Yes	No	Yes
Macro vars (1st diff)	No	Yes	No	Yes	No	Yes
Firm controls (1st diff)	No	Yes	No	Yes	No	Yes
Observations	90	83	84	83	90	83

Figure A.1

Comparing Aggregate Leverage Series: HSUS vs. Flow of Funds, all non-financial sectors

The solid line is the aggregate ratio of long-term debt to assets for the non-financial corporate sector from US Flow of Funds data. The dashed line is aggregate long-term debt to assets from the *Historical Statistics of the United States* (*HSUS*).

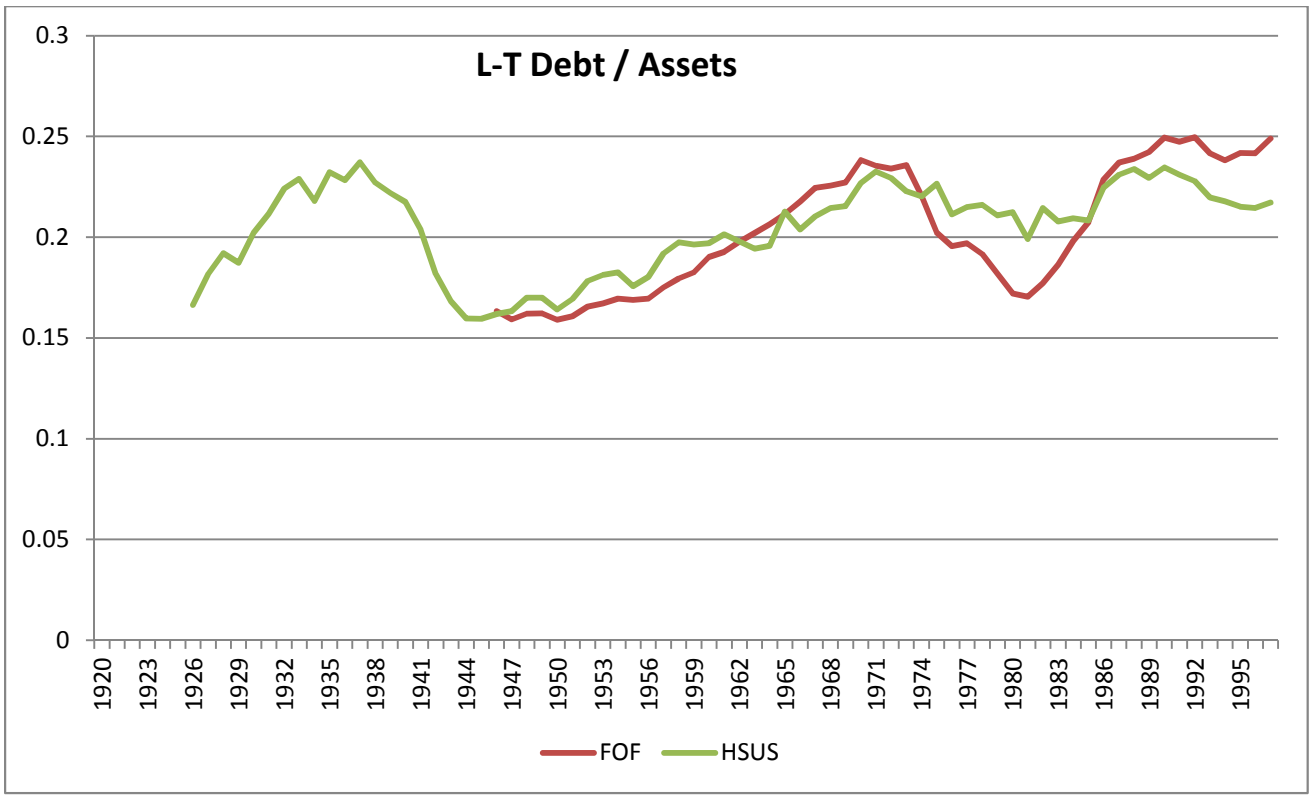


Figure A.2
HSUS vs. Moody's/Compustat by industry

In each panel, the solid line is the aggregate ratio of long-term debt to assets for each industry sector from our combined Moody's / Compustat sample. The dashed line is aggregate long-term debt to assets for the same industry from the *Historical Statistics of the United States* (*HSUS*).

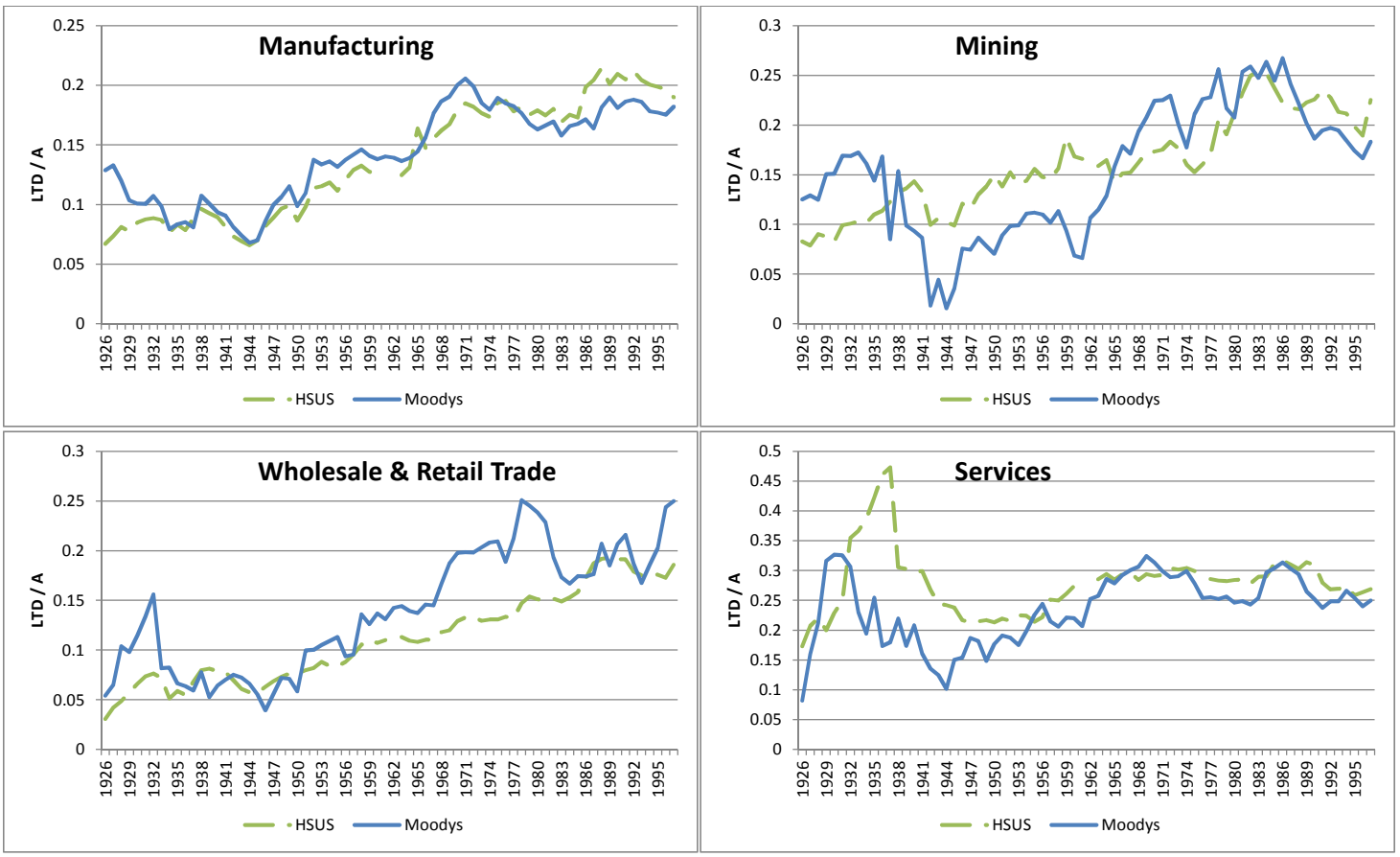


Figure A.3
Aggregate Leverage: Regulated and Unregulated Sectors

The long-dash line shows the time series of aggregate long-term debt to capital from *Historical Statistics of the United States* data for SIC codes 4000-4999 (utilities, transportation, and telecommunications). The short-dash and solid lines show aggregate leverage for all other non-financial industries from, respectively, *HSUS* and our combined Moody's / Compustat sample.

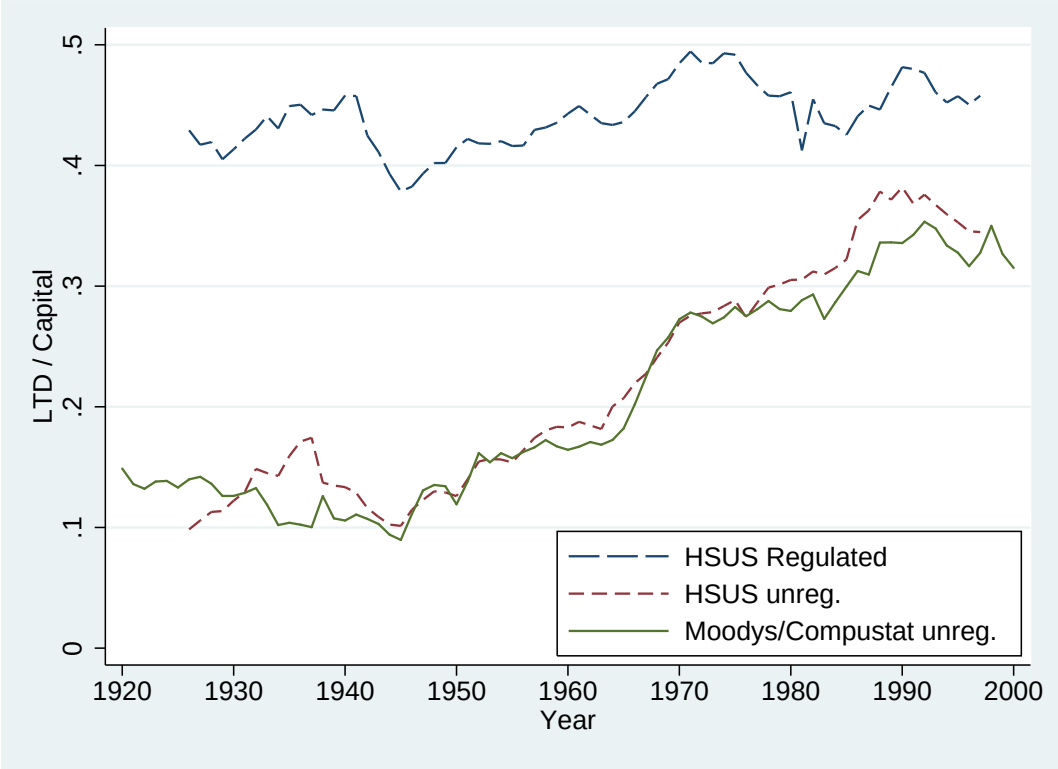


Figure A.4
Government Leverage

The figure presents a stacked area chart of government debt at the federal, state, and local levels. We normalize these levels by GDP.