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

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Abstract

We study the impact of the 1933 abrogation of gold clauses in the slow recovery of corporate investment from the Great Depression. Legal challenges to the abrogation's constitutionality exposed many firms to the possibility of a 69% increase in required payments to bondholders. We show that public firms with higher exposure to this risk exhibit a larger reduction in investment in 1933 and 1934. For these firms, investment recovers quickly following the 1935 Supreme Court decision to uphold the abrogation. In the cross-section of firms, the decrease in investment over 1933 and 1934 coincides with an increase in equity payouts. Our estimates imply that the risk of higher financial leverage accounts for one-third of the decline in the aggregate divestment by public firms over 1933–1934. This channel complements existing explanations of the slow recovery based on bank credit supply which public firms did not rely on.

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1 Introduction

The Great Depression lead to a remarkable contraction in private investment that persisted throughout the first years of the recovery: despite GDP growth of 11% in 1933 and 9% in 1934, net private investment remained negative in both years.[1] Given the lasting influence of the Great Depression on macroeconomics and finance, understanding the root causes behind the weak recovery of corporate investment is crucial, but the lack of disaggregated data over the period has limited our ability to study this episode. Using newly hand collected firm-level data, we show that much of the divestment by public US firms over 1933–1934 was triggered by the 1933 abrogation of gold clauses, a dramatic legal development that threatened many corporate bond issuers with bankruptcy.

Prior to 1933, it was common practice for corporate bond issuers to index coupon and principal payments to the price of gold. In the era of the gold standard, these contractual agreements known as "gold clauses" aimed to protect bond holders against a devaluation of the dollar with respect to gold. When the United States effectively abandoned the gold standard in April 1933, the dollar quickly depreciated against gold, and the existence of these clauses posed a serious threat to the US corporate sector. At the bottom of the worst economic collapse on record, enforcing gold clauses would greatly increase the debt burden of nearly all corporate bond issuers.[2]

Aware of this issue, Congress passed in June 1933 a joint resolution voiding gold clauses in all existing and future contracts. Resenting this decision, several bond holders filed lawsuits contesting the constitutionality of the abrogation and requesting that bond payments be indexed to gold as originally promised. Over the rest of 1933 and 1934, the validity of the abrogation was on trial, with several of the lawsuits progressing through the court system. As a result of those litigations, issuers of gold-denominated corporate bonds were exposed to leverage risk: if the courts were to overturn the abrogation, issuers would have to index bond payments, resulting in higher leverage.

[1] Cole and Ohanian (2004) also document that among common macroeconomic aggregates, investment was hit the hardest, being at 72% below trend in 1934, compared to GNP, consumption and hours worked, which were respectively 36%, 28%, and 31% below trend in the same year.

[2] MENTION THE FRACTION OF CORPORATE BONDS THAT HAD THE GOLD CLAUSE.

Finally, in February 1935, the Supreme Court ruled on the validity of gold clauses. In a narrow 5-4 decision, the Court confirmed the constitutionality of the abrogation, effectively eliminating leverage risk by establishing that corporate issuers would not be required to index bond payments to gold. At the time of the ruling, the dollar had depreciated by 69% against gold; had the court instead overturned the abrogation, coupon and principal payments would have increased by as much. While the threat of an increase in leverage did not ultimately materialize, corporate issuers nonetheless experienced much uncertainty regarding their future liabilities between the 1933 abrogation and the early 1935 Supreme Court decision. In this paper, we seek to identify and quantify the impact of this uncertainty on corporate investment.

Figure 1 presents suggestive evidence about the impact of leverage risk on investment. First, the top panel of the figure shows that public firms experienced a lengthy contraction in investment similar to that of the rest of the private sector. (SHOULD THE Y AXIS OF FIGURE 1 MENTION "NET INVESTMENT (1931–1932 =-100)" INSTEAD **2) done**) This observation is significant because large firms, due to their ample cash holdings, were mostly insulated from the distress of the financial sector (see Lutz (1945), Hunter (1982), Bernanke (1983), and Calomiris and Mason (2003)). A closer inspection of the data reveals that much of the observed slump in public firms' investments over 1933–1934 is driven by firms exposed to leverage risk. As the bottom panel of Figure 1 shows, public firms *not* exposed to leverage risk exhibited an earlier recovery in investment when compared to the overall private sector. (LET'S TALK ABOUT PANEL B. I AM NOT SURE I UNDERSTAND WHY INVESTMENT IS AT -300% FOR D>0 FIRMS OVER 1933–1934 IN THE FIGURE, WHILE IN PANEL A AND B OF TABLE 2 I SEE THAT THE AVERAGE INVESTMENT RATE GOES FROM -0.04 IN 1931–1932 TO -0.05 IN 1933–1934 FOR D>0 FIRMS.)

To conduct our formal analysis, we first hand-collect balance sheet and bond characteristics data for all publicly traded industrial U.S. firms, from 1930 to 1936. This data includes detailed firm-level information on investment and gold-denominated debt outstanding. Our identification strategy exploits preexisting heterogeneity in firms' reliance on gold denominated debt in a difference-in-differences empirical design. For the average firm with gold-denominated debt outstanding, we estimate that leverage risk lead to a reduction in annual investment equals to 2.1% of installed capital over 1933 and 1934. Supporting the validity of our inference, we find that the effect of gold clause exposure on investment vanishes in 1935-36, following the Supreme Court decision to uphold the abrogation. Strikingly, we also find that firms more exposed to leverage risk actually increase their equity payout during 1933–1934; this difference again vanishes following the Supreme Court decision. Taken together, these results on investment and payout decisions suggest that firms exposed to leverage risk did not reduce their investments because of financial constraints.

Instead, our results are consistent with the optimal behavior of firms facing debt overhang (see Myers (1977)). The legal struggle over gold effectively increased the expected future liabilities of exposed firms, reducing equity holders' incentive to invest because more of the added value would accrue to bondholders. The equity payout behavior we identify is in line with that in dynamic debt overhang problems studied by Hennessy (2004), who shows that the optimal payout policy of distressed firms involves paying shareholders a high dividend rate.[3] (JOAO SUGGESTED TO DELETE THIS FOOTNOTE. IF IT WASN'T OF TONI WHITED'S REACTION WHEN I PRESENTED AT WFA I WOULD AGREE. YOU CAN REMOVE IT FOR NOW IF YOU WANT, BUT WE SHOULD PUT IT BACK IF WE EVER SUBMIT TO JFE...**4) we should keep it. Here is what Hennessy says: "the characterization of the optimal investment level remains correct when a is a control. High volatility is optimal when equity is convex in e, which is necessarily the case near the default contour, indicating that the optimal policy for distressed firms entails paying the maximum dividend allowed by the debt covenant, since q approaches zero, and speculating with any remaining funds" Can we make an extended footnote with content out of it rather than just see section?**) Consistent with this theory, we further find that the impact on equity payout is stronger for firms with lower credit ratings. Our paper thus contributes to the empirical literature

[3]See section I. C. of Hennessy (2004).

on debt overhang by analyzing the impact of a plausibly exogenous shock to leverage on firms' investment decisions.

Beyond increasing expected future leverage, the battle over the abrogation also introduced uncertainty regarding the future capital structure of exposed firms. From that perspective, our findings are consistent with models of investment under uncertainty (see e.g., Dixit and Pindyck (1994) and Bloom (2009)). This literature argues that, when the value of an irreversible investment project is uncertain, it can be optimal to wait for uncertainty to resolve before investing. Although this literature typically emphasizes asset side uncertainty, our results suggest that capital structure uncertainty also influences investment decisions.

Throughout the paper, our identification strategy relies on the assumption that firms with different amount of gold-denominated debt outstanding were differentially affected by leverage risk, but were similarly exposed to other shocks relevant to investment decisions. Of course, the 1930s were rich in economic and political events that may challenge the validity of this assumption. For example, firms relying more heavily on gold-denominated debt may have been differentially exposed to the distress of the banking sector, the frictions of the bond market, the industrial policies of the New Deal, and to the aggregate demand effects of the dollar devaluation. A significant part of our analysis is devoted to addressing each of these potentially confounding channels.

First, the disruptions in the financial sector during the Great Depression, which greatly limited access to bank credit for some firms (Bernanke (1983)), are unlikely to explain our findings since public firms mostly did not rely on bank loans as a source of financing. In our sample, bank debt accounts on average for 1% of total liabilities.[4] In our empirical tests, we further confirm that heterogeneity in firms' reliance on bank debt cannot explain the investment gap we document.

In related work, Benmelech, Frydman, and Papanikolaou (2018) show that firms with corporate bonds maturing during the Great Depression experienced larger decline in employment due to the lack of access to credit. This raises the concern that leverage risk might simply proxy for credit

[4]As Bernanke (1983) and Kimmel (1939) note, the credit constraints stemming from disruption in the banking sector that were binding for smaller firms were not as relevant for larger firms.

constraints, because firms with more gold-denominated corporate bond issues were more likely to have a bond issue maturing during the crisis. By themselves, our results on equity payout alleviate this concern. Moreover, we find that leverage risk still matters for firms that did not have bonds maturing during the Great Depression.

Regarding the impact of the New Deal policies, Cole and Ohanian (2004) argue that the industrial codes of the National Industrial Recovery Act (NIRA) created labor market rigidities that kept wages above their equilibrium level and the economy depressed. The NIRA codes prescribed specific operating rules that applied to all firms within an industry, yet some industries faced tighter restrictions than others. If industries with stricter codes also had more gold-denominated debt for some exogenous reasons, the relationship between leverage risk and investment might be spurious. Other New Deal policies, such as the Emergency Banking Act and the Agricultural Adjustment Act (AAA), are other examples of industry specific interventions that could potentially interfere with our analysis in similar ways. However, we show in our empirical tests that the effect of leverage risk remains important within industries.

Studying the early stages of the recovery, Hausman, Rhode, and Wieland (2017) show that the devaluation of the dollar in 1933 lead to a large increase in traded crop prices, followed by higher demand for goods in farming areas of the country. If the surge in farmer's demand was directed towards the output of firms with little exposure to gold clauses, this might explain why these firms invested relatively more. However, we find that the increase in farmers' demand did not differentially impact firms based on the gold content of their liabilities.

In their seminal book, Friedman and Schwartz (1963) points to the rapid fall in money supply as a leading cause of the Great Depression. But as Bernanke (1983) and Cole and Ohanian (2004) argue, while there is much support the adverse effect of the monetary contraction in the early years of the Great Depression, the timing and the magnitude of the monetary supply reduction makes it an unlikely explanation for the delayed recovery. Taken together, the above observations greatly mitigate the identification concerns associated with our empirical approach.

Nevertheless, to further challenge the validity of our identification strategy, we perform a number of robustness checks. We carry placebo tests, use alternative measures of investment and exposure to leverage risk, control for observable firm characteristics and year specific fixed-effect, and conduct a treatment reversal analysis based on the 1935 Supreme Court decision to uphold the abrogation. Collectively, the results of those tests lend further support to the validity of our approach.

Lastly, we observe that it is unlikely that firms optimized their capital structure in anticipation of the abrogation of gold clauses. First, the gold-denominated corporate bonds studied in this paper were for the most part issued many years before the onset of the Great Depression. (WE SHOULD ADD IN THE DESCRIPTIVE STATISTICS A ROW FOR THE AVERAGE AGE OF THE BONDS IN OUR SAMPLE AND REFER TO THE TABLE HERE) Second, financial markets reveal that the devaluation of the dollar was largely unexpected right up to the ban on gold holdings in April 1933. This can be seen in Figure 2, which illustrates the stability of the exchange rate between the US Dollar and the French Franc (a currency pegged to gold until 1936) leading up to the executive order. (CURRENTLY, THE GRAPH ONLY SHOWS A FEW MONTHS OF DATA REGARDING THE STABILITY OF THE EXCHANGE RATE WITH THE FRENCH FRANC. I THINK IT COULD BE NICE TO DISPLAY THAT THE RATE WAS STABLE FOR A LONGER PERIOD OF TIME, PERHAPS A YEAR (WHICH IS THE CASE).) Since the abrogation of gold clauses was triggered by the dollar devaluation, it seems unlikely that firms chose their capital structure in anticipation of the events we study.

Clearly, our results are not inconsistent with the existing explanations of the slow recovery mentioned above. Rather, we argue the legal drama surrounding the 1933 abrogation of gold clauses was an important, and so far neglected, factor behind the slow recovery. To quantify its importance at the aggregate level, we conduct a simple partial equilibrium aggregation exercise based on our reduced-form estimates.[5]. Within our sample, we evaluate that the leverage risk channel accounts for one-third of public firms' divestment over 1933–1934. Furthermore, we estimate that the elimination of leverage risk cut the amount of divestment in half in 1935 and is

[5]Similar aggregation exercises can be found in Benmelech, Frydman, and Papanikolaou (2018), Chodorow-Reich (2013), Hausman, Rhode, and Wieland (2017)

responsible for the end of divestment in 1936. Beyond improving our understanding the Great Depression, our results also shed light on modern issues.

While gold clauses are no longer included in bond contracts today, the risk we identify is still relevant for many emerging economies where corporations issue bonds denominated in foreign currencies (often in U.S. dollar). The possibility of a local currency depreciation exposes these emerging market issuers to leverage risk, much like gold clauses exposed U.S. issuers to a devaluation of the dollar in the 1930s.[6] For example, leverage risk materialized in Argentina when, following years of political and economic uncertainty, the country finally abandoned its convertibility plan in 2002, causing a 70% depreciation of the peso against the dollar.[7] Since 97% of Argentine corporate bonds were denominated in US dollar at the time, the devaluation triggered a wave of bankruptcies and lengthy debt restructurings.[8]

More generally, our paper also suggests a link between monetary policy uncertainty and the real economy. Since debt contract are almost always denominated in nominal terms, the possibility of future deflation (or even lower than expected inflation) generates leverage risk by itself. Our results suggest that firms react to this kind of uncertainty by cutting investment in fixed capital. We thus provide evidence supporting the notion that debt deflation can have significant macroeconomic consequences (Fisher (1933), Gomes, Jermann, and Schmid (2016)). Gold clauses may be relics of the past, but the saga of their abrogation carry important insights relevant to this day.

2 Literature

(WE SHOULD CITE A PAPER FROM AMIR SUFI AND ONE FROM VOTH AS WELL **7) Sufi is not cited in the intro. His paper is also generally interesting I put it in our**

[6]This of course holds only if much of the assets and revenue of an emerging market firm are in local currency, as was the case in Argentina.

[7]This is in contrast with the US experience with the abrogation of gold clause where leverage risk did not ultimately materialize.

[8]The data on Argentine corporate bonds is from Bedoya, González, Pernice, Streb, Czerwonko, and Díaz Santillán (2007). A notable example is the restructuring of *In re Supercanal* which was completed in 2018 (see Hernández (2019)). Argentine corporate bonds were issued under New York law and were not subject to the "pesification" of contracts.

literature folder. He just mentions the gold clause abrogation in the paper (footnote 4), but it is at least a paper where he talks about firm debt rather than just household debt. For Voth: his only paper that we could possibly cite is the one with Koudjis on leverage and experience. Since it is hard to find a relation, I am thinking we can mention it in the conclusion among with some Malmendier papers, and list our idea as a direction for future research. There, we can also mention that it is an event that did not materialize as in his paper, showing we understood his empirical setting. This could look a little odd though, so let me know what you think before I try to embed it.)

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 (2018) 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. Fisher

(1933), 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, Bolton and

Rosenthal (2002) build a model to study political interventions in private debt contracts motivated by the dollar devaluation in 1933, and Mian, Sufi, and Trebbi (2014) discuss the potential welfare gains from debt forgiveness using the gold clause abrogation as an example.

The outline of the article is as follows. Section 3 discusses relevant historical events to our study. Section 4 describes the firm-level data used in our analysis. Section 5 presents results on the relation between leverage risk, investment, and equity payouts. Section 6 evaluates potential alternative explanations. Section 7 presents results for a partial equilibrium aggregation exercise and discusses implications for the slow recovery from the Great Depression. Section 8 concludes.

3 Historical background

This section provides a brief summary of the historical events relevant to our study. For a comprehensive and masterful account of the events surrounding the 1933 repudiation of gold clauses, see Edwards (2018).

At the time of President Franklin D. Roosevelt inauguration on March 4, 1933, the U.S. economy was at the bottom of a severe banking crisis: the day before the inauguration, depositors withdrew \$250 million in gold and \$150 million in currency from the Federal Reserve Bank of New York, leaving the bank short of \$250 million in required reserves. In an attempt to salvage the banking sector and stem gold hoarding, Roosevelt signed into law the Emergency Banking Act of 1933 on March 9. The Act prescribed capital injections in the banking sector, which were well received by the markets and brought back confidence in the banking system. However, the amount of gold redeposited in the system was below the expectation of the administration.

To address this problem, President Roosevelt issued on April 5, 1933 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 official gold price of \$20.67 per ounce. To justify such a drastic policy, the Secretary of the Treasury Will Woodin argued that "gold in private hoards serves no useful purpose under current circumstances. When added to the stock of the Federal Reserve Banks it serves as a basis for currency and credit." While the executive order clearly implied the end of convertibility, the implications for the legitimacy of gold exports, a key tenet of the gold standard, was ambiguous.

On April 19, 1933, Roosevelt clarified the government position by declaring that gold exports would no longer be allowed, effectively throwing the nation off the gold standard. The reaction in foreign exchange market was immediate: the dollar lost ground against other currencies, including the French Franc, a currency still pegged to gold. The top panel of Figure 2 illustrates the depreciation of the Dollar/Franc and Dollar/Sterling exchange rates between December 31, 1932 and March 31, 1934. (SINCE WE ARE NOW REFERRING TO THE EXCHANGE BEFORE CPI, WE SHOULD PROBABLY FLIP THE ORDER OF THE TWO PANELS IN FIGURE 2 **8) done**) The stated intent of the devaluation was to increase commodity prices, whose dramatic fall throughout the Depression had hurt the agricultural sector.[9]

The devaluation of the dollar, however, created a new economic problem due to the presence of gold clauses in debt contracts. At the time, the payments on most US corporate bonds, treasuries, and even some long-term lease agreements were indexed to the price of gold. According to the administration's estimates, $120 billion of debt (about two times the value of GDP), of which about $100 billion had been issued by the private sector, was linked to the value of gold in 1933 (Edwards, Longstaff, and Marin (2015)). The depreciation of the dollar would thus lead to a nationwide increase in the debt burden of creditors, at a time when many borrowers were already struggling to meet their obligations.

Although the administration initially kept the official price of gold at its historical value of $20.67 per ounce, the implicit depreciation of the dollar against gold in international markets lead to the first legal actions regarding the enforceability of gold clauses.[10] To resolve this thorny issue, the administration asked Congress on May 26 to officially annul the gold clauses in both existing and future contracts. On June 5, the Joint Declaration of Congress abrogating the clause

[9] Roosevelt assessment was that the depreciation of the pound sterling against the dollar had adversely affected commodity prices in the United States, and that a devaluation of the dollar would help raise prices.

[10] On May 1, 1933, legal procedure began regarding the payment of gold denominated coupons on private bonds that had been paid in dollars (Edwards (2018)).

was signed into law, to the ire of several members of Congress who argued that the abrogation represented a repudiation of the government debt.

Starting in August 1933, the government steadily increased the price it paid for newly minted gold until it reached $34.06 per ounce in December 1933. Simultaneously, the US dollar steadily lost value in currency markets. The bottom panel of Figure 2 illustrates the evolution of the official price of gold and the exchange rates. (SAME AS ABOVE) Finally, on January 30, 1934, the Roosevelt administration fixed the price of gold at $35 per troy ounce, a 69% increase from the initial price of $20.67 in April 1933. At that point, enforcing gold clauses would increase the payments on gold-denominated bonds by 69%. As shown in Figure 2, inflation remained relatively low in 1934 (1.5%) and 1935 (3%). Thus, enforcing gold clauses would cause an increase in real leverage that would burden many private corporations.

As early as May 1933, investors that had purchased bonds protected by gold clauses filed lawsuits claiming that the abrogation was unconstitutional. These lawsuits made their way through the court system over the rest of 1933, and all of 1934. In January 1935, the Supreme Court heard four of these cases; two of them had to do with private debt contracts, while the two others were related to government bonds. In all cases, the Court had to decide whether Congress had violated the Constitution by altering existing contracts.

By a narrow 5-4 vote, that reflected the perceived uncertainty during this period, the Court upheld the abrogation of gold clauses, reasoning that Congress has the power to regulate monetary policy. The four conservative members of the Court wrote a scathing dissent of the majority's opinion. In the minority's opinion, the ruling meant that: "The Constitution as many of us understood it, the instrument that has meant so much to us, is gone." The minority agreed that Congress had power to regulate the monetary system, "but because Congress may adopt a system, it doesn't follow that this may be enforced in violation of existing contracts... Shame and humiliation are upon us now. Moral and financial chaos may be confidently expected." For corporations with gold clauses, the Supreme Court decision of 1935 was final and virtually eliminated the risk of seeing these clauses upheld.

Leading up to the ruling, however, the perceived likelihood of a reinstatement of the gold clause was high. The Roosevelt administration had even drafted executive orders to close the stock exchanges in case of an adverse ruling. Moreover, Edwards, Longstaff, and Marin (2015) use data on exchange rates and sovereign bond yields to show that markets attached a positive probability to the reinstatement of gold clauses.

This brief history of the abrogation establishes how the legal fight over gold generated a climate of uncertainty regarding the future liabilities of many firms. The uncertainty persisted for nearly two years, as legal challenges against the abrogation were multiplying. The Supreme Court ultimately eliminated the risk of a debt burden increase by upholding the abrogation.

4 Data

Our analysis requires accounting and bond characteristics data which, for the time period considered, are unavailable in commonly used databases. We thus 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.[11]

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

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

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.

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.

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). Also important for our purpose, there is 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. (I DROPPED TABLE 3 FROM THE AND FIGURE 4. I DON'T THEY ARE NECESSARY, BUT IF YOU WANT TO PUT THEM BACK, FEEL FREE **9) yes we can drop them - we should mention somewhere that there is d and leverage do not turn out to be the same thing in the data, that was the purpose of both**)

5 Main results

In this section, we lay out our identification strategy and establish our main empirical results. We analyze the impact of the emergence and subsequent elimination of leverage risk on investment. We also study equity payouts to better understand the factors driving our results. Lastly, we estimate the effect of leverage risk conditioning on a firm's credit quality.

5.1 Identification

In an ideal experiment, firms with similar investment opportunities would randomly be assigned a given amount of uncertainty with respect to their future liabilities, and investment outcomes would be compared across firms to determine the causal effect of leverage risk. Because such a controlled experiment is impossible to achieve, we instead rely on preexisting firm-level variation in gold-denominated liabilities as a source of plausibly exogenous exposure to leverage risk. The key identifying assumption is that firms with different amounts of gold-denominated debt had different exposures to leverage risk, but were similarly exposed to other shocks relevant to investment decisions. However, it is possible that treated firms ($d_i > 0$) were different from untreated firms ($d_i = 0$) in ways that could compromise our analysis. We thus begin by comparing the observable characteristics of the two groups of firms.

Panel A of Table 2 reports differences in means between the treated group and the control group for various observable characteristics in the pre-treatment period. The comparisons suggest that firms with gold-denominated debt are more like value firms: on average, those firms are larger and have lower market-to-book ratio, higher share of fixed capital in assets, higher financial leverage, lower share of cash in assets. These observations are not exactly surprising since modern corporate bond issuers also tend to be larger corporations, with more fixed capital to offer as collateral, and higher leverage ratios. To account for these differences, we include the pre-treatment value of these characteristics as control in our regression analysis and carry several robustness checks to address the implications of these differences.

A more critical concern with respect to our identification strategy is the possibility that treated and untreated firms were trending differently over the period we study. To alleviate this concern, we look at pre-treatment changes in firm characteristics between 1931 and 1932. Panel A of Table 3 shows there is no statistically significant differences between the two group of firms, for any of the twelve characteristics considered. Thus, in the pre-treatment period, we find no evidence of violation of the important parallel trend assumption.

Given the differences in characteristics documented above, our baseline specification is a generalized difference-in-differences panel regression including a rich set of control:

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

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). 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. Pre-treatment characteristics are added as control to correct for potential non-random assignment. The characteristics are also interacted with year-specific dummies to allow for a time varying relationship between characteristics and investment rates.

5.2 Investment

Column (1) of Panel A in Table 4 reports estimates for the coefficient β_1 of equation (2), where $p_t = 0$ for 1931 and 1932, and $p_t = 1$ for 1933 and 1934. Column (1) shows there is a negative univariate relationship between d_i and the change in investment. This negative relationship persists when controls and fixed effects are added to the regression, as shown in column (2). In the later specification, the coefficient estimate is -4.9%. This implies that the change in net investment following treatment is estimated to be lower by 4.9% for a firm with $d_i = 1$ compared to a firm with $d_i = 0$. The average treated firm has 43% of its liabilities denominated in gold ($d_i = 0.43$). Thus, for the average exposed firm, leverage risk lead to a reduction in annual investment equal to $0.43 \cdot -4.9\% = -2.1\%$ of installed capital.

These results confirm 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.

5.3 Reversal

An especially attractive feature of our empirical setting is the ability to assess the impact of treatment reversal when the Supreme Court upheld the abrogation of gold clauses in 1935. Since the Court's decision effectively eliminated leverage risk, the effect of gold clause exposure on investment should quickly vanish after the ruling. We examine the impact of the decision by reestimating (2) with $p_t = 0$ for 1933 and 1934, and $p_t = 1$ for 1935 and 1936.

Panel B of Table 2 reports the pre-reversal changes in firms characteristics between 1933 and 1934. We do not see statistically significant differences between the two groups of firms, except for the market-to-book ratio: the market value of equity of firms without exposure to leverage risk recovered between 1933 and 1934, while the market capitalization of exposed firms stagnated. According to the Q theory of investment, firms with higher market-to-book ratio should invest more. Thus our empirical approach might be biased against finding the reversal effect on investment we expect for exposed firms.

Nonetheless, Panel B of Table 4 reports that the expected reversal did occur. Column (1) shows that the estimate of β_1 is 4.5%, which is of similar magnitude as treatment effect reported in Panel A (-5.6%). Adding controls to the panel regression strengthens the estimated positive investment effect of the relief by 2.5%, while also increasing statistical significance. This reversal is strong evidence that the lower investment rates for firms with gold-denominated debt firms during the earlier period were indeed driven by their exposure to leverage risk during 1933 and 1934. An alternative explanations would not only need to explain the association between d_i and the path of investment rates from 1931–1932 to 1933–1934, but also the reversal that occurred between 1933–1934 to 1935–1936 upon elimination of leverage risk. (FOR THE TREATMENT

REVERSAL, AT WHICH TIME ARE THE CHARACTERISTICS SAMPLED? **10) The Table notes says "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."**)

5.4 Equity payouts

I will label the columns in the table more uniquely to make the reading easier here.

Why does leverage risk lower investment in productive capital? One possibility is that leverage risk reduces firms' demand for investment goods, either because of debt overhang issues (e.g., Myers (1977), Hennessy (2004)) or because it generates fundamental uncertainty (e.g., Dixit and Pindyck (1994), Bloom (2009)). Another possibility is that leverage risk discourages investors from extending additional credit to corporations, generating financial frictions that limit firms' ability to invest. To study which of these two channels are more likely to drive our results, we analyze equity payouts. (WE SHOULD WRITE HERE WHAT IS THE PRECISE DEFINITION OF EQUITY PAYOUT THAT WE ARE USING IN OUR REGRESSIONS. I FORGOT IT. **11) Variable definitions including this one are in the corresponding Section in the Appendix.**)

According to the dynamic debt overhang theory of Hennessy (2004), the optimal policy of distressed firms is to pay out a high dividend rate. The intuition is that, because shareholders lose their claim on long term assets upon default, they prefer to payout rather than invest available funds during distress times. On the opposite, we would expect firms facing tighter financial constraints to reduce equity payouts to increase their available liquidity. We test these contrasting empirical implications by reestimating equation (2) with equity payout as dependent variable.

Consistent with the implications of debt overhang, Panel A Table 5 shows that firms with greater exposure to gold-denominated debt *increased* their equity payouts more upon the emergence of leverage risk. The coefficient estimate is 2.9% and is marginally statistically significant. Also consistent with debt overhang, Panel B of Table 5 shows that, following the elimination of leverage risk, firms with more exposure to gold clauses reduced their equity payouts more. The coefficient is -4.4% and statistically significant. Taken together, our joint results on investment and equity payout suggest that leverage risk reduced firms' demand for investment goods.

5.5 Credit ratings

Debt overhang should be most severe for firms closer to default (see Myers (1977) and Hennessy (2004)). We test this hypothesis by adding to equation (2) an indicator variable for firms with low credit rating, $\mathbb{I}_{\text{low rating},i}$:

$$\text{Net investment}_{i,t} = \beta_0 + \beta_1 d_i p_t + \beta_2 d_i p_t \mathbb{I}_{\text{low rating},i} + \sum_j \sum_\tau \beta_{j,\tau} \mathbb{I}_{t=\tau} X_{i,j} + \alpha_i + \delta_t + u_{i,t}. \quad (3)$$

A firm's credit rating is deemed low if any of its bond is rated below "Baa" by Moody's at the end of 1932 (MAKE SURE THIS DEFINITION IS ACCURATE **12) It is not. As the corresponding Table note already says, low rating is a C rating. Let me know if you want to mention this here too.**).

Table 5 reports the estimation results of equation (3). We do not find a statistically significant stronger divestment effect among firms with lower credit ratings. This is likely because, for many distressed firms, decreasing investment further would require selling fixed capital. The adjustment costs involved, combined with weak demand for capital goods at the time, would likely make the sale unprofitable. Adjusting equity payout, however, is arguably subject to less frictions.

Table 5 also reports the estimation of equation (3) with equity payout as dependent variable. The coefficient on the interaction term is Panel A is 0.045 and statistically significant, implying that firms with lower credit ratings increased equity payout more upon the emergence of leverage risk. Consistently, Column Y of Panel B shows that the reversal effect in equity payout following the Court's decision was also stronger for low rated firms. Our equity payout results thus suggest that leverage risk created a more severe debt overhang problem for firms initially closer to default. (THE EQUATION AT THE BOTTOM OF THE ORIGINAL TABLE THAT REFERRED TO THESE RESULTS DID NOT INCLUDE THE CHARACTERSITICS AS CONTROL.)

6 Alternative explanations

In this section, we conduct several robustness exercises. We first show that the distress of the banking sector did not materially impact public firms, and provide further evidence that financial frictions do not explain our results. We also show that the industry specific policies of the National Industrial Recovery Act (NIRA) cannot explain the investment gap we document. We then establish that the devaluation of the dollar did not impact firms differentially based on their exposure to gold-denominated debt. Lastly, we show that our results are robust to a wide range of alternative specifications and carry various falsification tests.

6.1 Credit constraints

6.1.1 Bank loans

In a seminal paper, Bernanke (1983) argues that the disruptions of the banking sector during the Great Depression reduced the supply of credit available to borrowers. While the contraction in bank credit might explain why smaller firms reduced their investment, this channel is unable to explain the investment gap related to gold clause exposure for at least two reasons.

First, as Bernanke (1983) acknowledges, "most larger corporations entered the decade with sufficient cash and liquid reserves to finance operations and any desired expansions". Consistent with this assessment, the large public firms in our sample have about 10% of their assets in cash and liquid assets throughout the 1931 to 1936 period. This amount of cash would have been sufficient to finance the investment gap caused by leverage risk for about three years for firms with $d = 1$. Second, public firms seldom relied on bank debt as a source of financing. As shown in Table 1, bank loans on average contribute to 1% of total liabilities, which is an order of magnitude smaller than the contribution of corporate bonds.

Nonetheless, we test whether firms' reliance on bank debt can explain the investment gap by replacing our usual measure d_i by the share of bank debt in total liabilities. Specification (2) of Table 7 shows that this alternative measure of exposure cannot explain cross-sectional variation in investment.

6.1.2 Corporate bonds

In related work, Benmelech, Frydman, and Papanikolaou (2018) show that firms with corporate bonds maturing during the Great Depression were subject to greater financial frictions because public bond markets shut down during the crisis. Since firms with more gold-denominated corporate bonds were more likely to have a bond issue maturing during the crisis (or at any point in time), a concern is that our leverage risk measure d_i might simply proxy for the credit constraints of firms with maturing bond issues.

To rule out this possibility, we collect data on the maturity date of the bond issues and remove from the sample any firm with a bond issue maturing in 1933 or 1934. The procedure eliminates 31 firms from the sample. Specification (6) of Table A1 reports that our main results remain unchanged using this alternative sample. Leverage risk matters even for firms that did not have bonds maturing during the Great Depression.

6.2 New Deal policies

Following the inauguration of Roosevelt in early 1933, a series of programs, public projects, financial reforms and regulations were enacted. Collectively referred to as the New Deal, the most important initiatives included the Emergency Banking Act, the Glass–Steagall Act, the Agricultural Adjustment Act (AAA), and the National Industrial Recovery Act (NIRA). The effect of these reforms on the economy are still debated to this day, with many economists suggesting that the New Deal policies kept the economy depressed beyond 1933 (see Cole and Ohanian (2004) for a discussion of the New Deal and its impact). If firms with more gold-denominated debt were incidentally more affected by New Deal policies, the association between leverage risk and investment might be spurious.

Studying the effect of the NIRA on the recovery, Cole and Ohanian (2004) argue that the industrial codes included in the act created labor market rigidities that kept the economy depressed.

The NIRA codes prescribed specific operating rules that applied to all firms within an industry, but some industries faced tighter restrictions than others. Similarly, the AAA introduced regulations specific to the agricultural sector, and the two banking acts were directed at the financial sector.[12] Thus, to control for the potentially confounding effects of the New Deal policies on our results, we add industry–year fixed effects to equation (2) and reestimate the model.

Table 8 reports the results. Including industry–year fixed effect to the regression model does not change the economic magnitude of our results by much. Specification (2) of Panel A shows that, when industry–year fixed effects are included, the estimated treatment effect coefficient is -4.1% (as opposed to -4.9% without). Similarly, specification (2) of Panel B shows that the estimated treatment reversal coefficient is 7.1% when industry–year fixed effects are included (as opposed to 7.5% without). The statistical significance of our results is, however, slightly weaker once industry–year fixed effects are included. Overall, the results suggest that leverage risk remains important even after controlling for the effect of the New Deal policies. (THE EQUATION AT THE BOTTOM OF THE TABLE DOESN'T SHOW THE INDUSTRY–YEAR FIXED EFFECT (OR THEY ARE CONSIDERED PART OF X?))

6.3 Dollar devaluation

In their study of the early stages of the recovery, Hausman, Rhode, and Wieland (2017) show that the devaluation of the dollar in 1933 lead to a large increase in traded crop prices, leading to a higher demand for goods in the agricultural regions of the country. If firms with little exposure to gold-denominated debt incidentally benefited more of the rise in demand, it could explain why those firms invested more.

To determine if the investment gap we document could be explained by demand shocks, we reestimate equation (2) with sales growth and profitability as dependent variables. Table 9 reports the results. There is no significant relationship between the gold content of a firm's liabilities and either of these two dependent variables. It is thus unlikely that our results can be attributed to a

[12]Financial firms are excluded from our analysis, and as previously discussed, the public firms included in our sample did not rely on bank debt as a source of financing

positive demand shock specific to firms without exposure to gold clauses.

6.4 Robustness

We experiment with various alternative measures of investment and exposure to gold clauses to determine the robustness of our results. We verify that non-linearity in the relationship between investment and control variables are not inducing bias in our estimation. We show there is no relation between investment and long-term liabilities *not* denominated in gold. We conduct a time series placebo test. (PAPANIKOLAOU ALSO DO A ROBUSTNESS TEST USING ONLY FIRMS THAT HAD SOME BONDS MATURING IN THE GREAT DEPRESSION. THE EQUIVALENT ROBUSTNESS TEST HERE WOULD BE TO RUN OUR REGRESSIONS INCLUDING ONLY FIRMS WITH D>0. DO YOU THINK WE SHOULD DO IT?)

6.4.1 Alternative variable definitions

In Table A1, we present the estimation results for various alternative specification. 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. Both our results for the emergence (Panel A) and elimination (Panel B) of leverage risk are robust to all of those alternative specifications.

6.4.2 Non linear controls

We also verify that our results are robust to the inclusion of non-linear controls and reestimate equation (2) using characteristics decile dummies. Doing so greatly increases the number of regressors, and because of the size of our sample, we include in the regression one control variable at a time. Table 6 reports the results. Overall, the inclusion of non linear control does not change our coefficient estimates and their significance by much.

6.4.3 Long term liabilities

To ensure that our results are not driven by the differential exposure to macroeconomic shocks related to the duration of firms 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 investment rates upon the emergence of leverage risk in 1933 or its elimination in 1935.

6.5 Time series placebo

Measuring the effect of exposure to gold clauses on investment before the abrogation of gold clauses can serve as a way to evaluate the validity of our leverage risk measure. (WE NEED TO DISCUSS OUR TIME SERIES PLACEBO REGRESSION BEFORE I WRITE THIS SECTION)

7 Aggregate implications

Under additional assumptions, our firm-level estimates may be aggregated to determine the total effect of leverage risk. This aggregation exercise sheds light on the macroeconomic significance of our results, and helps address the following two questions: What would have happened to investment if the Supreme Court had preempted leverage risk by ruling the abrogation constitutional immediately after Congress passed the joint resolution in June 1933? What would have been the consequences for investment if, instead of being eliminated in early 1935, leverage risk had persisted over 1935–1936.

To address the first question, we abstract from general equilibrium effects and assume that, in the absence of leverage risk in the economy, all firms would invest as if they had no exposure to gold clauses (as if $d_i = 0$). Under these additional assumptions, the rate of aggregate investment foregone due to leverage risk in 1933 and 1934 is given by:

$$\text{Leverage risk effect}_t = \frac{\beta_1 \sum_i d_i \text{Fixed capital}_{t-1}}{\sum_i \text{Fixed capital}_{t-1}}, \tag{4}$$

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). Similarly, the aggregate effect of the elimination of leverage risk in 1935 and 1936 can be estimated as in equation (4) where β_1 is the treatment reversal estimate in Panel B of Table 4.(WE SHOULD BE MORE SPECIFIC ABOUT WHERE THE COEFFICIENT β_1 IS COMING FROM, I.E., MENTION FROM WHICH SPECIFICATION IN THE TABLE.)

Table 10 reports the results. The first row of Panel A shows that, in 1933 and 1934, the aggregate net investment rates of public firms where −2.91% and −2.82% respectively.[13] The second row shows that our estimates of the leverage risk effect based on equation (4) are −1.00% and −0.92% among $d > 0$ firms, respectively. Thus our estimates imply that preempting leverage risk would have cut divestment by approximately one-third in 1933 and 1934. Panel B of Table 10 shows that, among $d > 0$ firms, leverage risk accounts for about half of the divestment in 1933 and 1934.

The last two columns of Panel A report that, in 1935 and 1936, aggregate net investment rates were -1.09% and 1.61% respectively. Our estimates of the aggregate effect of the elimination of leverage risk are 1.41% and 1.46% respectively. Thus the Supreme Court decision cut divestment in 1935 by more than half, and accounts for almost all of the positive net investment in 1936.

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. We find that leverage risk lead public firms to delay investment in fixed capital by two years. This channel complements existing explanations of the delayed recovery based on the disruption of credit intermediation, which is more applicable to smaller firms.

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

8 Conclusion

This paper shows that the 1933 abrogation of gold clauses played a significant role in the slow recovery of corporate investment from the Great Depression. The threat of gold clause enforcement exposed many public firms to the risk of a 69% increase in bond payments. Firms more exposed to that risk reduced their investment more. At the aggregate level, leverage risk explains one-third of the total decline in investment among public firms over 1933 and 1934. Once the Supreme Court upheld the abrogation of gold clauses in 1935, the investment rate of firms initially exposed to leverage risk recovered quickly.

Firms exposed to leverage risk did not rely on bank financing, were not financially constrained, and increased their equity payouts. These observations are consistent with a decrease in firms' demand for capital goods caused by debt overhang and increased capital structure uncertainty. This mechanism complements explanations of the slow recovery based on the availability of bank credit emphasized by Bernanke (1983), which public firms did not rely on.

Bond contracts no longer include gold clauses, but our results nonetheless shed light on important modern issues. Since debt contracts are mostly denominated in nominal terms, uncertainty about future inflation translates into uncertainty about the future real debt burden of bond issuers. We provide evidence that firms react to such uncertainty by reducing their investment in fixed capital. Our results thus lend support to the notion that debt deflation can have important real consequences (Fisher (1933), Gomes, Jermann, and Schmid (2016)).

In addition, emerging market corporations often issue bonds denominated in foreign currencies. The risk of a local currency devaluation therefore exposes these issuers to leverage risk. The case of the Argentine crisis of 1998-2002 is a prime example. But Argentina is by no means an isolated example; similar currency crises happened in other developing nations where corporations rely heavily on U.S. denominated debt such as Mexico, Turkey, Indonesia, and Chile. Quantifying the impact of leverage risk during emerging market crises is a promising path for future research.

Appendix

A Variable definitions

The Moody's Manual in year t usually reports annual balance sheet and income statement data from year $t-7$ to $t-1$. In any case, 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 (market) 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 5 are denominated by fixed capital in 1931 for emergence, and fixed capital in 1933 for elimination.

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Table 1: Summary Statistics

Variable	Firms	N	Mean	SD	5%	25%	50%	75%	95%
Panel A: 1931 - 1932									
Net investment	475	741	-0.06	0.13	-0.35	-0.08	-0.04	-0.00	0.06
Book leverage	475	741	0.39	0.30	0.03	0.14	0.34	0.55	0.92
Market leverage	475	741	0.55	0.31	0.07	0.27	0.57	0.86	0.98
Pref. shares/Assets	475	741	0.14	0.19	0.00	0.00	0.05	0.24	0.50
Log(Assets)	475	741	17.10	1.33	15.05	16.17	16.97	17.91	19.50
Tobin's Q	475	741	0.81	0.59	0.21	0.46	0.66	0.97	2.10
Payout/Fixed capital	475	741	0.13	0.30	-0.00	0.00	0.02	0.11	0.72
Noncurrent assets/Assets	475	741	0.61	0.23	0.20	0.46	0.65	0.79	0.94
Cash/Assets	475	741	0.12	0.13	0.01	0.04	0.08	0.16	0.35
Profitability	475	741	0.03	0.12	-0.14	-0.04	0.02	0.08	0.23
Bank debt/Liabilities	468	729	0.03	0.10	0.00	0.00	0.00	0.00	0.21
d	475	741	0.11	0.23	0.00	0.00	0.00	0.00	0.67
$\mathbb{I}_{d>0}$	475	741	0.26	0.44	0.00	0.00	0.00	1.00	1.00
Panel B: 1933 - 1934									
Net investment	509	777	-0.04	0.13	-0.26	-0.06	-0.03	-0.00	0.09
Book leverage	509	777	0.44	0.39	0.04	0.15	0.37	0.64	0.99
Market leverage	509	777	0.46	0.32	0.04	0.15	0.42	0.78	0.98
Pref. shares/Assets	509	777	0.15	0.23	0.00	0.00	0.04	0.24	0.57
Log(Assets)	509	777	17.14	1.46	14.94	16.11	17.01	18.00	19.82
Tobin's Q	509	777	1.36	1.31	0.39	0.71	0.93	1.47	4.34
Payout/Fixed capital	509	777	0.08	0.20	-0.01	0.00	0.00	0.06	0.53
Noncurrent assets/Assets	509	777	0.57	0.26	0.12	0.38	0.59	0.79	0.95
Cash/Assets	509	777	0.13	0.14	0.01	0.04	0.09	0.16	0.39
Profitability	509	777	0.05	0.11	-0.08	-0.00	0.03	0.08	0.32
Bank debt/Liabilities	493	753	0.04	0.12	0.00	0.00	0.00	0.00	0.25
d	509	777	0.13	0.24	0.00	0.00	0.00	0.18	0.72
$\mathbb{I}_{d>0}$	509	777	0.31	0.46	0.00	0.00	0.00	1.00	1.00
Panel C: 1935 - 1936									
Net investment	490	795	-0.01	0.11	-0.15	-0.04	-0.01	0.02	0.15
Book leverage	490	795	0.48	0.48	0.04	0.20	0.39	0.66	1.09
Market leverage	490	795	0.40	0.32	0.03	0.12	0.32	0.67	0.98
Pref. shares/Assets	490	795	0.15	0.23	0.00	0.00	0.00	0.24	0.60
Log(Assets)	490	795	17.09	1.41	15.09	16.10	16.93	17.96	19.74
Tobin's Q	490	795	2.14	2.33	0.52	0.91	1.32	2.31	6.54
Payout/Fixed capital	490	795	0.14	0.34	-0.09	0.00	0.02	0.11	1.30
Noncurrent assets/Assets	490	795	0.51	0.28	0.00	0.29	0.51	0.73	0.95
Cash/Assets	490	795	0.14	0.14	0.01	0.05	0.10	0.18	0.42
Profitability	490	795	0.10	0.12	-0.04	0.02	0.06	0.13	0.40
Bank debt/Liabilities	479	769	0.04	0.13	0.00	0.00	0.00	0.00	0.29
d	490	795	0.12	0.23	0.00	0.00	0.00	0.11	0.68
$\mathbb{I}_{d>0}$	490	795	0.28	0.45	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 characteristics 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	0.33	0.55	0.00
Market leverage	0.49	0.71	0.00
Pref. shares/Assets	0.14	0.14	0.90
Log(Assets)	16.77	18.07	0.00
Tobin's Q	0.80	0.84	0.36
Payout/Fixed capital	0.15	0.07	0.00
Noncurrent assets/Assets	0.58	0.71	0.00
Cash/Assets	0.13	0.10	0.01
Profitability	0.04	0.02	0.13
Bank debt/Liabilities	0.03	0.02	0.33
Panel B: 1933 - 1934			
Net investment	-0.03	-0.05	0.05
Book leverage	0.36	0.60	0.00
Market leverage	0.37	0.65	0.00
Pref. shares/Assets	0.15	0.15	0.67
Log(Assets)	16.71	18.07	0.00
Tobin's Q	1.42	1.23	0.06
Payout/Fixed capital	0.10	0.04	0.00
Noncurrent assets/Assets	0.52	0.69	0.00
Cash/Assets	0.14	0.09	0.00
Profitability	0.06	0.03	0.01
Bank debt/Liabilities	0.04	0.01	0.00
Panel C: 1935 - 1936			
Net investment	-0.01	-0.01	0.89
Book leverage	0.42	0.61	0.00
Market leverage	0.34	0.54	0.00
Pref. shares/Assets	0.15	0.14	0.57
Log(Assets)	16.74	18.00	0.00
Tobin's Q	2.31	1.73	0.00
Payout/Fixed capital	0.17	0.06	0.00
Noncurrent assets/Assets	0.46	0.62	0.00
Cash/Assets	0.16	0.10	0.00
Profitability	0.10	0.08	0.10
Bank debt/Liabilities	0.05	0.03	0.02

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: Pretreatment changes in characteristics

Variable	$d = 0$	$d > 0$	p-val.
	Panel A: Δ1932		
Net investment	-0.04	-0.06	0.30
Book leverage	0.02	0.01	0.55
Market leverage	0.01	0.01	0.89
Pref. shares/Assets	0.02	0.01	0.73
Log(Assets)	-0.13	-0.10	0.22
Tobin's Q	-0.00	-0.04	0.63
Payout/Fixed capital	-0.06	-0.04	0.68
Noncurrent assets/Assets	-0.00	0.01	0.25
Cash/Assets	0.01	0.01	0.95
Profitability	-0.04	-0.03	0.55
Bank debt/Liabilities	-0.01	-0.01	0.63
	Panel B: Δ1934		
Net investment	0.03	0.01	0.37
Book leverage	0.02	-0.01	0.13
Market leverage	-0.02	-0.02	0.55
Pref. shares/Assets	0.00	0.01	0.84
Log(Assets)	-0.01	-0.02	0.67
Tobin's Q	0.13	0.03	0.06
Payout/Fixed capital	0.02	0.00	0.07
Noncurrent assets/Assets	-0.02	-0.02	0.44
Cash/Assets	0.01	-0.00	0.08
Profitability	0.00	0.00	0.88
Bank debt/Liabilities	0.01	0.00	0.20

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 4: The impact of leverage risk on investment

	Panel A		Panel B	
	(1)	(2)	(1)	(2)
$d_i p_t$	-0.073	-0.007	0.055	0.053
	[-4.04]	[-0.18]	[2.64]	[2.64]
R^2	0.013	0.373	0.015	0.397
No. of firms	121	121	490	490
No. of obs.	421	421	1545	1545
FE	No	Yes	No	Yes

Notes: [ADJUST THIS EXPLANATION, (1) IS REGULAR DiD (2) IS GENERALIZED DiD]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: The impact of leverage risk on equity payouts

	Net investment		Equity payout	
	(1)	(2)	(1)	(2)
Panel A				
$d_i p_t$	-0.065	-0.058	0.033	0.029
	[-3.20]	[-2.74]	[1.77]	[1.49]
$d_i p_t \mathbb{I}_{\text{low rating},i}$		-0.077		0.049
		[-0.89]		[2.41]
Overall R^2	0.373	0.373	0.850	0.850
Within R^2	0.037	0.038	0.083	0.083
No. of firms	475	475	463	463
No. of obs.	1476	1476	1334	1334
Panel B				
$d_i p_t$	0.053	0.052	-0.033	-0.026
	[2.64]	[2.57]	[-2.67]	[-2.10]
$d_i p_t \mathbb{I}_{\text{low rating},i}$		0.010		-0.092
		[0.07]		[-2.11]
Overall R^2	0.397	0.397	0.815	0.815
Within R^2	0.035	0.035	0.037	0.040
No. of firms	490	490	465	465
No. of obs.	1545	1545	1394	1394

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 6: Leverage risk and investment with controls decile x year fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Panel A				
$d_i p_t$	-0.041	-0.053	-0.060	-0.034	-0.054	-0.062	-0.043	-0.051
	[-2.00]	[-2.04]	[-2.37]	[-1.69]	[-2.37]	[-3.27]	[-2.01]	[-2.68]
Overall R^2	0.396	0.383	0.391	0.394	0.392	0.392	0.391	0.397
Within R^2	0.073	0.053	0.065	0.069	0.066	0.066	0.066	0.074
No. of firms	475	475	475	475	475	475	475	475
No. of obs.	1476	1476	1476	1476	1476	1476	1476	1476
				Panel B				
$d_i p_t$		0.050	0.062	0.057	0.057	0.059	0.066	0.066
	[]	[2.49]	[2.89]	[2.78]	[2.85]	[2.75]	[3.34]	[3.65]
Overall R^2	0.411	0.422	0.405	0.416	0.410	0.413	0.414	0.415
Within R^2	0.055	0.074	0.048	0.065	0.054	0.060	0.061	0.063
No. of firms	490	490	490	490	490	490	490	490
No. of obs.	1545	1545	1545	1545	1545	1545	1545	1545

Notes: [ADJUST THIS EXPLANATION,controls start in year 2, the order has changed too] 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 7: The impact of other long-term liabilities and bank debt on investment

	Panel A		Panel B	
	(1)	(2)	(1)	(2)
$d_i^{alt} p_t$	-0.011	0.211	-0.002	0.048
	[-0.85]	[1.37]	[-0.15]	[0.61]
Overall R^2	0.396	0.398	0.408	0.408
Within R^2	0.072	0.075	0.051	0.051
No. of firms	475	475	490	490
No. of obs.	1476	1476	1545	1545
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)
$d_i p_t$	-0.058	-0.050	0.055	0.059
	[-2.48]	[-2.11]	[2.67]	[2.82]
Overall R^2	0.446	0.463	0.465	0.478
Within R^2	0.149	0.175	0.143	0.164
No. of firms	475	475	490	490
No. of obs.	1476	1476	1545	1545
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
$d_i p_t$	0.011	-0.020	-0.017	-0.019
	[0.23]	[-0.72]	[-0.50]	[-1.04]
Overall R^2	0.380	0.854	0.513	0.892
Within R^2	0.030	0.102	0.007	0.177
No. of firms	358	454	471	468
No. of obs.	756	1320	1213	1417

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: Total effect of leverage risk on investment in the sample

	1933	1934	1935	1936
Panel A: All firms				
Total net investment in %	-2.77	-2.69	-1.19	0.62
Leverage risk effect in %	-1.35	-1.26	0.97	1.02
Panel B: $d > 0$ firms				
Total net investment in %	-3.15	-2.70	-1.76	-0.22
Leverage risk effect in %	-1.79	-1.75	1.41	1.52

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

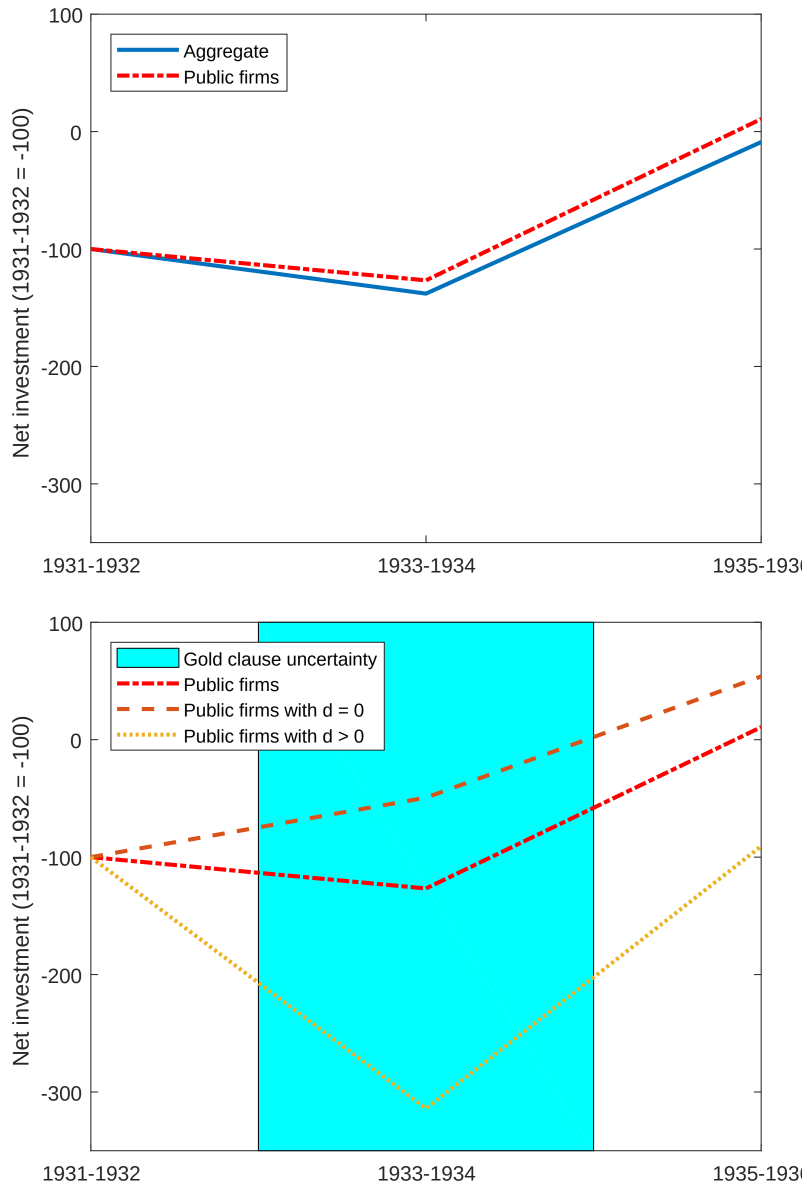
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A			
$d_i p_t$	-0.027	-0.041	-0.038	-0.025	-0.089	-0.050
	[-1.67]	[-1.47]	[-1.76]	[-2.29]	[-2.19]	[-2.89]
Overall R^2	0.394	0.395	0.388	0.400	0.397	0.397
Within R^2	0.070	0.069	0.076	0.078	0.074	0.073
No. of firms	475	475	441	468	475	446
No. of obs.	1476	1476	1373	1449	1476	1383
			Panel B			
$d_i p_t$	0.055	0.066	0.079	0.036	0.116	0.063
	[2.98]	[3.00]	[3.49]	[5.61]	[3.26]	[2.61]
Overall R^2	0.410	0.397	0.414	0.417	0.421	0.419
Within R^2	0.055	0.055	0.060	0.063	0.072	0.069
No. of firms	490	490	453	483	490	460
No. of obs.	1545	1545	1414	1518	1545	1442

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

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

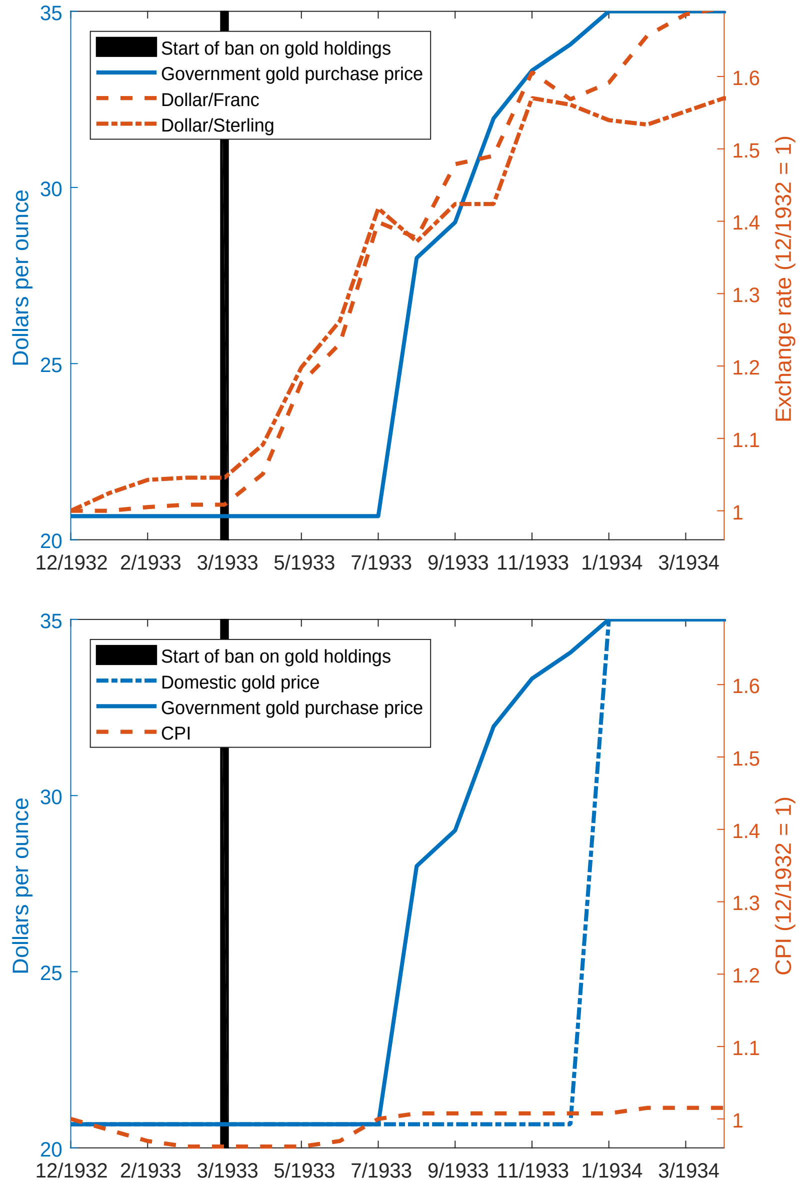
where i indexes firms, t is year, p_t is the post-treatment indicator, $X_{i,j}$ are pre-treatment firm characteristics interacted with year dummies $\mathbb{I}_{t=\tau}$, and α_i is firm fixed effects (FE). Results in Panel A use data from 1931 to 1934, and set $p_t = 1$ for 1933 and 1934. Results in 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.

Figure 1: Aggregate investment and total investment in the sample



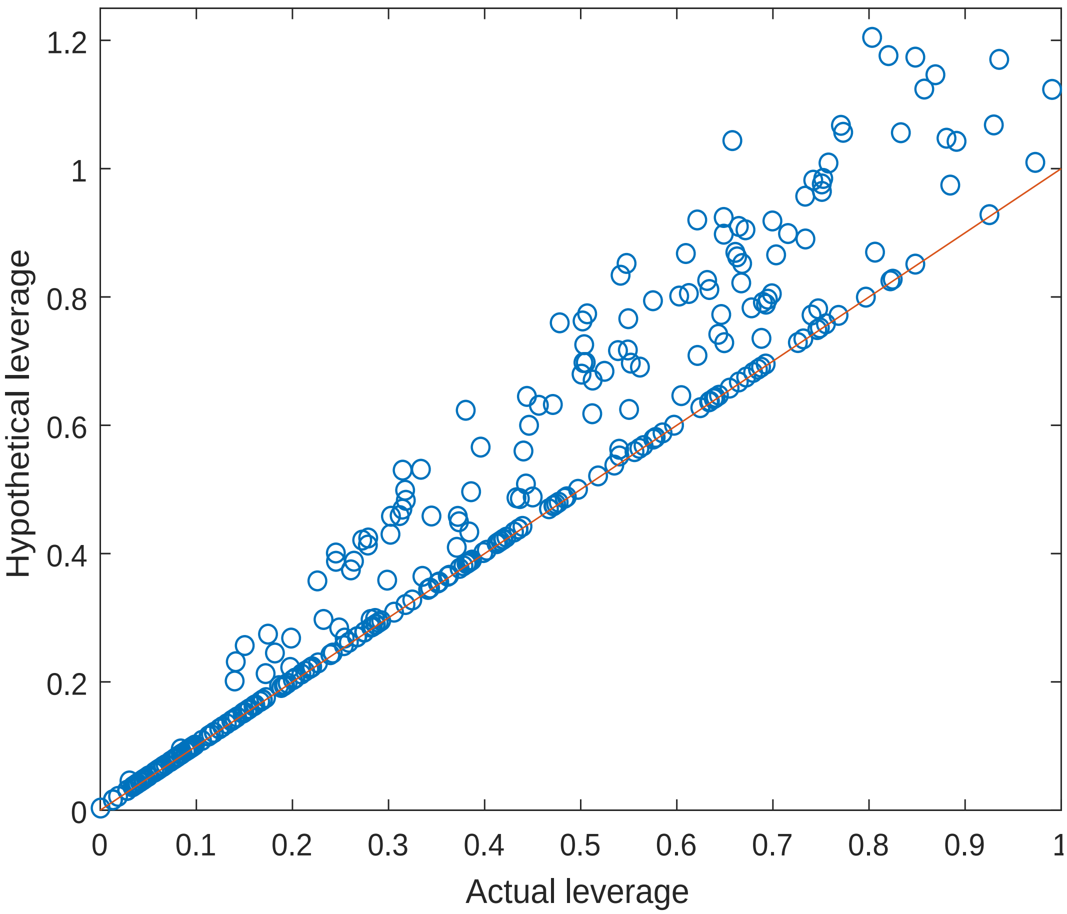
Notes: Figure plots the path of investment in three two-year periods: 1931 - 1932, 1933 - 1934, 1935 - 1936. Aggregate investment is net fixed private domestic investment from the BEA. Public firms' investment is the total net investment by firms in our sample adjusted for variations in the size of our 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.

Figure 3: The impact of gold clause reinstatement on financial leverage



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.