Leverage Risk and Investment: The Case of Gold Clauses in the 1930s *

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Abstract

We study the role of the 1933 gold clause abrogation in the slow recovery of corporate investment from the Great Depression. The risk of reinstated gold clauses exposed large firms with outstanding corporate bonds to a 69% increase in payments to bondholders. We show that firms with higher exposure to this risk exhibit larger reduction in investment in 1933 and 1934. For these firms, investment recovered following the 1935 Supreme Court decision that eliminated the risk of higher debt payments by upholding the abrogation of gold clauses. In the cross-section of firms, the decrease in investment in 1933 and 1934 coincides with an increase in equity payouts. Taken together, our results show that the risk of higher financial leverage decreases demand for investment. This channel complements existing explanations of the slow recovery based on bank credit supply which large firms did not rely on.

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1 Introduction

The Great Depression was the longest and deepest economic downturn in the 20th century. The recession and its aftermath comprises several economic events of enormous relevance to monetary and financial economics. Bernanke (1983) argues that problems in the banking sector causing disruptions in credit supply constitute a major driver of the slow speed of the recovery in the 1930s. The credit supply channel provides an explanation for the slow recovery of corporate investment and complements the argument by Friedman and Schwartz (1963) who put forward the limited money supply argument as the driver of the contraction itself. However, as shown in the upper panel of Figure 1, the recovery in investment is not any faster for large corporations with publicly traded equity although they did not rely on banks as a primary source of financing.[1] As a result, a full understanding and a correct interpretation of the slow recovery from the Great Depression require an explanation for the delay in the recovery of large corporations' investment.

We propose the uncertainty surrounding the 1933 abrogation of gold clauses as an explanation for the protracted slump in investment by large firms in 1933 and 1934.[2] Prior to 1933, it was common practice for corporate bond issuers to index coupon and principal payments to the price of gold. These contractual agreements were known as "gold clauses". In June 1933, Congress passed a joint resolution that voided all gold clauses in private and public contracts, including corporate bonds. At the same time, the United States was effectively off the gold standard devaluing dollar against foreign currencies in financial markets, and the President was empowered to change the nominal price of gold which he raised from \$20.67 to \$35.00 per ounce in the beginning of 1934. As a result of voiding gold clauses, corporate bond holders were forced to forgo coupon and principal payments that are higher by 69% as the gold clauses in their bond contracts would imply. Some bond holders did not accept the alteration of bond contracts silently, and took the cases to Federal Courts starting immediately after the abandonment of gold clauses in 1933. In February 1935, the

[1] In 1933, bank loans are, on average, only one percent of total liabilities for public firms in our sample. Furthermore, Kimmel (1939) provides survey evidence that the probability of bank credit refusal is 14.3 - 30.2 percent for small firms while it is 3.2 percent for large firms in 1932.

[2] See Section 2 for a detailed description of relevant events for our study.

Supreme Court decided to uphold the abrogation of gold clauses with a 5-4 vote. This decision ended the uncertainty regarding the reinstatement of gold clauses, preventing an increase of up to 69% in the debt burden of corporate bond issuers.

The lower panel of Figure 1 illustrates that the slump in public firm investments is driven by firms that have outstanding bonds with gold clauses in 1933. In this paper, we exploit the cross-sectional heterogeneity of public firms in the exposure to the risk of reinstated gold clauses, hereafter leverage risk. Firms differ in the fraction of outstanding debt that carried a gold clause, and we use this dispersion to study the causal impact of leverage risk on investment. Specifically, we collect annual data on balance sheets and corporate bond characteristics from 1930 to 1936 for public firms in the United States. Leverage risk prevails in 1933 and 1934, and firms are subject to the risk of an increase in debt burden to the extent that their liabilities include bonds that have gold clauses. We use the unexpected emergence of leverage risk as a natural experiment and employ a differences-in-differences (DiD) approach using years 1931 and 1932 as the pre-treatment period, and 1933 and 1934 as the post-treatment period. In our baseline specification, we find that a firm with all of its liabilities featuring the gold clause exhibits a 5 percentage point lower increase in annual net investment rate from 1931 - 1932 to 1933 - 1934 compared to a firm with no gold clauses in debt contracts. We argue that leverage risk causes this differential path for investment between firms that have different exposure to the risk of reinstated gold clauses. We also utilize a major advantage of the empirical setup, namely, that leverage risk in 1933 and 1934 is subsequently eliminated in 1935 by the Supreme Court decision. To test the impact of leverage risk relief, we use 1933 and 1934 as the pre-treatment, and 1935 and 1936 as the post-treatment periods and find a complete reversal of the leverage risk effect on investment upon the Supreme Court decision in 1935.

To establish the causal effect of leverage risk on investment, we provide several pieces of evidence that the fraction of debt with a gold clause proxies for exposure to leverage risk. That is, it does not coincide with exposures to other contemporaneous events or other determinants of the firms' investment path. The reversal of the investment effect in 1935 and 1936 upon the elimination of leverage risk lends strong support to our assumption that our treatment variable does not measure exposure to other macroeconomic events and that the divergence of investment between high and low leverage risk firms in 1933 and 1934 is driven by the emergence of leverage risk in 1933. To alleviate concerns about random assignment, namely, that our results may be driven by other determinants of investment that low and high leverage risk firms differ in, we show that controlling for a battery of firm characteristics interacted with time does not affect our main result. Furthermore, we do not obtain significant results on investment when we replace our leverage risk variable by bank debt. This confirms that the credit intermediation channel, that is emphasized by Bernanke (1983), Hamilton (1987) and Calomiris and Mason (2003) and that applies to small firms, does not drive the investment behavior of large, public firms. To ensure that leverage risk does not proxy for exposure to major changes in fiscal policy (New Deal policies) that likely have differential effects on industries, we show that our results are robust to the addition of the industry-year fixed effects. Finally, leverage risk heterogeneity does not lead to dispersion in profitability as opposed to investment which suggests that our results are not driven by differences in the demand for firms' output, e.g. due to farmers' demand for durable goods documented in Hausman, Rhode, and Wieland (2017).

What is the economic mechanism behind the relation between leverage risk and investment? A possibility is the credit supply channel: the heightened default risk may result in unwillingness by lenders leading to binding financial constraints and lower investment. Our results do not support this channel due to two observations. First, firms facing leverage risk hold substantial amounts of cash and liquid assets that could, on average, be sufficient to finance the observed investment gap for three years. This is consistent with Bernanke (1983)'s argument that even "cash-rich corporations" were reluctant to expand production in this period, which remains to be explained after accounting for the disruption in credit intermediation. Second, firms facing high leverage risk increase equity payouts which contradicts the financial constraints explanation for their reluctance to invest in productive capital. The equity payout behavior lends support to explanations based on lower firm demand to invest despite availability of resources. In particular, our results are consistent both with the lower cash flow and higher discount rate effect of higher default risk on the valuation of investment opportunities in the presence of bankruptcy costs, and Myers (1977)'s debt overhang. Myers (1977) argues that equity holders optimally delay investment in the presence of risky long-term debt to avoid that cash flows generated by new capital accrue to creditors. Equity holders that face higher default risk in the presence of multi-period debt are also incentivized to exploit remaining resources of the firm instead of investing in long-lived assets. Consistently, we find that the positive impact of leverage risk on equity payouts is stronger for firms with low credit ratings. Finally, to the extent financial leverage matters for investment decisions resulting from violations of Modigliani-Miller irrelevance theorem, higher leverage risk translates into higher fundamental uncertainty. As a result, optimal delays in execution of investment options amplifies the negative impact of leverage risk on investment (Dixit and Pindyck (1994), Bloom (2009)). In sum, our results suggest that leverage risk gives rise to a unique type of debt overhang problem that lowers equity holders' incentive to invest and to increase payouts instead.

We use our results from the cross-section of public firms to conduct a partial equilibrium aggregation exercise. The leverage risk channel driven by the abrogation of gold clauses explains about one-third of the decline in fixed capital investment of public firms in 1933 and 1934. Furthermore, the elimination of leverage risk cut the amount of divestment in half in 1935 and is responsible for the end of divestment in 1936. As a result, our work suggests that leverage risk is a contributor to the slow recovery of investment from the Great Depression for large, public firms. The risk of gold clause reinstatement led to lower investment in 1933 and 1934, delaying the recovery to the period after the 1935 Supreme Court decision.

Beyond providing a more complete understanding of macroeconomic dynamics in the aftermath of the Great Depression, our results shed light on the role of leverage and leverage risk in recessions. We show that leverage risk by itself can be the driver of a slowdown in investment for large firms that are less affected by credit intermediation disruptions emphasized by Bernanke and Gertler (1995) and Kiyotaki and Moore (1997). Firms may face leverage risk due to different reasons. For instance, exchange rate fluctuations induce uncertainty about the real value of foreign currency denominated debt, and uncertainty about future inflation along with nominal corporate debt resembles leverage risk as it also gives rise to the risk of a higher debt burden for the private sector. Our results suggest that elimination of such risks is crucial for dampening the real effects of recessions beyond efforts to maintain financial intermediaries' lending ability.

Our paper is related to several strands of literature. The Great Recession in the last decade renewed interest in the macroeconomic role of firm financing in recessions in the empirical literature. Chodorow-Reich (2013) studies the role of bank lending disruptions on employment in the aftermath of the Great Recession. This study emphasizes the importance of the credit intermediation channel for the Great Recession that Bernanke (1983) proposes to explain the slow recovery from the Great Depression. Benmelech, Frydman, and Papanikolaou (2017) provide an explanation of the decline in employment from 1928 to 1933 based on restricted credit supply on bond markets from 1930 to 1934. Our work presents a new driver of the slow recovery that is not related to financing constraints imposed by the financial sector or the debt market, but is driven by the investment demand by firms facing leverage risk.

The theory of debt overhang starting with Myers (1977) provides an explanation for the relation between leverage risk and investment. Hennessy (2004) builds a model that suggests an empirical proxy for marginal Q that takes debt overhang into account and finds a significant debt overhang effect, especially in form of lower investment in long-lived assets consistent with our results on fixed capital. Diamond and He (2014) investigate the impact of debt maturity on debt overhang. DeMarzo, Fishman, He, and Wang (2012) study the interaction of financing constraints and Tobin's Q in a setting with incentive contracting. Lamont (1995) provides a mechanism that amplifies the impact of debt overhang in periods of economic distress, such as the Great Depression. Bhamra, Fisher, and Kuehn (2011) and Gomes, Jermann, and Schmid (2016) highlight the impact of deflation on the debt burden of firms in the presence of nominal long-term debt and show that debt overhang can produce sizable macroeconomic effects. The risk of deflation along with nominal debt is equivalent to leverage risk, namely the risk of an increase in real debt burden. Exogenous variation in the cross-section of leverage risk allows us to quantify the importance of the leverage risk channel at the firm level and for the macroeconomy.

Our work contributes to a rich empirical literature on debt overhang but in a setup that has the advantage of wide economic coverage and clearer causal inference regarding the impact of leverage on investment which is difficult to find in the data due to the endogeneity of financial leverage. Lang, Ofek, and Stulz (1996) find how leverage is negatively associated with future hiring and investment. Giroud, Mueller, Stomper, and Westerkamp (2011) study the debt restructuring of highly leveraged Austrian ski hotels and find evidence that debt relief results in better operating performance and avoidance of strategic defaults. We focus on investment and find no variation in profits that depends on leverage risk. Becker and Strömberg (2012) use a legal change alleviating equity-debt holder conflicts and find a decrease in the consequences of debt overhang that are broadly consistent with Myers (1977). Finally, Hennessy, Levy, and Whited (2007) use a version of Q-theory with financing frictions to show how debt overhang discourages corporate investment consistent with our results.

The abrogation of gold clauses in sovereign debt contracts is also a *de facto* default of the US government (Edwards (2018)). Edwards, Longstaff, and Marin (2015) study the effects of the abrogation of gold clauses on government's cost of capital and the Treasury's ability to issue new debt. Using sovereign bonds with and without gold clauses, the authors find a significant positive probability that the Courts would rule that the abrogation is unconstitutional. This finding provides an important external validation of our empirical setup on the financial market's perception of the uncertainty during the 1933 - 1934 period. Kroszner (1999) examine asset prices responses to the Supreme Court's decision to uphold the abrogation of gold clauses, and finds that the effective debt relief leads to a rise in equity and corporate bond prices. Finally, motivated by the dollar devaluation in 1933, Bolton and Rosenthal (2002) build a model to study political interventions in private debt contracts.

The outline of our article is as follows. Section 2 discusses relevant historical events to our study in the 1930s. Section 3 describes the firm-level data used in our analysis. Section 4 presents results on the relation between leverage risk and investment. Section 5 inspects the mechanism by studying the impact of leverage on equity payouts. Section 6 presents results for a partial equilibrium aggregation exercise and discusses implications for the slow recovery from the Great Depression. Section 7 concludes.

2 Historical background

This section provides a brief summary of the historical events relevant to our study.[3] The severely distressed US economy naturally dominated the discussions during the Presidential campaign of 1932. A major promise of the eventual winner, Franklin D. Roosevelt, particularly popular among farmers, was to raise commodity prices, which had consistently fallen throughout the Great Depression. There was however no public discussion regarding how this could be achieved. Although some in academic circles and in Congress proposed abandoning the Gold Standard, incumbent president Herbert Hoover strongly opposed the idea, and Roosevelt himself emphasized he also favored "sound money" policies.

However, the period between Roosevelt's election victory in November 1932 to his inauguration in March 1933 was dominated by a severe banking crisis, and policies regarding gold standard became prevalent in the public discussion. On April 5, 1933, President Roosevelt issued an executive order forbidding private gold ownership and requiring all individuals and businesses to return their gold holdings to the Federal Reserve by May 1, 1933 at the gold standard price of $20.67 per ounce. By April 19, 1933, the US was effectively off the gold standard. Although official gold prices did not changed immediately, the ban on the use of gold caused an immediate devaluation of the US dollar against foreign currencies markets (Edwards, Longstaff, and Marin (2015)).[4] On May 12, 1933, the US Congress passed the Thomas Amendment authorizing the president to raise the nominal price of gold up to $41.34 per ounce.

In early 1933, most US corporate bonds, mortgages, and even some treasuries had an attached gold clause that allowed creditors to receive payments in the "gold-equivalent" of their receivables.

[3]Edwards (2018) offers an excellent discussion of the events surrounding abandonment of gold clauses in 1933 in public and private contracts.

[4]See Figure 2 for the time series of gold prices and exchange rates.

According to the administration's estimates, \$120 billion of debt (about two times the value of GDP), of which about \$100 billion was private, were linked to the value of gold in 1933 (Edwards, Longstaff, and Marin (2015)).

On June 5, Congress passed a joint resolution that voided all gold clauses in both public and private contracts, prohibiting the indexation of coupon and principal payments to the price of gold. More importantly it made these actions effective retroactively for all *outstanding* obligations. From August 1933, the government steadily increased the price for newly minted gold until it reached \$34.06 per ounce in December 1933. This increase was accompanied by a steady devaluation of US dollar in currency markets. Finally, on January 30, 1934, the Roosevelt administration fixed the price of gold at \$35 per troy ounce, a 69% increase since July 1933.

These actions triggered a series of court cases that introduced substantial juristic uncertainty about how gold clauses in public and private contracts would be handled. Several lawsuits were filed by creditors advocating their right to receive indexed coupons and principal as early as May 1933. The face value of an outstanding (gold claused) bond issue in the amount of \$100 could jump to \$169 if abrogation of gold clauses was overturned in court. As inflation remained relatively low in 1934 (1.5%) and 1935 (3%) this increase in real leverage would be a substantial burden for most private corporations. We call this phenomenon that prevailed in 1933 and 1934 "leverage risk".

Four lawsuits, two of them on private debt, known as the Gold Clause cases, eventually made it to the United States Supreme Court.[5] The Supreme Court heard the cases from January 8 to January 11, 1935 and judgement was announced on February 17, 1935. By a narrow 5 - 4 vote, that reflected the perceived uncertainty during this period, the Court upheld the abrogation of gold clauses with the reasoning that Congress has the power to regulate monetary policy. The likelihood of a reinstatement was so high that the Roosevelt administration even drafted executive orders to close the stock exchanges if the Supreme Court ruled against abrogation. Edwards, Longstaff, and Marin (2015) use data on exchange rates and sovereign bond yields to show that markets attached a significant probability of a decision against abrogation of gold clauses. For

[5] The so called "Gold Clause" cases, are Norman v. Baltimore & Ohio Railroad Co., United States v. Bankers Trust Co., Nortz v. United States, Perry v. United States.

corporations with gold clause contracts, the Supreme Court decision in 1935 was virtually final and essentially eliminated all risk of seeing these clauses upheld until 1977 (McCulloch (1980)).

3 Data

We hand-collect annual balance sheet and income statement data from the Moody's Industrial Manuals covering the period from 1930 to 1936. Our sample consists of public firms with available data from the Center for Research in Securities Prices (CRSP). We do not include financial firms and railroads, classified by Graham, Leary, and Roberts (2015) as "regulated industries".

Our primary variable of interest is *net investment*, defined as the annual growth of the firm's fixed capital stock. We use the book value of property, plant, and equipment in the balance sheet for year t as our measure of the stock of fixed capital at the end of that year.[6]

Importantly, the Moody's Industrial Manuals also contain detailed information on individual bond characteristics, including data on par value outstanding and information on the presence of gold clauses. In our baseline analysis, we define the variable $d_i \geq 0$ as the fraction of a firm i's total liabilities that contains gold clauses in 1933, and use this variable as the measure of exposure to leverage risk:

$$d_i = \frac{\text{Total amount outstanding of bonds with gold clause in 1933}}{\text{Total liabilities in 1933}} \tag{1}$$

This variable thus captures the debt composition of firm i. Importantly, variation in d_i is not mechanically related to variation in overall financial leverage which is a highly endogenous quantity.

Table 1 provides summary statistics of firm-year observations in our sample for three two-year periods. We trim observations at the upper and lower one-percentile of net investment every year. To be included in the 1931 - 1932 or 1935 - 1936 samples, a firm is required to have at least one observation in the 1933 - 1934 period. As a result of this procedure, our sample includes 464 firms in 1931 and 1932, 503 firms in 1933 and 1934, and 483 firms in 1935 and 1936.

[6] Appendix A provides the details on all our variable definitions.

In our sample period, aggregate net investment in the United States is negative, reflected in the negative average net investment rates in all three periods. In the 1931 - 1932 period, 26% of firm-year observations correspond to firms that have a positive amount of bonds with a gold clause outstanding in 1933. The resulting average cross sectional level of d_i is 11%. These numbers remain stable over time at 32% and 13%, respectively, in 1933 and 1934, and 30% and 13%, respectively, in 1935 and 1936.

Figure 3 shows the potentially severe consequences of a gold clause reinstatement in 1935. It plots the book leverage for each firm in 1933 against its hypothetical level if gold clauses were deemed valid by the Supreme Court. As we can see, many firms would have experienced a substantial increase in leverage (as high as 40 percentage points). More importantly for our purposes, there is also great heterogeneity in how much firms would be affected by this possible shock. It is this heterogeneity in exposures that we exploit in our empirical analysis.

4 The impact of leverage risk on investment

4.1 Identification

Our ultimate goal is to uncover the causal impact of these risks on firm investment. Consider two firms that are identical in all attributes that are relevant for investment. We hypothesize that, if one of these firms exposure to these risks increases, it will more likely reduce investment in productive capital. Likewise, the same firm will find it optimal to increase investment once the leverage risk disappears.

In our empirical setup, the identifying assumption is that firms with different leverage risk in 1933 were not different in dimensions that would affect the path of investment from 1931 - 1932 to 1933 - 1934. This implies that the path of investment for $d_i > 0$ firms would have looked identical to that of $d_i = 0$ firms controlling for other determinants of investment.

Table 2 reports average statistics for subsamples facing either zero ($d_i = 0$) or a positive amount ($d_i > 0$) of leverage risk. Panel A shows that there are some differences in the sample averages of these two groups before treatment. Firms with $d_i > 0$ have higher financial leverage, are larger, have a higher fraction of fixed capital in assets, a lower fraction of cash in assets. As shown in Table 3, this results in non-zero correlations between d_i and firm characteristics. With a few notable exceptions, the correlation of d_i with most of these characteristics has the same sign both in the entire sample and within the $d_i > 0$ subsample. However, correlations of d_i with leverage and firm size are positive in the sample that contains all firms, but negative in the $d_i > 0$ subsample.

Systematic differences between $d_i = 0$ and $d_i > 0$ firms might well be driven by the nature of investment opportunities. Lower market-to-book ratios, higher financial leverage, and the high share of long-lived fixed capital of $d_i > 0$ firms suggest that they might be value firms with longer-term projects. Myers (1977) argues that firms delay investment decisions until debt payments are made to avoid that cash flows from new capital accrue to creditors. As a result, firms that have long-term debt are likely to have longer asset duration as the high share of fixed capital suggests. Our identification requires that we control for any differences that may affect the sensitivity of investment to macroeconomic shocks in our sample period. Therefore, the identifying assumptions are satisfied if the relation between investment and leverage risk holds after controlling for these firm characteristics and there are no other unobservable determinants of investments that are related to leverage risk.

Our empirical approach is to use a generalized Differences in Differences (approach for our analysis) DiD methodology. Our baseline specification is given by the following panel regression:

$$\text{Net investment}_{i,t} = \beta_0 + \beta_1 d_i p_t + \sum_j \sum_\tau \beta_{j,\tau} \mathbb{I}_{t=\tau} X_{i,j} + \alpha_i + \delta_t + u_{i,t}, \tag{2}$$

where i indexes firms, t is year, p_t is the post-treatment indicator, $X_{i,j}$ are pre-treatment firm characteristics interacted with year dummies $\mathbb{I}_{t=\tau}$, and α_i represents firm fixed effects (FE).[7]

[7]Firm FE are included to allow for different average net investment rates across firms, for instance due to differences in capital depreciation rates, instead of imposing an identical intercept in (2) for all firms.

4.2 Investment outcomes

4.2.1 Main results

Panel A of Table 4 reports estimates for β_1 in (2) using $p_t = 0$ for 1931 and 1932, and $p_t = 1$ for 1933 and 1934. The change in net investment from 1931 - 1932 to 1933 - 1934 is estimated to be lower by 5 percentage points for a firm with $d_i = 0$ compared to a firm with $d_i < 0$. This result is statistically significant, and holds controlling for a number of characteristics (size, book leverage, market leverage, cash/assets, profitability, fixed capital/assets) interacted with year dummies that control for possible non-random assignment and differential trends based on these characteristics.

Thus, it appears that the emergence of leverage risk in 1933 led to a sizable downward divergence of the investment path for firms with leverage risk exposure in 1933 and 1934 consistent with the visual divergence in the lower panel of Figure 1.

An especially attractive feature of this episode is the ability to also assess the impact of treatment reversal. Leverage risk arises in 1933 from the abrogation of gold clauses and dollar devaluation. However, the Supreme Court decision in 1935 upholding abrogation removes this risk. Panel B of Table 4 examines the impact of this shock by reestimating (2) but using $p_t = 0$ for 1933 and 1934, and $p_t = 1$ for 1935 and 1936. The change in the net investment from 1933 - 1934 to 1935 - 1936 is estimated to be an increase of 5 percentage points for a firm with $d_i > 0$ compared to a firm with $d_i = 1$. This strong reversal is very strong evidence that the lower investment rates by $d_i > 0$ firms during the earlier period were indeed driven by their risk exposure during 1933 and 1934. It is difficult to provide an alternative explanations that would explain both the initially strong association between d_i and the path of investment rates from 1931 - 1932 to 1933 - 1934, and the recovery from 1933 - 1934 to 1935 - 1936. Adding controls to the panel regression strengthens the estimated positive investment effect of the relief from leverage risk by 3 percentage points, while also increasing statistical significance.

4.2.2 Robustness of identification

The robustness of our results to the inclusion of controls suggests that the difference in the investment path of $d = 0$ and $d > 0$ firms is driven by leverage risk. In the following, we challenge the identification assumptions of our baseline result in a number of ways.[8]

To enhance the evidence that our results are not driven by other characteristics, we construct deciles for firm characteristics (asset size, market-to-book ratio, book leverage, market leverage, profitability, cash/assets, fixed capital/assets) and control for their interaction with year. This specification captures the time-dependent and non-linear relation between investment and firm characteristics. For instance, it allows for the comparison of two firms that are in the same leverage decile, and controls for changes in the sensitivity of investment to financial leverage. Figure 4 shows that there is substantial variation in d within leverage deciles which facilitates this comparison. Results in Table 5 show that the impact of leverage risk on investment is robust to these extensive controls. In sum, despite differences in pre-treatment characteristics, the exposure to leverage risk satisfies random assignment based on observable firm characteristics.

We also investigate whether firms in the $d = 0$ and $d > 0$ samples are following parallel trends before treatment. Parallel trends lend support to the identifying assumption that, absent leverage risk, the change in investment for $d > 0$ firms from 1931 - 1932 to 1933 - 1934 would not have been different than the change for $d = 0$ firms. Panel A of Table 6 presents statistical evidence on the difference of changes in characteristics from 1931 to 1932. For none of the twelve firm characteristics, we can reject the change is significantly different between $d = 0$ and $d > 0$ firms lending support to the random assignment assumption. Panel B of Table 6 reports results for changes from 1933 and 1934, and the difference in changes is not statistically significant for eleven characteristics with the exception of market-to-book ratio only. And the increase in the market value of equity for $d = 0$ suggests that these firms benefit from the recovery from 1933 to 1934 while firms facing leverage risk do not. Parallel trends from 1933 to 1934 supports the validity of our test that uses the elimination of leverage risk as a natural experiment.

[8] Appendix B presents several robustness checks for our results beyond what is presented in this section.

Another difference between the $d = 0$ and $d > 0$ firms is the duration of their liabilities in our sample. Most corporate bonds have long maturities, with an average of 10.5 years.[9] Furthermore, most bonds have gold clauses: the share of bonds with no gold clauses in our sample is only 3%. Our sample period arguably includes significant shocks to inflation expectations which affect short and long-term nominal debt differently and could generate differences in real debt burden.[10] To ensure that our results are not driven by the differential exposure to macroeconomic shocks due to duration of liabilities, we compute the share of preferred shares and bonds with no gold clauses in total liabilities. This ratio represents the share of long-term liabilities that are not exposed to leverage risk. Specification (1) in Table 7 shows that the share of other long-term liabilities does not generate any dispersion in the path of investment upon the emergence of leverage risk in 1933 or its elimination in 1935.

The period that starts with Roosevelt's inauguration in 1933 has witnessed a larger set of economic policy actions. Next, we present evidence that leverage risk is not a proxy for differential exposure to the enactment of these New Deal policies. For instance, the United States banking system collapsed and the Emergency Banking Act, aimed at stabilization, passed upon Roosevelt's inauguration. Another banking-related policy action is the 1933 Banking Act (often referred to as Glass-Steagall) on the regulation of financial intermediation. While these shocks are important to understand the behavior of small firms, large firms did not rely on bank financing as much, and are therefore less likely to be affected by these shocks to financial intermediation (Bernanke (1983)). As shown in Table 1, bank loans are on average only 1% of total liabilities in our sample which is more than ten times smaller than corporate bond financing. Specification (2) in Table 7 shows that, replacing d by the share of bank debt in total liabilities, differences in the reliance on bank debt do not correspond to differences investment patterns. Other influential policy actions by the Roosevelt administration that coincide with leverage risk are Agricultural Adjustment Act of 1933 (AAA) and National Industrial Recovery Act of 1933 (NIRA). While the AAA is an attempt

[9] The average time passed since issuance is 8.93 years.

[10] A positive shock to inflation expectations would actually lower the real debt burden of firms that have outstanding long term nominal debt. This mechanism works against finding evidence for higher real debt burden for high d firms showcasing the strength of the relation between leverage risk and investment that we document.

to boost prices of agricultural products, NIRA started the Public Works Administration, a large program of infrastructure construction across the country. The effects of these policy actions are largely industry-specific. Therefore, we repeat our empirical exercise including industry and year fixed effects to account for the time-varying and industry-specific effects of public policy. As shown in Table 8, both the negative response of investment in 1933 and 1934 as well as the recovery in 1935 and 1936 are unaffected by this additional set of controls. To sum up, the relation between leverage risk and investment is not driven by differential exposure to policy shocks.

5 Inspecting the mechanism

Why does leverage risk lower investment in productive capital? There are two possible channels that may drive this result. The first is that binding financial constraints driven by limited credit supply severely limit high leverage risk firms' ability to invest. Another possibility is that firms actually would be able to invest from a financial perspective, but choose not to spend resources on expanding productive capital.

Bernanke (1983) puts forward the limited credit supply by banks as a major factor that slowed down the recovery from the Great Depression. While this channel is crucial to explain the behavior of smaller firms, Bernanke (1983) acknowledges that "most larger corporations entered the decade with sufficient cash and liquid reserves to finance operations and any desired expansions". Consistently, firms in our sample, that arguably belong to the group of larger corporations, have about 10% of their assets in cash and liquid assets throughout our sample period from 1931 to 1936. This cash amount would have been sufficient to finance the investment gap caused by leverage risk for about three years in case of a firm with $d = 1$. Furthermore, we do not observe a change in cash growth that corresponds to the change in investment rate upon emergence and elimination of leverage risk (Table 9). The fact that public firms in our sample are cash-rich and that cash does not respond to leverage risk are challenging for explanations based on financial constraints. Firms might also be willing to maintain a cash share in assets, and perceive declining profits as a sign of tightening constraints. However, Table 9 shows that the decline in investment does not correspond to a decline in profits.[11] So far, empirical evidence does not support the hypothesis that high leverage risk firms face tighter financial constraints in 1933 and 1934. More convincingly, the decline in investment for high leverage risk firms corresponds to an increase in equity payouts as shown in Panel A Table 10.[12] This increase in equity payouts is reversed upon the elimination of leverage risk along with an increase in investment (Panel B of Table 10). These results suggest that firms facing high leverage risk do not face binding financial constraints and they are equipped with resources to increase benefits to equity holders, and they decide to lower equity payouts and increase investment once leverage risk is eliminated.

Why does high leverage risk result in lower demand for investment despite availability of resources? The equity payout increase is consistent with an attempt to shield resources from future bankruptcy proceedings. The value of investment is low in firms facing higher default risk in the presence of bankruptcy costs, both due to lower expected cash flows and potentially higher discount rates. Furthermore, our results are consistent with high leverage risk corresponding to a severe Myers (1977) debt overhang problem that equity holders optimally delay investment in the presence of risky long-term debt. Future cash flows generated by newly installed capital may accrue to creditors making investment optimal after debt is due. The incentives of equity holders in case of debt overhang depend on the degree of default risk imposed on the firm by leverage risk. If the firm is relatively more likely to alive, then equity holders may find it optimal to stop investment but not to exploit resources in the form of equity payouts. However, if the perceived default risk is high and imminent, then higher equity payouts may become optimal as firm survival is unlikely and firm assets are likely to be obtained by creditors. Specification (2) in Table 10 supports this mechanism by studying the differential effect of leverage risk on investment and equity payouts for firms with low ratings. We find no evidence for a stronger divestment effect

[11] The lack of an association between leverage risk and profits also suggests that the relation between leverage risk and investment is not driven by differences in demand for firms output, e.g. due to farmers' demand for durable goods documented in Hausman, Rhode, and Wieland (2017).

[12] Corporate bond contracts in our sample did not contain covenants that prevented firms from increasing equity payouts.

among low-rating firms. This is likely the case because these firms are not investing at all, and lowering investment further would require selling fixed capital which is unlikely to be profitable in recessions. However, there is no such natural boundary for equity payouts, and we find that firms with low ratings increase equity payouts relatively more as a result of leverage risk (Panel A of Table 10). After the elimination of leverage risk, it is again firms with initial low ratings that lower equity payouts more (Panel B of Table 10).

Leverage risk in our setting is the risk of higher leverage, and therefore, has similar implications to an actual increase in leverage. The debt overhang argument establishes that the presence of multi-period financial leverage has an impact on firm investment decisions. As a result, the relevance of debt overhang for investment also implies that leverage risk is a source of fundamental uncertainty for firms. In general, uncertainty regarding the determinants of firms' asset value such as future productivity or profitability has been shown to impact the value of growth options and investment (Bloom (2009), Dixit and Pindyck (1994)). Leverage risk is a new source of risk that is directly related to the financing side of the firm as opposed to the asset side. Uncertainty about future exogenous changes in capital structure may result in lower investment further amplifying the impact of debt overhang. To summarize, our results suggest that the mechanism behind leverage risk's impact on investment is severe debt overhang combined with higher financing uncertainty.

6 Aggregate implications

We compute the aggregate effect of leverage risk on investment in the aftermath of the Great Depression using our cross-sectional estimates in Section 4.2. First, we ask how total investment in our sample would have behaved, if the Supreme Court declared the abrogation of gold clauses to be constitutional immediately after the Joint Resolution in 1933. In other words, would aggregate investment in our sample be significantly higher in the absence of leverage risk in 1933 and 1934?

For the aggregate exercise, we abstract from general equilibrium effects and assume that firm behavior in the absence of leverage risk in the economy would be identical to what we observe from firms with no exposure to leverage risk ($d = 0$) firms. Under this additional assumption, the rate of aggregate foregone investment due to leverage risk is given by:

$$\text{Leverage risk effect}_t = \frac{\beta_1 \sum_i d_i \text{Fixed capital}_{t-1}}{\sum_i \text{Fixed capital}_{t-1}}, \quad (3)$$

where i indexes firms, β_1 is the impact of leverage risk on investment estimated in (2), d_i is firm i's leverage risk exposure as in (1). Panel A of Table 11 reports that total net investment in our sample in 1933 and 1934 are -2.91% and -2.82%, respectively.[13] Our estimates of the leverage risk effect from (3) for 1933 and 1934 are 1.00 and 0.92 percentage points, respectively. Hence, the results indicate that leverage risk can account for about one-third of net divestment among public firms in 1933 and 1934. The aggregate impact of leverage risk provides an explanation for the stark divergence of investment for $d = 0$ and $d > 0$ firms in 1933 and 1934 as illustrated in Figure 1. As Panel B of Table 11 shows, leverage risk accounts for about half of the divestment among $d > 0$ firms in 1933 and 1934.

What if the Supreme Court declared the abrogation of gold clauses to be unconstitutional in 1935? We estimate the aggregate effect of the Supreme Court decision using the leverage risk effect in (3) where we set β_1 to the estimate in Panel B of Table 4. Table 4 reports that the Supreme Court decision cut divestment in 1935 in more than half, and accounts for almost all of the positive net investment in 1936. Note that these numbers provide only a lower bound to the contribution of the Supreme Court decision in 1935 and 1936. The analysis assumes that $d > 0$ firms would have changed their investment by the same rate as $d = 0$ firms in case of a reinstatement of gold clauses. Such an event, however, would have caused widespread default events and a larger decline in investment than predicted by the behavior of the $d = 0$ firms (Edwards (2018)).

Taken together, our partial equilibrium aggregation exercise suggests that the uncertainty surrounding the abrogation of gold clauses led to a steep decline in investment for public firms, and therefore, likely contributed to the slow speed of the recovery from Great Depression. Together with our finding in Section 4.2 that the leverage risk effect is driven by debt overhang, leverage

[13] Total net investment is given by $\frac{\sum_i \text{Fixed capital}_t}{\sum_i \text{Fixed capital}_{t-1}} - 1$.

risk is an important channel that is crucial to understand the slump in investment for large firms in early 1930s. It caused a delay of investment in fixed capital by two years for a large number of public firms. This channel complements existing explanations based on the disruption of credit intermediation that is more applicable to smaller firms.

7 Conclusion

This paper shows that the 1933 gold clause abrogation plays a significant role in the slow speed of corporate investment recovery from the Great Depression. The risk of reinstated gold clauses in corporate bonds exposed large firms to the possibility of a 69% increase in their liabilities. Firms with higher exposure to this risk reduced investment in 1933 and 1934 explaining one-third of the aggregate decline in investment among public firms. Once leverage risk is eliminated by the Supreme Court in 1935, firms that face high leverage risk in 1933 and 1934 exhibit a faster recovery in 1935 and 1936. Taken together, the uncertainty regarding a possible reinstatement of gold clauses delayed the recovery in corporate investment by two years among large firms.

High leverage risk firms do not rely on bank financing, are not financially constrained, and increase equity payouts relative to firms that face no leverage risk. The behavior of firms under leverage risk is consistent with real effects of debt overhang as proposed by Myers (1977). The severity of the debt overhang problem and the imminence of perceived default risk leads to stronger opportunistic behavior by equity holders in form of higher equity payouts. Furthermore, the implied uncertainty about exogenous changes in future capital structure is likely to amplify the impact of leverage risk to the extent leverage matters for real decisions in the private sector. The leverage risk mechanism that we uncover in this paper complements explanations of the slow recovery based on limited credit supply emphasized by Bernanke (1983) as the primary obstacle for small firms in the beginning of 1930s. Furthermore, the reversal of the investment effect upon the 1935 Supreme Court decision shows that leverage risk works in both directions: its emergence leads to declines in investment while a relief from leverage risk contributes to the recovery of investment.

Our paper contributes to the understanding of the severity of the Great Depression and the causal impact of corporate debt on macroeconomic outcomes. Furthermore, the results on leverage risk have direct implications for the role of corporate debt in the macroeconomy in two different contexts. First, leverage risk is reminiscent of exchange rate uncertainty in the presence of debt contracts written in foreign currencies. For firms with substantial debt in foreign currency, a large depreciation means distress, and often bankruptcy, as in Argentina in 2002 and Turkey in 2018 (Edwards (2018)). The private sectors of emerging countries are often exposed to the risk of devaluation that implies leverage risk similar to the case in 1933 and 1934 in the United States. Our results indicate that such exchange rate uncertainty can discourage investment significantly in the private sector and deepen recessions or slow down macroeconomic recoveries. Therefore, policy makers may find it worthwhile not only focusing on the stabilization of financial intermediation upon financial crises but also stabilize factors that affect the value of future liabilities of firms. Second, leverage risk represents the risk of higher real debt burden, and is therefore closely related to the interplay between nominal corporate debt and deflation risk. Market participants perceive significant deflation risk in the long run (Fleckenstein, Longstaff, and Lustig (2017)). For firms with outstanding long-term nominal debt, this risk is equivalent to the risk of an increase in the real debt burden in the future. Our results show that this risk has profound implications for investment in the corporate sector, and can therefore, amplify the severity of recessions through the leverage risk channel even if the financial sector is completely stabilized.

Appendix

A Variable definitions

The Moody's Manual in year t reports annual balance sheet and income statement data from year $t-7$ to $t-1$. We compute all growth rates using the variable reported in the same manual.

- Net investment is given by $\frac{\text{Fixed capital}_t}{\text{Fixed capital}_{t-1}} - 1$.
- Book leverage is the ratio of total liabilities (including preferred shares) to total assets.
- Market leverage is the ratio of total liabilities to the sum of total liabilities and equity market capitalization from CRSP.
- Market-to-book is the total equity market capitalization divided by the book value of equity.
- Payout yield (book) is the sum of equity payouts from CRSP divided by book equity. Equity payout is computed using cash dividends and share repurchases following Boudoukh, Michaely, Richardson, and Roberts (2007).
- Payout yield (book) is the sum of equity payouts from CRSP divided by equity market capitalization.
- Profitability is the ratio of net income to total assets.
- Cash growth and profitability in Table 9 as well as equity payout in Table 10 are denominated by fixed capital in 1931 for emergence, and fixed capital in 1933 for elimination.

B Robustness checks

Table A1 presents several robustness checks of our main result in Table 4 controlling for characteristic and year fixed effects. In (1), we define book debt net of preferred shares. In (2), use the log investment rate as the dependent variable. In (3), we omit other regulated industries, namely transportation, communication, and utilities. In (4), we define book debt net of cash. In (5), we define d using total assets as the denominator instead of total liabilities. In (6), we exclude firms that have bonds due in 1933 or 1934 to avoid capturing the effect of credit supply on the bond market in those years. Both our results for the emergence (Panel A) and elimination (Panel B) of leverage risk are robust to all of these six specifications.

Table A2 reports results for a placebo test by changing the years with $p_t = 1$, while keeping the number of years with $p_t = 1$ at two as in our baseline exercise. We confirm the lack of any significant impact of leverage risk on investment once treatment is assigned randomly across years.

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Table 1: Summary Statistics

Variable	Firms	N	Mean	SD	5%	25%	50%	75%	95%
Panel A: 1931 - 1932									
Net investment	464	729	-0.06	0.13	-0.35	-0.08	-0.04	-0.01	0.06
Book leverage	464	729	0.34	0.36	0.03	0.12	0.31	0.51	0.80
Market leverage	459	714	0.54	0.31	0.06	0.26	0.55	0.84	0.97
Pref. shares/Assets	464	729	0.13	0.18	0.00	0.00	0.05	0.23	0.45
Log(Assets)	464	729	17.16	1.37	15.11	16.19	17.04	17.97	19.55
Market-to-book	464	729	0.54	0.63	0.04	0.15	0.33	0.69	1.81
Payout yield (Book)	459	714	0.04	0.07	-0.01	0.00	0.01	0.06	0.18
Payout yield (Market)	459	714	0.06	0.18	-0.03	0.00	0.04	0.10	0.21
Fixed capital/Assets	464	729	0.49	0.23	0.10	0.32	0.51	0.68	0.86
Inventory/Assets	449	705	0.14	0.10	0.01	0.07	0.13	0.20	0.34
Cash/Assets	459	720	0.10	0.10	0.01	0.03	0.07	0.14	0.30
Profitability	411	648	0.00	0.09	-0.13	-0.04	0.00	0.05	0.14
Bank debt/Liabilities	464	729	0.01	0.06	0.00	0.00	0.00	0.00	0.07
d	464	729	0.11	0.23	0.00	0.00	0.00	0.04	0.68
$\mathbb{I}_{d>0}$	464	729	0.26	0.44	0.00	0.00	0.00	1.00	1.00
Panel B: 1933 - 1934									
Net investment	503	770	-0.04	0.12	-0.26	-0.06	-0.03	-0.00	0.09
Book leverage	503	770	0.38	0.29	0.04	0.14	0.34	0.58	0.83
Market leverage	486	749	0.44	0.32	0.04	0.14	0.41	0.75	0.96
Pref. shares/Assets	503	770	0.14	0.20	0.00	0.00	0.04	0.22	0.47
Log(Assets)	503	770	17.25	1.49	15.07	16.15	17.14	18.17	19.87
Market-to-book	503	770	1.03	1.37	0.06	0.34	0.71	1.21	2.81
Payout yield (Book)	486	749	0.04	0.07	-0.00	0.00	0.00	0.05	0.15
Payout yield (Market)	486	749	0.03	0.06	-0.00	0.00	0.01	0.05	0.10
Fixed capital/Assets	503	770	0.49	0.24	0.10	0.30	0.49	0.67	0.90
Inventory/Assets	488	745	0.16	0.12	0.01	0.07	0.14	0.23	0.39
Cash/Assets	500	764	0.10	0.10	0.01	0.03	0.07	0.14	0.31
Profitability	467	721	0.03	0.08	-0.08	-0.00	0.02	0.06	0.15
Bank debt/Liabilities	503	770	0.01	0.07	0.00	0.00	0.00	0.00	0.07
d	503	770	0.13	0.24	0.00	0.00	0.00	0.19	0.72
$\mathbb{I}_{d>0}$	503	770	0.32	0.47	0.00	0.00	0.00	1.00	1.00
Panel C: 1935 - 1936									
Net investment	483	777	-0.01	0.11	-0.15	-0.04	-0.01	0.02	0.15
Book leverage	483	777	0.37	0.36	0.03	0.16	0.33	0.57	0.83
Market leverage	458	737	0.36	0.33	0.02	0.11	0.29	0.59	0.93
Pref. shares/Assets	483	777	0.13	0.21	0.00	0.00	0.00	0.22	0.47
Log(Assets)	483	777	17.25	1.46	15.09	16.18	17.17	18.12	19.80
Market-to-book	483	777	1.56	1.77	0.14	0.66	1.08	1.92	4.07
Payout yield (Book)	458	737	0.15	1.69	0.00	0.00	0.04	0.09	0.34
Payout yield (Market)	458	737	0.04	0.08	0.00	0.00	0.03	0.05	0.14
Fixed capital/Assets	483	777	0.47	0.23	0.09	0.29	0.47	0.64	0.88
Inventory/Assets	471	756	0.18	0.13	0.01	0.07	0.16	0.25	0.43
Cash/Assets	481	773	0.11	0.10	0.01	0.04	0.08	0.15	0.31
Profitability	463	734	0.06	0.07	-0.04	0.02	0.05	0.09	0.19
Bank debt/Liabilities	483	777	0.01	0.07	0.00	0.00	0.00	0.00	0.07
d	483	777	0.13	0.24	0.00	0.00	0.00	0.14	0.69
$\mathbb{I}_{d>0}$	483	777	0.30	0.46	0.00	0.00	0.00	1.00	1.00

Notes: Table reports summary statistics for firm-year observations separately for two-year periods from 1931 to 1936. See Appendix A for variable definitions.

Table 2: Average statistics in $d = 0$ and $d > 0$ samples

Variable	$d = 0$	$d > 0$	p-val.
Panel A: 1931 - 1932			
Net investment	-0.07	-0.04	0.01
Book leverage	0.29	0.48	0.00
Market leverage	0.48	0.71	0.00
Pref. shares/Assets	0.14	0.13	0.52
Log(Assets)	16.80	18.19	0.00
Market-to-book	0.57	0.45	0.03
Payout yield (Book)	0.04	0.03	0.06
Payout yield (Market)	0.06	0.06	0.90
Fixed capital/Assets	0.46	0.61	0.00
Inventory/Assets	0.15	0.12	0.00
Cash/Assets	0.12	0.07	0.00
Profitability	0.00	0.00	0.87
d	0.00	0.43	0.00
Panel B: 1933 - 1934			
Net investment	-0.04	-0.05	0.28
Book leverage	0.31	0.53	0.00
Market leverage	0.35	0.64	0.00
Pref. shares/Assets	0.14	0.13	0.55
Log(Assets)	16.80	18.21	0.00
Market-to-book	1.10	0.87	0.03
Payout yield (Book)	0.04	0.03	0.00
Payout yield (Market)	0.03	0.03	0.66
Fixed capital/Assets	0.44	0.61	0.00
Inventory/Assets	0.18	0.13	0.00
Cash/Assets	0.12	0.06	0.00
Profitability	0.03	0.02	0.01
d	0.00	0.42	0.00
Panel C: 1935 - 1936			
Net investment	-0.01	-0.01	0.81
Book leverage	0.31	0.51	0.00
Market leverage	0.29	0.52	0.00
Pref. shares/Assets	0.13	0.12	0.59
Log(Assets)	16.86	18.17	0.00
Market-to-book	1.68	1.29	0.01
Payout yield (Book)	0.09	0.27	0.19
Payout yield (Market)	0.04	0.05	0.68
Fixed capital/Assets	0.43	0.59	0.00
Inventory/Assets	0.19	0.14	0.00
Cash/Assets	0.13	0.07	0.00
Profitability	0.06	0.05	0.01
d	0.00	0.42	0.00

Notes: Table reports averages for firm-year observations of $d = 0$ and $d > 0$ from 1931 to 1936. The last column reports the p-value for the difference between the means of $d = 0$ and $d > 0$ firms. See Appendix A for variable definitions.

Table 3: Correlation of d with firm characteristics in 1933

Variable	All firms	$d > 0$
Net investment	-0.103	-0.090
Book leverage	0.265	-0.251
Market leverage	0.328	-0.156
Pref. shares/Assets	-0.135	-0.301
Log(Assets)	0.142	-0.297
Market-to-book	-0.132	-0.101
Payout yield (Book)	-0.168	-0.142
Payout yield (Market)	-0.045	-0.054
Fixed capital/Assets	0.296	-0.006
Inventory/Assets	-0.121	0.129
Cash/Assets	-0.292	-0.069
Profitability	-0.176	-0.167

Notes: Table reports the correlation of d with other firm characteristics in 1933 among all firms and among $d > 0$ firms. See Appendix A for variable definitions.

Table 4: The impact of leverage risk on investment

	Panel A		Panel B	
	(1)	(2)	(1)	(2)
$d_i p_t$	-0.056	-0.049	0.045	0.075
	[-2.82]	[-2.20]	[2.32]	[3.38]
Overall R^2	0.404	0.417	0.426	0.445
Within R^2	0.036	0.058	0.045	0.076
No. of firms	464	464	483	483
No. of obs.	1449	1449	1519	1519
Controls	No	Yes	No	Yes

Notes: Table reports coefficient estimates on $d_i p_t$ in the regression

$$\text{Net investment}_{i,t} = \beta_0 + \beta_1 d_i p_t + \sum_j \sum_\tau \beta_{j,\tau} \mathbb{I}_{t=\tau} X_{j,i} + \alpha_i + \delta_t + u_{i,t},$$

where i indexes firms, t is year, p_t is the post-treatment indicator, $X_{i,j}$ are pre-treatment firm characteristics interacted with year dummies $\mathbb{I}_{t=\tau}$, α_i represents firm fixed effects (FE) and δ_t is year FE. (1) does not include controls ($X_{i,j}$), (2) does. Results in Panel A use data from 1931 to 1934, and set $p_t = 1$ for 1933 and 1934. Results in Panel A use data from 1933 to 1936, and set $p_t = 1$ for 1935 and 1936. Firm characteristics are log(Assets), market-to-book, book leverage, market leverage, cash/assets, profitability, fixed capital/assets in the first year of data used in a regression. All regressions include year FE and firm FE. t-statistics reported in brackets are based on standard errors clustered at the industry level. Within R^2 refers to explained variation at the firm level. Overall R^2 includes variation within and across firms.

Table 5: Leverage risk and investment with decile x year fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Panel A			
$d_i p_t$	-0.054	-0.055	-0.054	-0.043	-0.054	-0.055	-0.052
	[-3.07]	[-2.75]	[-2.53]	[-2.22]	[-2.34]	[-2.56]	[-3.02]
Overall R^2	0.410	0.418	0.407	0.420	0.416	0.413	0.417
Within R^2	0.047	0.059	0.042	0.063	0.057	0.052	0.058
No. of firms	464	464	464	464	464	464	464
No. of obs.	1449	1449	1449	1449	1449	1449	1449
				Panel B			
$d_i p_t$	0.059	0.062	0.058	0.059	0.072	0.063	0.069
	[2.72]	[2.65]	[2.75]	[2.70]	[2.98]	[2.66]	[3.65]
Overall R^2	0.436	0.439	0.435	0.435	0.442	0.440	0.441
Within R^2	0.062	0.066	0.059	0.060	0.071	0.068	0.070
No. of firms	483	483	483	483	483	483	483
No. of obs.	1519	1519	1519	1519	1519	1519	1519

Notes: Table reports coefficient estimates on $d_i p_t$ in the regression

$$\text{Net investment}_{i,t} = \beta_0 + \beta_1 d_i p_t + \sum_j \sum_\tau \beta_{j,\tau} \mathbb{I}_{t=\tau} X_{j,i} + \alpha_i + u_{i,t},$$

where i indexes firms, t is year, p_t is the post-treatment indicator, $X_{i,j}$ are pre-treatment firm characteristic deciles interacted with year dummies $\mathbb{I}_{t=\tau}$, and α_i is firm fixed effects (FE). Results in Panel A use data from 1931 to 1934, and set $p_t = 1$ for 1933 and 1934. Results in Panel A use data from 1933 to 1936, and set $p_t = 1$ for 1935 and 1936. Firm characteristic deciles are based on the distribution of (1) log(Assets), (2) market-to-book, (3) book leverage, (4) market leverage, (5) profitability, (6) cash/assets, (7) fixed capital/assets in the first year of data used in a regression. All regressions include firm FE. t-statistics reported in brackets are based on standard errors clustered at the industry level. Within R^2 refers to explained variation at the firm level. Overall R^2 includes variation within and across firms.

Table 6: Pre-treatment changes in characteristics

Variable	$d = 0$	$d > 0$	p-val.
Panel A: Δ1932			
Net investment	-0.04	-0.06	0.33
Book leverage	0.04	0.01	0.63
Market leverage	0.00	0.03	0.10
Pref. shares/Assets	0.01	0.01	0.97
Log(Assets)	-0.11	-0.10	0.64
Market-to-book	-0.02	0.03	0.35
Payout yield (Book)	-0.02	-0.02	0.90
Payout yield (Market)	-0.05	-0.03	0.63
Fixed capital/Assets	0.01	0.01	0.75
Inventory/Assets	-0.01	-0.01	0.80
Cash/Assets	0.01	0.01	0.53
Profitability	-0.03	-0.02	0.58
Panel B: Δ1934			
Net investment	0.01	0.01	0.58
Book leverage	-0.00	-0.01	0.69
Market leverage	-0.03	-0.02	0.38
Pref. shares/Assets	-0.00	0.00	0.39
Log(Assets)	-0.01	-0.01	0.65
Market-to-book	0.15	-0.01	0.00
Payout yield (Book)	0.01	0.01	0.78
Payout yield (Market)	0.00	0.02	0.16
Fixed capital/Assets	-0.01	-0.01	0.29
Inventory/Assets	0.01	0.01	0.54
Cash/Assets	0.01	0.00	0.33
Profitability	0.01	0.01	0.45

Notes: Table reports average one-year changes (Panel A from 1931 to 1932, Panel B for 1933 and 1934) for firm-year observations of $d = 0$ and $d > 0$ samples. The last column reports the p-value for the difference between the mean changes for $d = 0$ and $d > 0$ firms. See Appendix A for variable definitions.

Table 7: The impact of other long-term liabilities and bank debt on investment

	Panel A		Panel B	
	(1)	(2)	(1)	(2)
$d_i^{alt} p_t$	-0.009	0.194	0.002	0.031
	[-0.75]	[1.28]	[0.32]	[0.54]
Overall R^2	0.416	0.418	0.440	0.440
Within R^2	0.056	0.059	0.068	0.068
No. of firms	464	464	483	483
No. of obs.	1449	1449	1519	1519
Controls	Yes	Yes	Yes	Yes

Notes: Table reports coefficient estimates on $d_i^{alt} p_t$ in the regression

$$\text{Net investment}_{i,t} = \beta_0 + \beta_1 d_i^{alt} p_t + \sum_j \sum_\tau \beta_{j,\tau} \mathbb{I}_{t=\tau} X_{j,i} + \alpha_i + \delta_t + u_{i,t},$$

where i indexes firms, t is year, p_t is the post-treatment indicator, $X_{i,j}$ are pre-treatment firm characteristics interacted with year dummies $\mathbb{I}_{t=\tau}$, α_i represents firm fixed effects (FE) and δ_t is year FE. (1) uses the total share of preferred shares and bonds without a gold clause in total liabilities and (2) uses the share of bank debt in total liabilities. Results in Panel A use data from 1931 to 1934, and set $p_t = 1$ for 1933 and 1934. Results in Panel A use data from 1933 to 1936, and set $p_t = 1$ for 1935 and 1936. Firm characteristics ($X_{i,j}$) are log(Assets), market-to-book, book leverage, market leverage, cash/assets, profitability, fixed capital/assets in the first year of data used in a regression. All regressions include year FE and firm FE. t-statistics reported in brackets are based on standard errors clustered at the industry level. Within R^2 refers to explained variation at the firm level. Overall R^2 includes variation within and across firms.

Table 8: The impact of leverage risk on investment with industry x year fixed effects

	Panel A		Panel B	
	(1)	(2)	(1)	(2)
$d_i p_t$	-0.048	-0.041	0.047	0.071
	[-2.06]	[-1.61]	[2.42]	[3.06]
Overall R^2	0.466	0.480	0.490	0.511
Within R^2	0.137	0.159	0.152	0.186
No. of firms	464	464	483	483
No. of obs.	1449	1449	1519	1519
Controls	No	Yes	No	Yes

Notes: Notes: Notes: Table reports coefficient estimates on $d_i p_t$ in the regression

$$\text{Net investment}_{i,t} = \beta_0 + \beta_1 d_i p_t + \sum_j \sum_\tau \beta_{j,\tau} \mathbb{I}_{t=\tau} X_{j,i} + \alpha_i + u_{i,t},$$

where i indexes firms, t is year, p_t is the post-treatment indicator, $X_{i,j}$ are industry fixed effects interacted with year dummies $\mathbb{I}_{t=\tau}$, and α_i is firm fixed effects (FE). Results in Panel A use data from 1931 to 1934, and set $p_t = 1$ for 1933 and 1934. (1) does not include controls ($X_{i,j}$), (2) does. Results in Panel A use data from 1933 to 1936, and set $p_t = 1$ for 1935 and 1936. Industries are based on the two-digit SIC classification. All regressions include firm FE. t-statistics reported in brackets are based on standard errors clustered at the industry level. Within R^2 refers to explained variation at the firm level. Overall R^2 includes variation within and across firms.

Table 9: The impact of leverage risk on cash and profitability

	Panel A		Panel B	
	Cash growth	Profitability	Cash growth	Profitability
$d_i p_t$	-0.018	-0.021	0.010	0.006
	[-0.72]	[-0.76]	[0.43]	[0.30]
Overall R^2	0.390	0.864	0.331	0.892
Within R^2	0.005	0.101	0.005	0.180
No. of firms	457	445	476	464
No. of obs.	1401	1298	1472	1397

Notes: Table reports coefficient estimates on $d_i^{alt} p_t$ in the regression

$$y_{i,t} = \beta_0 + \beta_1 d_i^{alt} p_t + \sum_j \sum_\tau \beta_{j,\tau} \mathbb{I}_{t=\tau} X_{j,i} + \alpha_i + \delta_t + u_{i,t},$$

where y is cash growth or profitability, i indexes firms, t is year, p_t is the post-treatment indicator, $X_{i,j}$ are pre-treatment firm characteristics interacted with year dummies $\mathbb{I}_{t=\tau}$, α_i represents firm fixed effects (FE) and δ_t is year FE. Results in Panel A use data from 1931 to 1934, and set $p_t = 1$ for 1933 and 1934. Results in Panel A use data from 1933 to 1936, and set $p_t = 1$ for 1935 and 1936. Firm characteristics ($X_{i,j}$) are log(Assets), market-to-book, book leverage, market leverage, cash/assets, profitability, fixed capital/assets in the first year of data used in a regression. All regressions include year FE and firm FE. t-statistics reported in brackets are based on standard errors clustered at the industry level. Within R^2 refers to explained variation at the firm level. Overall R^2 includes variation within and across firms.

Table 10: The impact of leverage risk on equity payouts

	Net investment		Equity payout	
	(1)	(2)	(1)	(2)
Panel A				
$d_i p_t$	-0.056	-0.049	0.029	0.025
	[-2.63]	[-2.21]	[1.96]	[1.64]
$d_i p_t \mathbb{I}_{\text{low rating},i}$		-0.080		0.045
		[-0.94]		[2.31]
Overall R^2	0.402	0.403	0.885	0.885
Within R^2	0.036	0.037	0.096	0.096
No. of firms	464	464	453	453
No. of obs.	1443	1443	1296	1296
Panel B				
$d_i p_t$	0.045	0.045	-0.044	-0.037
	[2.32]	[2.25]	[-4.30]	[-3.63]
$d_i p_t \mathbb{I}_{\text{low rating},i}$		0.003		-0.084
		[0.03]		[-1.97]
Overall R^2	0.426	0.456	0.843	0.843
Within R^2	0.045	0.045	0.042	0.045
No. of firms	483	483	458	458
No. of obs.	1519	1519	1355	1355

Notes: Table reports coefficient estimates on $d_i p_t$ in the regression

$$y_{i,t} = \beta_0 + \beta_1 d_i p_t + \beta_2 d_i p_t \mathbb{I}_{\text{low rating},i} + \alpha_i + \delta_t + u_{i,t},$$

where y is net investment or equity payout, i indexes firms, t is year, p_t is the post-treatment indicator, $\mathbb{I}_{\text{low rating},i}$ is an indicator function that the firm has a C rating, α_i represents firm fixed effects (FE) and δ_t is year FE. Results in Panel A use data from 1931 to 1934, and set $p_t = 1$ for 1933 and 1934. Results in Panel A use data from 1933 to 1936, and set $p_t = 1$ for 1935 and 1936. All regressions include year FE and firm FE. t-statistics reported in brackets are based on standard errors clustered at the industry level. Within R^2 refers to explained variation at the firm level. Overall R^2 includes variation within and across firms.

Table 11: Total effect of leverage risk on investment in the sample

	1933	1934	1935	1936
Panel A: All firms				
Total net investment in %	-2.91	-2.82	-1.09	1.61
Leverage risk effect in %	-1.00	-0.92	1.41	1.46
Panel B: $d > 0$ firms				
Total net investment in %	-3.04	-2.72	-1.69	-0.11
Leverage risk effect in %	-1.35	-1.32	1.99	2.14

Notes: Table reports total net investment from 1933 to 1936 given by

$$\frac{\sum_i \text{Fixed capital}_t}{\sum_i \text{Fixed capital}_{t-1}} - 1,$$

and estimates of the leverage risk effect given by

$$\text{Leverage risk effect}_t = \frac{\beta_1 \sum_i d_i \text{Fixed capital}_{t-1}}{\sum_i \text{Fixed capital}_{t-1}},$$

where i indexes firms and β_1 is the estimate of leverage risk effect reported in Panel A of Table 4 for 1933 and 1934 and in Panel B of Table 4 for 1935 and 1936. Panel A reports results for all firms, Panel B reports results for the subsample of $d > 0$ firms.

Table A1: Robustness checks

	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A			
$d_i p_t$	-0.033	-0.053	-0.048	-0.029	-0.071	-0.055
	[-1.94]	[-1.85]	[-1.86]	[-2.79]	[-1.82]	[-2.85]
Overall R^2	0.416	0.411	0.411	0.421	0.417	0.419
Within R^2	0.056	0.049	0.060	0.063	0.058	0.058
No. of firms	464	464	432	456	464	435
No. of obs.	1449	1449	1351	1418	1449	1356
			Panel B			
$d_i p_t$	0.063	0.082	0.088	0.042	0.141	0.084
	[2.87]	[3.14]	[3.47]	[7.08]	[3.16]	[3.36]
Overall R^2	0.442	0.418	0.451	0.453	0.459	0.459
Within R^2	0.072	0.067	0.084	0.085	0.099	0.098
No. of firms	483	483	446	474	483	452
No. of obs.	1519	1519	1388	1486	1519	1414

Notes: Table reports coefficient estimates on $d_i p_t$ in the regression

$$\text{Net investment}_{i,t} = \beta_0 + \beta_1 d_i p_t + \sum_j \sum_\tau \beta_{j,\tau} \mathbb{I}_{t=\tau} X_{i,j} + \alpha_i + u_{i,t},$$

where i indexes firms, t is year, p_t is the post-treatment indicator, $X_{i,j}$ are pre-treatment firm characteristics interacted with year dummies $\mathbb{I}_{t=\tau}$, and α_i is firm fixed effects (FE). Results in Panel A use data from 1931 to 1934, and set $p_t = 1$ for 1933 and 1934. Results in Panel A use data from 1933 to 1936, and set $p_t = 1$ for 1935 and 1936. In (1), we define book debt net of preferred shares. In (2), use the log investment rate as the dependent variable. In (3), we omit other regulated industries: transportation, communication, and utilities. In (4), we define book debt net of cash. In (5), we define d using total assets as the denominator instead of total liabilities. In (6), we exclude firms that have bonds due in 1933 or 1934. All regressions include firm FE and year FE. t-statistics reported in brackets are based on standard errors clustered at the industry level. Within R^2 refers to explained variation at the firm level. Overall R^2 includes variation within and across firms.

Table A2: Time series placebo

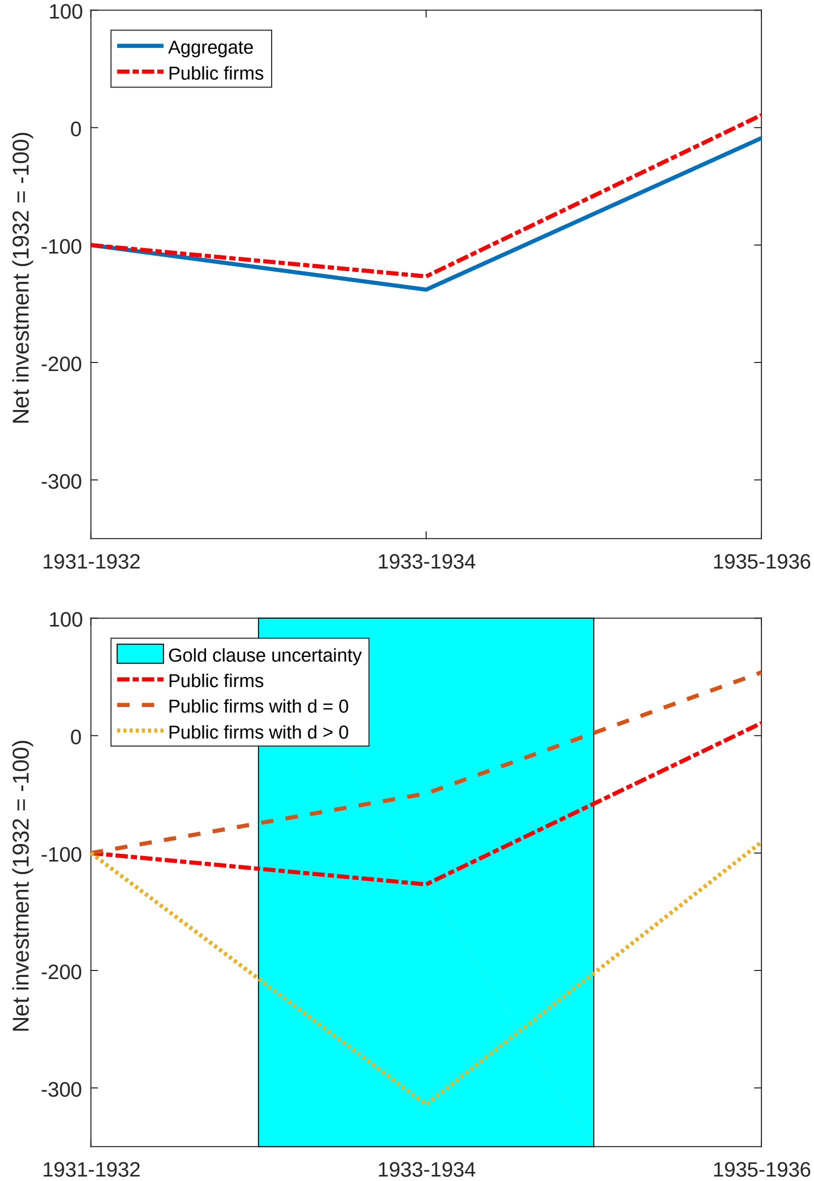
	(1)	(2)	(3)	(4)
	Panel A			
$d_i p_t$	-0.014	-0.005	0.005	0.014
	[-0.69]	[-0.31]	[0.31]	[0.69]
Overall R^2	0.415	0.415	0.415	0.415
Within R^2	0.055	0.055	0.055	0.055
No. of firms	464	464	464	464
No. of obs.	1449	1449	1449	1449
	Panel B			
$d_i p_t$	0.011	0.031	-0.031	-0.011
	[0.53]	[1.57]	[-1.57]	[-0.53]
Overall R^2	0.440	0.441	0.441	0.440
Within R^2	0.068	0.069	0.069	0.068
No. of firms	483	483	483	483
No. of obs.	1519	1519	1519	1519

Notes: Table reports coefficient estimates on $d_i p_t$ in the regression

$$\text{Net investment}_{i,t} = \beta_0 + \beta_1 d_i p_t + \sum_j \sum_\tau \beta_{j,\tau} \mathbb{I}_{t=\tau} X_{i,j} + \alpha_i + \delta_t + u_{i,t},$$

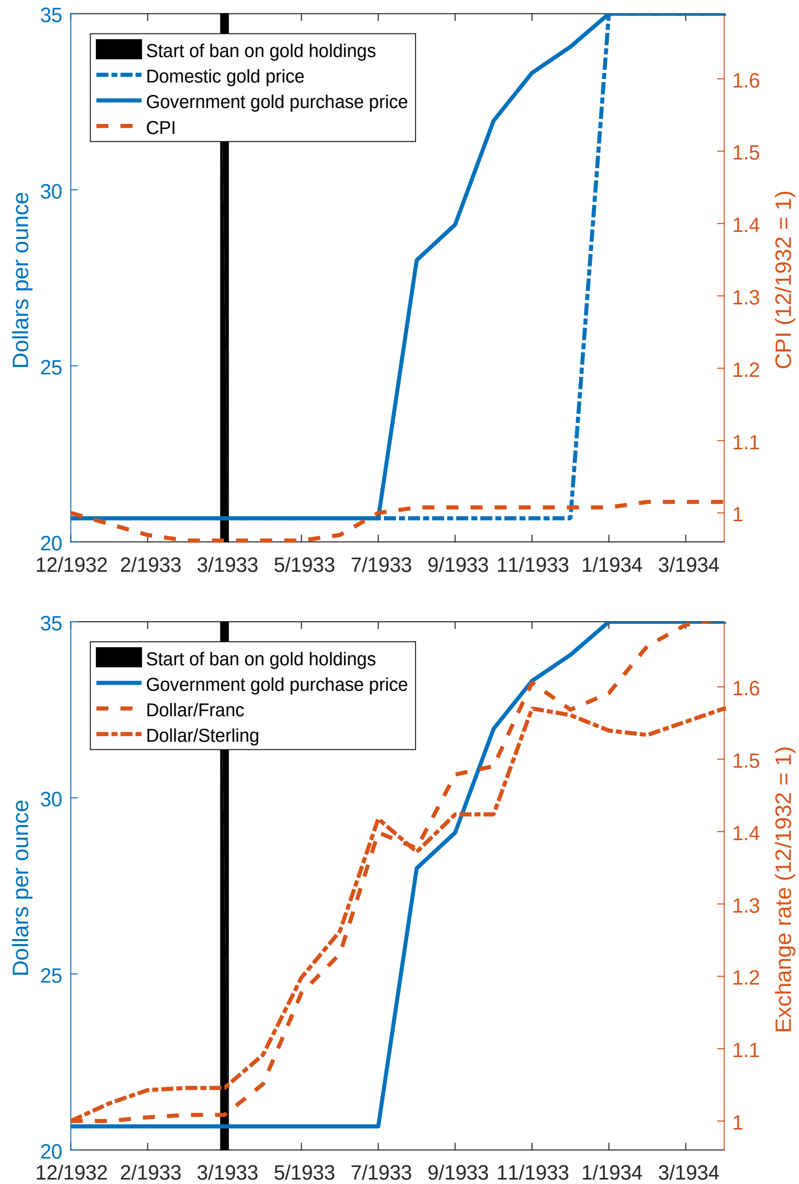
where i indexes firms, t is year, p_t is the post-treatment indicator, $X_{i,j}$ are pre-treatment firm characteristics interacted with year dummies $\mathbb{I}_{t=\tau}$, α_i represents firm fixed effects (FE) and δ_t is year FE. (1) does not include controls ($X_{i,j}$), (2) does. Results in Panel A use data from 1931 to 1934. Results in Panel A use data from 1933 to 1936. Firm characteristics are log(Assets), market-to-book, book leverage, market leverage, cash/assets, profitability, fixed capital/assets in the first year of data used in a regression. In Panel A, $p_t = 1$ for (1) 1932 and 1933, (2) 1932 and 1934, (3) 1931 and 1933, (4) 1931 and 1934. In Panel B, $p_t = 1$ for (1) 1934 and 1935, (2) 1934 and 1936, (3) 1933 and 1935, (4) 1933 and 1936. All regressions include year FE and firm FE. t-statistics reported in brackets are based on standard errors clustered at the industry level. Within R^2 refers to explained variation at the firm level. Overall R^2 includes variation within and across firms.

Figure 1: Aggregate investment and total investment in the sample

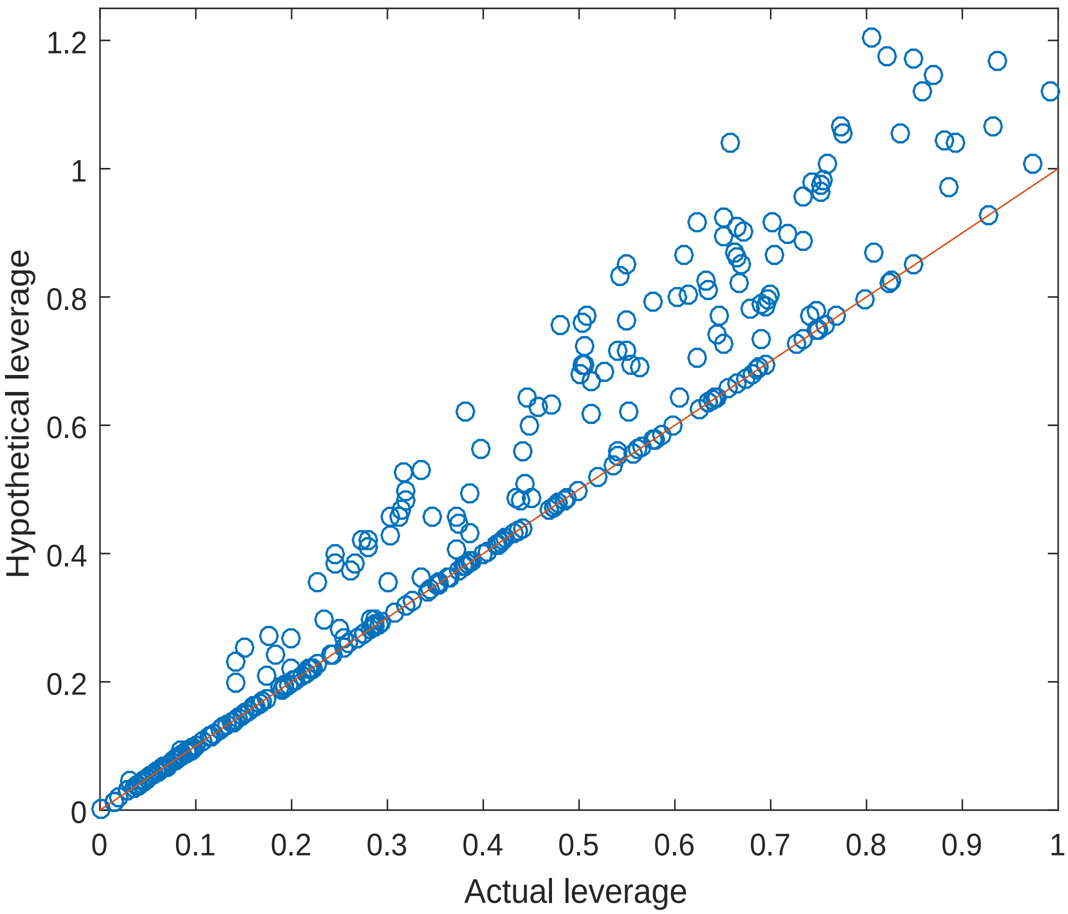


Notes: Figure plots the path of investment in three two-year periods: 1931 - 1932, 1933 - 1934, 1935 - 1936. Aggregate investment is net fixed private domestic investment from the BEA. Public firms' investment is the total net investment by firms in our sample adjusted for variations in the size of our panel. The lower panel plots total investment among firms with no $d = 0$ and a positive amount $d > 0$ of bonds with gold clauses in 1933. All quantities are normalized to -100 in 1931 - 1932.

Figure 2: Gold price, inflation, and exchange rates in 1933 and 1934

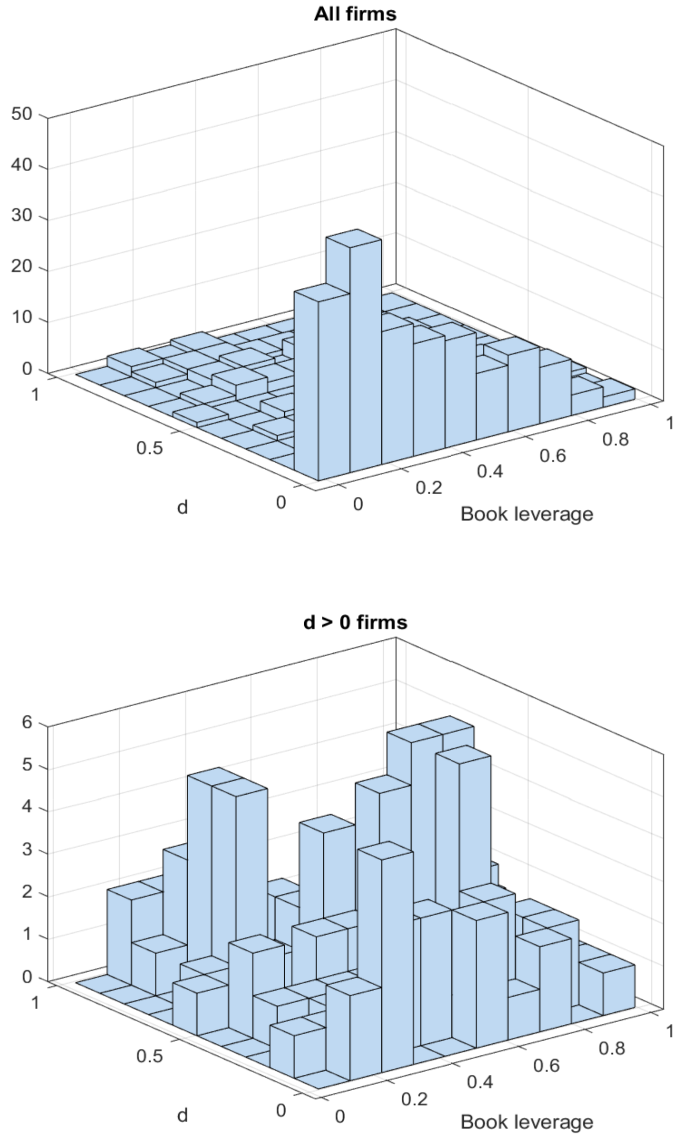


Notes: Upper figure plots monthly data on the official domestic price of gold in the United States, the gold price in buying programs of the government, and the Consumer Price Index (normalized to 1 in 12/1932) from 12/1932 to 3/1934. Lower figure plots the Dollar/Franc and Dollar/Sterling exchange rates normalized to 1 in 12/1932. The black vertical line is the start of the requirement to return all gold holdings to the government in the United States.



Notes: Figure plots the observed financial (book) leverage of firms in our sample in 1933 against the hypothetical leverage that would have been observed in case of a gold clause enforcement. Hypothetical leverage is computed as the sum of total liabilities plus 69% of outstanding bond amount divided by total assets.

Figure 4: Frequency distribution of leverage and d



Notes: Figure plots a two-dimensional histogram of firms by book leverage and d in 1933 for all firms (upper panel) and for $d > 0$ firms (lower panel).