# 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 on the slow recovery of corporate investment following the Great Depression. Legal challenges to the abrogation's constitutionality exposed many firms to a potential 69% increase in bond payments. Public firms with higher exposure to this risk reduced their investment in 1933 and 1934 followed by a recovery upon the Supreme Court's 1935 decision to uphold the abrogation. In the cross-section, decreases in investment over 1933 and 1934 coincide with increases in equity payouts. The risk of higher leverage accounts for one-third of public firms' divestment over 1933 and 1934.

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# 1 Introduction

The Great Depression led to a remarkable contraction in private investment that persisted throughout the first years of recovery: despite aggregate output 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 limits researchers' ability to study this episode. Using newly hand-collected firm-level data, we show that much of the divestment by public U.S. firms over 1933 and 1934 was driven by the 1933 abrogation of gold clauses, a dramatic legal development that threatened many corporate bond issuers with bankruptcy.

Prior to 1933, corporate bond issuers commonly indexed 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 the 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 U.S. corporate sector. At the bottom of the worst economic collapse on record, enforcing gold clauses would have greatly increased the debt burden of nearly all corporate bond issuers.[2]

To safeguard against this threat, Congress passed a joint resolution in June 1933 voiding gold clauses in all existing and future contracts. Resenting this decision, several bond holders filed lawsuits to contest the constitutionality of the 1933 resolution voiding gold clauses and to request that bond payments be indexed to gold as originally promised. Over the rest of 1933 and 1934, the validity of Congress's action was on trial, with several 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 resolution, issuers would have to index bond

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

[2] In the sample of public industrial firms, 97% of all bond amounts outstanding were subject to a gold clause in 1933.

payments to the new gold price, resulting in higher leverage.

Finally, in February 1935, the Supreme Court announced a ruling on the court cases. In a narrow 5-4 decision, the Court ruled the resolution to be constitutional, confirming the abrogation of gold clauses and 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 thus have increased by 69%. Although the threat of an increase in leverage did not ultimately materialize, corporate issuers nonetheless experienced substantial uncertainty regarding their future liabilities between the 1933 abrogation and the Supreme Court's early 1935 decision. In this paper, our goal is to identify and quantify the impact of this uncertainty on corporate investment.[3]

Figure 1 presents suggestive evidence of the impact of leverage risk on investment during the Great Depression. First, the top panel of the figure shows that public firms, like private firms, experienced a lengthy contraction in investment. This observation is significant, because large firms, with their ample cash holdings, were mostly insulated from the distress of the financial intermediation sector (see Lutz (1945), Hunter (1982), Bernanke (1983), and Calomiris and Mason (2003)). A closer inspection of the data, however, reveals that much of the observed slump in public firms' investments over 1933–1934 was driven by firms exposed to leverage risk. The bottom panel of Figure 1 indeed shows that public firms *not* exposed to the gold clause exhibit an earlier recovery in investment when compared to the overall private sector, while the opposite is true for exposed firms. The figure also shows that, following the 1935 Supreme Court decision to uphold the abrogation, the investment of exposed firms recovers sharply.

Beyond improving our understanding of the Great Depression, our results shed new light on current economic issues. While gold clauses are no longer included in modern bond contracts, many firms in emerging economies issue bonds denominated in foreign currencies. The possibility of a local currency depreciation exposes these issuers to leverage risk, much like gold clauses

[3]See Section 3 for details about the historical background relevant to our study.

exposed U.S. issuers to the risk of a dollar devaluation in the 1930s. For example, at the onset of the 1998–2002 Argentine crisis, 97% of Argentine corporate bonds were denominated in U.S. dollar (see Bedoya, González, Pernice, Streb, Czerwonko, and Díaz Santillán (2007)) and the peso was pegged to the US dollar. As the crisis unfolded, political and economic instability raised the possibility of a future devaluation of the peso (see Daseking, Ghosh, Thomas, and Lane (2004)), generating leverage risk. Our results suggest that firms react to this type of uncertainty by cutting investment in fixed capital, which may help explain the 30% decline in Argentina's rate of capital formation between 1997–2001.[4]

Unlike U.S. issuers of bonds with gold clauses, Argentine borrowers eventually experienced an adverse shock to leverage when the country abandoned the dollar peg in January 2002. In the months that followed the devaluation, the peso lost 70% of its value against the U.S. dollar. Because most bond issuers earned their revenues in pesos, many firms became unable or unwilling to pay their U.S. dollar denominated obligations, which led to a wave of bankruptcies and lengthy debt restructurings.[5] The fate of Argentine issuers following the devaluation is thus useful to illustrate the dire consequences of the *realization* of a leverage shock.[6] In contrast, the Supreme Court's 1935 decision to uphold the abrogation helps identify the effect of leverage *risk* on investment. The decision, which eliminated leverage risk while keeping firms' liabilities the same, should reverse the effect of exposure to gold denominated debt on investment. This unique feature of our empirical setting helps validate our identification strategy.

The modern relevance of leverage risk, however, is not limited to emerging economies. Would Greece, or any member of the eurozone, seek to exit and reestablish their own local currency, thorny issues related to existing debt contracts would arise: Enforcing contracts in euros, in accordance with the original terms, would expose Greek debtors to leverage risk as the reintroduced

[4] According to The World Bank, gross capital formation was $60 billion in 1997 and $42 billion in 2001.

[5] For instance, the restructuring of *In re Supercanal*, was completed in 2018 (see Hernández (2019)).

[6] The experience of Argentina is by no means an isolated example. In recent history, similar currency crises have occurred in developing nations such as Mexico, Turkey, Indonesia, and Chile, where corporations rely heavily on foreign denominated debt (see Edwards (2018)). For example, the corporate sector of Turkey is currently experiencing a debt crisis (see Koc and Ersoy (2018)) linked to the sustained devaluation and volatility of the lira against the U.S. dollar over the last few years. During the 1994–1995 Mexican peso crisis, Mexico experienced a speculative attack on its currency that culminated in the devaluation of the peso.

drachma could depreciate against the euro. Greece might be tempted to "abrogate the euro clause" and declare that existing debts can be discharged in new (depreciated) drachma, as Argentina attempted in 2002. Predictably, aggrieved creditors would bring suit—the precedent of the US abrogation of gold clauses looming over the litigations.[7,8] Leaving the monetary union would thus inevitably generate leverage risk; in light of our results, adverse consequences on capital formation must be expected. Gold clauses may be relics of the past, but the saga of their abrogation carries important insights relevant to this day.

More generally, our paper suggests a potential link between monetary policy uncertainty and the real economy. Because long term debt contracts are almost always denominated in nominal terms, deflation increases the real debt burden of issuers (see Fisher (1933) and Gomes, Jermann, and Schmid (2016)). As such, deflation risk generates leverage risk. Deflation risk is priced in financial markets and is negatively correlated with financial market outcomes and consumer confidence (see Fleckenstein, Longstaff, and Lustig (2017)). Leverage risk provides a channel through which deflation risk can affect the real economy.

To formally identify the effect of leverage risk on investment, we hand-collect data on balance sheets, income statements, and bond characteristics for all publicly traded industrial U.S. firms from 1930 to 1936. These data include 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. Our empirical setting, which features the sudden emergence and subsequent elimination of leverage risk (without the realization of an actual shock to leverage), provides a convincing framework to identify the impact of this type of risk on investment: the Supreme Court decision to uphold the abrogation acts as treatment reversal, following which the effect of gold exposure on investment

[7]According to Edwards (2018), during the legal proceedings that followed Argentina's attempt to "pesify" dollar denominated contracts, the country's legal team invoked the US gold clause abrogation as precedent, arguing that if the U.S. abrogation was legal, so was Argentina's repeal of dollar indexation.

[8]Discussing the implication of a hypothetical repudiation of the "euro clause", Edwards (2018) notes that "As a member of the European Union, Greece has to abide by European Union laws and regulations," and that European courts would ultimately rule on the issue. In addition, Edwards (2018) emphasizes that "Greece has also signed Bilateral Investment Treaties (BIT) with thirty-nine countries.... Thus, any attempt to change the currency of contracts will end up in arbitration at the International Center for Settlement of Investment Disputes (ICSID)."

should dissipate.

For the average firm with gold-denominated debt outstanding, we estimate that leverage risk led to a 2.6% annual reduction in 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 and 1936, following the Supreme Court's decision. Strikingly, firms more exposed to leverage risk actually increase their equity payout during 1933 and 1934; this difference also reverses following the Supreme Court's decision. Taken together, our results on investment and payout decisions suggest that firms exposed to leverage risk did not reduce their investments because of financial constraints.

Instead, the results are consistent with the optimal behavior of firms facing debt overhang (see Myers (1977)). The legal struggle over gold effectively increased exposed firms' expected future liabilities, thereby reducing equity holders' incentives to invest since more of the added value from new productive capital 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.[9] As the likelihood of default increases, equity holders choose to expropriate bondholders by extracting cash out of the firm through high equity payout. Consistent with theory, we further find that the impact on equity payout is stronger for firms with lower credit ratings prior to the abrogation of gold clauses. Our paper thus contributes to the empirical literature on debt overhang by analyzing the impact of a plausibly exogenous shock to expected future leverage on firms' investment and payout decisions.

Beyond increasing expected future leverage, the battle over the abrogation of gold clauses 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)). The literature argues that, when the outcome of an irreversible investment project is uncertain, waiting for the resolution of uncertainty before

[9]See section I.C in Hennessy (2004).

investing can be optimal. Although the literature typically emphasizes asset side uncertainty, our results suggest that capital structure uncertainty could also influence firms' investment decisions.

Intrinsically, leverage risk generates a combination of debt overhang and capital structure uncertainty, and quantifying the relative importance of the two channels remains a challenge since our empirical setting does not feature exogenous variations specific to each individual mechanism. Nonetheless, our empirical analysis clearly shows that the joint effect of these two channels on investment is important to understand the recovery from the Great Depression. In the other manifestations of leverage risk discussed above, such as the Argentine devaluation, the two channels similarly conflate.

Throughout the paper, our identification strategy relies on the assumption that firms with different amounts of gold-denominated debt outstanding were differentially affected by leverage risk, but were similarly exposed to other shocks relevant to investment decisions. The 1930s were inevitably rich in economic and political events that may challenge the validity of this assumption. For example, firms more heavily relying 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 the aggregate demand effects of the dollar's devaluation. A significant part of our analysis is devoted to addressing each of these potentially confounding channels.

First, disruptions in the financial sector during the Great Depression, which greatly limited some firms' access to bank credit (Bernanke (1983)), are unlikely to explain our findings, because public firms mostly did not rely on bank loans as a source of financing. In our sample, bank debt accounts for on average 3% of firms' total liabilities with gold-denominated debt as well as of other firms.[10] In our empirical tests, we further confirm that heterogeneity in firms' reliance on bank debt does not 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 a larger decline in employment because of a lack of access to credit. This raises the concern that heterogeneity in leverage risk might be

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

related to differences in credit constraints, because firms with more gold-denominated corporate bond issues were more likely to have a bond issue maturing during the crisis. Our results on equity payout alleviate this concern, and, more directly, we confirm that the leverage risk effect is significant among firms that did not have bonds maturing in 1933 and 1934.

Regarding the impact of 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 the equilibrium level and the economy depressed. The NIRA regulations 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 relation between leverage risk and investment might be driven by the effect of regulations. Other New Deal policies, such as the Emergency Banking Act and the Agricultural Adjustment Act (AAA), exemplify industry-specific interventions that could potentially interfere with our analysis in similar ways. To alleviate these concerns, we show that the effect of leverage risk remains significant within industries after controlling for industry-specific effects.

Studying the early stages of the recovery, Hausman, Rhode, and Wieland (2019) show that the dollar's devaluation in 1933 led to a large increase in traded crop prices, followed by higher demand for goods in farming areas of the country. The possibility of a surge in farmer's demand directed toward the products of firms with little exposure to gold clauses leading to higher profits might explain why these firms invested relatively more. However, that we find no evidence of a leverage risk effect on profits alleviates the concern about an interaction with the "farm channel."

In their seminal book, Friedman and Schwartz (1963) point 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, although there is evidence for 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 use alternative measures of investment and exposure to leverage risk, control for observable firm characteristics and year-specific effects, and conduct a treatment reversal analysis based on the 1935 Supreme Court's decision to uphold the abrogation of gold clauses. 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 are mostly issued many years before the onset of the Great Depression.[11] Second, financial markets reveal that the dollar's devaluation was largely unexpected up until the ban on gold holdings in April 1933. This can be seen in Panel A of Figure 2, which illustrates the stability of the exchange rate between the U.S. dollar and the Sterling leading up to the executive order by President Franklin D. Roosevelt forbidding private gold ownership. Had financial markets expected the devaluation, the Sterling would have appreciated in anticipation. Instead, the Sterling shows no upward trend leading up to the abandonment of the gold standard.[12] This shows that the devaluation, which ultimately triggered the abrogation of gold clauses, was unanticipated. It is thus highly 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. But we argue that 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.[13] Within our sample, we find that the leverage risk channel accounts for about one-third of public firms' divestment over 1933–1934. Furthermore, we estimate that the elimination of leverage risk is responsible for the end of divestment in 1935 and for positive net investment in 1936.

[11] In 1933, the average time since issuance across all bonds with a gold clause is 19.70 years. When bonds are value weighted within firms, the average time since bond issuance across firms is 11.41 years.

[12] The UK abandoned the gold standard in September 1931, which explains the sudden devaluation of the pound against the dollar in the last quarter of 1931.

[13] Chodorow-Reich (2013), Hausman, Rhode, and Wieland (2019), and Benmelech, Frydman, and Papanikolaou (2018) present similar aggregation exercises.

The outline of this article is as follows. Section 2 summarizes related literature. Section 3 discusses historical events relevant 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 and presents robustness analyses. Section 7 presents results from a partial equilibrium aggregation exercise and discusses implications for the slow recovery from the Great Depression. Section 8 concludes.

## 2 Literature

Our paper is related to several strands of literature. The Great Recession renewed interest in the macroeconomic role of firm financing in recessions. Chodorow-Reich (2013) studies the role of bank lending disruptions on employment in the aftermath of the Great Recession. That study emphasizes the importance of the credit intermediation channel for the Great Recession that Bernanke (1983) proposed as an explanation for the economy's slow recovery from the Great Depression. Benmelech, Frydman, and Papanikolaou (2018) provide an explanation for the decline in employment from 1928 to 1933 based on restricted credit supply in the bond markets from 1930 to 1934. Our work presents a new explanation of the economy's slow recovery in that it is not related to financing constraints imposed by the financial sector or the debt market. Rather, slow recovery is also rooted in the investment demand by firms facing leverage risk.

The theory of debt overhang starting with Myers (1977) provides a mechanism 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 the 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 the rich empirical literature on debt overhang 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 because of the endogenous nature of financial leverage. Lang, Ofek, and Stulz (1996) find that financial 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 these hotels' 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 is broadly consistent with the finding of 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 U.S. government (Edwards (2018)). Edwards, Longstaff, and Marin (2015) study the effects of the abrogation of gold clauses on the government's cost of capital and the Treasury's ability to issue new debt. Using data on U.S. Treasury bonds with and without gold clauses between the abrogation of gold clauses in 1933 and the Supreme Court's decision in 1935, the authors find a significant positive probability that the Supreme Court could have ruled that the abrogation of gold clauses is unconstitutional. This finding provides an important external validation of our empirical setup regarding the financial market's perception of uncertainty during the 1933–1934 period. Kroszner (1999) examines asset price responses to the Supreme Court's decision to uphold the abrogation of gold clauses and finds that the effective debt relief leads to an average increase in equity and corporate bond prices. Bolton and Rosenthal (2002) build a model to study political interventions in private debt contracts, and Mian, Sufi, and Trebbi (2014) discuss the potential welfare gains from debt forgiveness, both using the abrogation of gold clauses in 1933 as their motivation.

Finally, Koudijs and Voth (2016) study the persistent impact of experiencing the risk of credit losses on lenders' future leverage choice in a historical setting in which losses did not materialize. Although our focus is on borrower firms' behavior facing the risk of a leverage spike, the consequences of leverage risk in 1933 and 1934 also did not materialize because the Supreme Court upheld the decision to abrogate gold clauses. This sequence of events provides a unique setting in which we can study the impact of the emergence of leverage risk and its elimination on firms' decisions.

# 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 abrogation of gold clauses, see Edwards (2018).

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

To address this problem, FDR issued an executive order on April 5, 1933, 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 William H. 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." Although FDR's executive order on gold holdings clearly implied the end of convertibility, the implications for the legitimacy of gold exports, a key tenet of the gold standard, were ambiguous. On April 19, 1933, FDR clarified the government's position by declaring that gold exports would no longer be allowed, effectively throwing the nation off the gold standard. The stated intention of the devaluation was to increase commodity prices, the dramatic fall of which throughout the Depression hurt the agricultural sector.

The decision to abandon the gold standard came as a surprise. The reaction in foreign exchange markets was immediate: the dollar lost ground against other currencies, including the French franc, a currency still pegged to gold. Panel B of Figure 2 illustrates the depreciation of the U.S. dollar against the French franc between December 31, 1930 and March 31, 1934. To many, the decision was particularly shocking because, during the electoral campaign of 1932, Roosevelt had emphatically denied he would alter the value of gold in response to president Hoover's allegation to the contrary (see Edwards (2018)).[14] The secretary of the treasury, Will Woodin, had even reiterated the administration's commitment to the gold standard as late as March 6, 1933, saying that it was "ridiculous and misleading to say that we are off the gold standard.... We are definitely on the gold standard."

The dollar's devaluation, however, prompted a new economic problem because of the presence of gold clauses in debt contracts. At the time, payments on most U.S. 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 2 times the value of the gross domestic

[14]Hoover himself was a staunch supporter of the gold standard. While many other countries abandoned the gold standard early in the decade (including the United Kingdom in 1931), Hoover continued to embrace the doctrine, which he considered to be "little short of a sacred formula." (see Eichengreen and Temin (2000))

product), 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 dollar's depreciation would thus lead to a nationwide increase in the debt burden of corporations, 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 led to the first legal actions regarding the enforceability of gold clauses.[15] To resolve this thorny issue, the administration asked Congress on May 26 to officially annul gold clauses in both existing and future contracts. On June 5, the Joint Declaration of Congress abrogating gold clauses was signed into law, to the ire of several members of the Congress who argued that the abrogation of gold clauses represented a repudiation of the government's debt and a violation of existing private debt contracts.

Starting in August 1933, the government steadily increased the price of newly minted gold until it reached $34.06 per ounce in December 1933. Simultaneously, the U.S. dollar steadily lost value in currency markets. 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 3, inflation remained relatively low in 1933 (0.8%) and 1934 (1.5%). Thus, the enforcement of gold clauses would have caused an increase in the real debt burden of many private corporations.

As early as May 1933, investors that held bonds protected by gold clauses filed lawsuits claiming that the abrogation of gold clauses 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 which dealt with private debt contracts and two of which were related to government bonds. In all cases, the Court had to decide whether Congress had violated the Constitution by altering existing contracts.

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

By a narrow 5-4 vote, which 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." The Supreme Court's 1935 decision was final and virtually eliminated the risk that corporations with gold clauses would see these clauses upheld.

Leading up to the ruling, however, the perceived likelihood of a reinstatement of the gold clause by the government and financial markets 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 of gold clauses establishes how the legal fight over gold generated a climate of uncertainty regarding the future liabilities of many firms. The uncertainty persisted for nearly 2 years, as legal challenges against the abrogation of gold clauses multiplied. The Supreme Court ultimately eliminated the risk of a debt burden increase by upholding the abrogation of gold clauses.

# 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 that are classified by Graham, Leary, and Roberts (2015) as "regulated industries."

Our primary variable of interest is *net investment*, which is defined as the annual growth of firms' 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.[16]

Importantly, 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 contain gold clauses in 1932, and we use this variable to measure firms' exposure to leverage risk:

$$d_i = \frac{\text{Total amount outstanding of bonds with gold clause in 1932}}{\text{Total liabilities in 1932.}} \tag{1}$$

This variable thus captures firm $i$'s debt composition. Importantly, variation in $d_i$ is not mechanically related to variation in the firm's overall financial leverage.

Table 1 provides summary statistics for firm-year observations in our sample across three 2-year periods. We trim observations at the upper and lower first percentile of net investment every year. For inclusion 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 473 firms in 1931 and 1932, 496 firms in 1933 and 1934, and 477 firms in 1935 and 1936.

In our sample period, aggregate net investment in the United States is negative, as reflected in the negative average net investment rates in all three periods. In the 1931–1932 period, 36% of firm-year observations correspond to firms that have a positive amount of bonds with a gold clause outstanding in 1932. The resultant average cross-sectional level of $d_i$ is 16%. These numbers remain stable over time at 39% and 17%, respectively, in 1933 and 1934, as well as in 1935 and 1936.

Figure 4 illustrates the severe consequences of a hypothetical gold clause reinstatement. That is,

[16] The appendix provides all details on the variable definitions and sample construction.

the figure plots each firms' book leverage in 1932 against its hypothetical level had gold clauses been deemed valid by the Supreme Court. The figure shows that many firms would have experienced a substantial increase in leverage (as high as 40 percentage points). Also important for our purpose, is the heterogeneity in the degree to which firms would have been affected by this possible shock. We exploit this heterogeneity in our empirical analysis.

# 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 of leverage risk and its subsequent elimination on firms' investment. We also study equity payouts to better understand which factors drive our results. Lastly, we estimate the effect of leverage risk by conditioning on a firm's credit quality.

## 5.1 Identification

In the ideal experiment, firms with similar investment opportunities would be randomly 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 rely on preexisting firm-level variation in gold-denominated liabilities as a source of firms' 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 tied to their investment decisions. However, it is possible that treated firms ($d_i > 0$) are 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 pretreatment period prior to the abrogation of gold clauses. Comparisons of average firm characteristics suggest that firms with gold-denominated debt exhibit features like value firms: on average, they are larger, have a higher share of fixed capital in assets, have a higher financial leverage, and have a lower share of cash in assets. These observations are not surprising, because 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 pretreatment values of these characteristics as controls in our robustness analysis and carry out several other checks to address the implications of these differences. Furthermore, our evidence on treatment reversal presented below suggests that unconditional differences between treated and untreated firms are unlikely to completely explain our results on investment.

A more critical concern with respect to the identification strategy is the possibility that treated and untreated firms trend differently over the period we study. To alleviate this concern, we look at pretreatment 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 eleven characteristics considered. Thus, in the pretreatment period, we find no evidence of a violation of the important parallel trends assumption.

Our baseline specification is a generalized difference-in-differences (DiD) panel regression:

$$\text{Net investment}_{i,t} = \beta_0 + \beta_1 d_i p_t + \alpha_i + \delta_t + u_{i,t}, \quad (2)$$

where $i$ indexes firms, $t$ is year, $p_t$ is the post-treatment indicator, $\alpha_i$ represents firm fixed effects (FE), and $\delta_t$ is a year FE. Firm FE are included to allow for different average net investment rates across firms, for instance, because of differences in capital depreciation rates, instead of imposing an identical intercept in (2) for all firms. Year FE captures annual aggregate effects in net investment.

## 5.2 Investment

Column (2) of Panel A in Table 4 reports estimates for the coefficient $\beta_1$ in equation (2), where $p_t = 0$ for 1931 and 1932, and $p_t = 1$ for 1933 and 1934.[17] The coefficient estimate is -5.9%,

[17] We opt for the generalized DiD as the main specification and also report results for a standard DiD given by $\text{Net investment}_{i,t} = b_0 + b_1 d_i + b_2 p_t + b_3 d_i p_t + u_{i,t}$ in Column (1) of Table 4, which yields similar results.

which is statistically significant. This implies that the change in annual net investment following treatment is estimated to be lower by 5.9% of capital for a firm with $d_i = 1$ compared to a firm with $d_i = 0$. The average treated firm has 44% of its liabilities denominated in gold ($d_i = 0.44$). Thus, for the average treated firm, leverage risk leads to a reduction in annual investment equal to $0.44 \cdot -5.9\% = -2.6\%$ of its installed fixed capital.

These results confirm that the emergence of leverage risk in 1933 led to a sizable downward divergence of the investment path for firms exposed to leverage risk 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 a treatment reversal when the Supreme Court decided to uphold the abrogation of gold clauses in 1935. Because the Court's decision effectively eliminated leverage risk, the effect of firms' exposure to gold clauses 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 prereversal changes in firm characteristics between 1933 and 1934. We do not see statistically significant differences between the two groups of firms.

Panel B of Table 4 shows that the expected reversal did occur. Column (2) shows that the estimate of $\beta_1$ is 5.1%, which is of similar magnitude to the treatment effect reported in Panel A (-5.8%). The reversal effect strengthens our evidence that the lower investment rates for firms with gold-denominated debt firms during the earlier period were indeed driven by firms' exposure to leverage risk during 1933 and 1934. Alternative explanations would need to explain not only 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 the elimination of leverage risk.

## 5.4 Equity payouts

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 credit to corporations facing leverage risk, thereby generating financial frictions that limit firms' ability to invest. To study which of these two channels most likely drives our results, we analyze equity payouts, measured as the total equity payout divided by pretreatment fixed capital.

According to the dynamic debt overhang theory of Hennessy (2004), the optimal policy of a distressed firm's shareholders is to increase equity payouts: as the likelihood of default increases, equity holders find it optimal to expropriate bondholders by increasing equity payout. On the contrary, 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 the 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 3%, which 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 -4.7%, which is statistically significant and confirms the effect of treatment reversal. Taken together, our joint results on investment and equity payout suggest that leverage risk reduced firms' demand for investment goods.[18]

[18]In unreported results, we find no evidence of a leverage risk effect on cash growth. This finding suggests that firms do not hoard cash or use cash to alleviate the impact of financial constraints in the face of leverage risk.

## 5.5 Credit ratings

The debt overhang problem should be most severe for firms in financial distress (see Myers (1977) and Hennessy (2004)). We test this hypothesis by adding to equation (2) an indicator variable for firms close to default, $\mathbb{I}_{\text{low rating},i}$ interacted with $d_i p_t$:

$$\text{Net investment}_{i,t} = \beta_0 + \beta_1 d_i p_t + \beta_2 d_i p_t \mathbb{I}_{\text{low rating},i} + \alpha_i + \delta_t + u_{i,t}. \tag{3}$$

A firm is deemed close to default if its bonds are rated below "B" by Moody's at the end of 1932.

Column (2) of 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, further decreasing investment would require selling fixed capital. The involved adjustment costs, combined with weak aggregate demand for capital goods at the time, would likely make the sale unprofitable. Adjusting equity payout, however, is arguably less subject to frictions.

Table 5 also reports the estimation of equation (3) with equity payout as the dependent variable. The coefficient on the interaction term in Panel A is 2% and statistically significant, implying that firms with lower credit ratings increased equity payout more upon the emergence of leverage risk. Column (2) of Panel B shows that the reversal effect in equity payout following the Court's decision was also stronger for low-rated firms by 6.4%. Our equity payout results thus suggest that leverage risk resulted in a more severe debt overhang problem for firms initially closer to default.

# 6 Alternative explanations

In this section, we conduct several robustness exercises. We first show the robustness of our results to a rich set of controls. We then 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 dollar's devaluation did not differentially impact firms based on their exposure to gold-denominated debt. Lastly, we show that our results are robust to a wide range of alternative specifications.

## 6.1 Controlling for firm characteristics

To address the concern that pretreatment differences in firm characteristics between the control and treatment groups reflect differential exposure to macroeconomic and investment opportunity shocks, we run the following regression:

$$\text{Net investment}_{i,t} = \beta_0 + \beta_1 d_i p_t + \sum_j \sum_\tau \beta_{j,\tau} \mathbb{I}_{t=\tau} X_{j,i} + \alpha_i + \delta_t + u_{i,t}, \tag{4}$$

where $X_{j,i}$ is firm $i$'s pretreatment value for characteristic $j$. In each regression, $X_{j,i}$ is computed as the average value of the firm-level variable in the pretreatment period with $p_t = 0$. The pretreatment characteristics $X_{j,i}$ are interacted with time indicator functions for each year, denoted by $\mathbb{I}_{t=\tau}$, in order to account for variation in the impact of observable characteristics on investment over time. Column (1) of Table 6 reports results where the set of $X_{j,i}$ includes log(Assets), Tobin's Q, book leverage, financial leverage, cash/assets, net income/assets, and noncurrent assets/assets, which we found to be significantly different between $d = 0$ and $d > 0$ firms on average. We find that a statistically significant estimate of $\beta_1$ is -4.6% (Panel A) for the emergence of leverage risk and 6.3% (Panel B) for the elimination of leverage risk. This is economically and statistically similar to our findings confirming our conjecture that pretreatment differences do not explain the impact of leverage risk on investment.

We also verify that our results are robust to the inclusion of nonlinear controls, and we reestimate equation (4) using decile dummies for each characteristic.[19] 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. Columns (2) to (8) of Table 6 report the results. Overall, including a nonlinear control does not significantly change our coefficient estimates. Hence, despite differences in the average pretreatment values of firm attributes, there is variation in $d_i$ affecting the

[19] In this case, $X_{j,i}$ is an indicator function whether firm $i$ belongs to a particular decile of the pretreatment distribution of the characteristics and $j \in \{1, ..., 10\}$.

investment path among otherwise similar firms.

## 6.2 Credit constraints

### 6.2.1 Bank loans

In his seminal paper, Bernanke (1983) argues that the disruption in the banking sector during the Great Depression reduced the supply of credit available to borrowers. Although the contraction in bank credit might explain why smaller firms reduced their investment, this channel is unable to explain the investment gap related to firms' 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, public firms with gold-denominated debt in our sample had 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 3 years for firms with $d = 1$. Second, public firms rarely relied on bank debt as a source of financing. As shown in Table 1, the sum of bank loans and notes payable on average account for 3% of the total liabilities of these firms. This sum is an order of magnitude smaller than the contribution of corporate bonds (44%).

Nonetheless, we test whether firms' reliance on bank debt can explain the investment gap by replacing our leverage risk exposure measure $d_i$ by the share of bank debt in total liabilities. Specification (1) of Table 7 shows the lack of evidence that this alternative measure of exposure explains cross-sectional variation in firms' investment.

### 6.2.2 Corporate bonds

Benmelech, Frydman, and Papanikolaou (2018) show that firms with corporate bonds maturing during the Great Depression until 1934 were subject to more severe financial frictions, since the collapse of the corporate bond primary market during the crisis made it difficult to rollover maturing debt. Because firms with more gold-denominated corporate bonds are 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 $d_i$ is a 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 an outstanding bond maturing in 1933 or 1934. The procedure eliminates 29 firms from the 1931–1934 sample and 30 firms from the 1933–1936 sample. Specification (2) of Table 7 reports that our main results remain unaffected using this alternative sample. Leverage risk matters even for firms that did not have bonds maturing during the Great Depression.

## 6.3 New Deal policies

Following the inauguration of FDR 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 effects of these reforms on the economy are still debated to this day, with some 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 impacts). If firms with more gold-denominated debt were incidentally more affected by New Deal policies, the association between leverage risk and investment might be related to these policies.

For instance, Cole and Ohanian (2004) argue that the industrial codes included in the NIRA created labor market rigidities that kept the economy depressed. The NIRA regulations prescribed specific operating rules that applied to all firms within an industry, but some industries faced tighter restrictions than did others. Similarly, the AAA introduced regulations specific to the agricultural sector, and the two banking acts were directed at the financial sector.[20] To control for the potentially confounding effects of the New Deal policies on our results, we add 2-digit SIC industry-year fixed effects to equation (2) and reestimate the model.

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

Table 8 reports the results. Including industry-year fixed effects to the regression model does not affect our results significantly. Specification (1) of Panel A shows that, when industry-year fixed effects are included, the estimated treatment effect coefficient is -5.4% (compared to -5.9% without). Similarly, specification (1) of Panel B shows that the estimated treatment reversal coefficient is 4.9% when industry-year fixed effects are included (compared to 5.1% without). Column (2) of Table 8 confirms that the results with industry-year fixed effects are robust to the inclusion of firm-level controls in the regression. Overall, the results suggest that leverage risk remains significant even after controlling for the industry-wide effects of the New Deal policies.

## 6.4 Dollar's devaluation and the farm channel

In their study of the early stages of the recovery, Hausman, Rhode, and Wieland (2019) show that the dollar's devaluation in 1933 led to a large increase in traded crop prices and to a higher demand for goods in the agricultural regions of the country because of the increased purchasing power of farmers. If firms with little exposure to gold-denominated debt incidentally benefited more from the rise in demand, they would have higher sales and profits explaining why those firms invested more.

To determine whether the investment gap we document could be explained by demand shocks, we reestimate equation (2) with profits normalized by total assets as the dependent variable.[21] Table 9 reports the results. There is no significant relationship between the gold clause content of a firm's liabilities and profits. It is thus unlikely that our results can be attributed to a positive demand shock specific to firms without exposure to gold clauses.

## 6.5 Other robustness checks

We experiment with various alternative measures of investment and exposure to gold clauses to show the robustness of our results in Columns (1) to (5) of Table 10. In Column (1), we

[21] We use profits rather than sales, because most income statements in Moody's Manuals directly report net income rather than sales and costs separately.

define book debt net of preferred shares. In Column (2), we use the log investment rate as the dependent variable. In Column (3), we omit other regulated industries, namely, transportation, communication, and utilities. In Column (4), we define book debt net of cash. In Column (5), we define $d_i$ 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 alternative specifications.

To ensure that our results are not driven by firms' 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.[22] This ratio represents the share of long-term liabilities that are not exposed to leverage risk. Specification (6) in Table 10 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.

# 7 Aggregate implications

Under additional assumptions, our firm-level estimates can be aggregated to infer 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 of gold clauses 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 this assumption, the rate of forgone aggregate investment due

[22] See Diamond and He (2014) for a theoretical discussion of the relation between liability duration and debt overhang.

to leverage risk in 1933 and 1934 is given by

$$\text{Leverage risk effect}_t = \frac{\beta_1 \sum_i d_i \text{Fixed capital}_{t-1}}{\sum_i \text{Fixed capital}_{t-1}}, \tag{5}$$

where $i$ indexes firms, $\beta_1$ is the impact of leverage risk on investment reported in Panel A of Table 4, and $d_i$ 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 (5), where $\beta_1$ is the treatment reversal estimate in Panel B of Table 4.[23]

Table 11 reports the results. The first row of Panel A shows that, in 1933 and 1934, the aggregate net investment rates of public firms were −4.15% and −2.58%, respectively.[24] The second row shows that our estimates of the leverage risk effect based on equation (5) are −1.28% and −1.36% in 1933 and 1934, respectively. Thus, our estimates imply that preempting leverage risk would have cut firms' divestment by approximately one-third in 1933 and 1934. Panel B of Table 11 shows that leverage risk accounts for about half of the divestment in 1933 and 1934 among $d > 0$ firms.

The last two columns of Panel A report that, in 1935 and 1936, aggregate net investment rates were -0.05% and 1.13%, respectively. Our estimates of the aggregate effect of the elimination of leverage risk are 1.11% and 1.13%, respectively. Thus, the Supreme Court's decision nearly stopped divestment in 1935 and accounts for most 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 public firms' investment and, therefore, likely contributed to the slow speed of economic recovery from the Great Depression. We find that leverage risk led public firms to delay investment in fixed capital for two years. This finding complements existing explanations of the delayed recovery based on the disruption of credit intermediation, which is more applicable to smaller firms.

[23]See the appendix for a detailed explanation of aggregate capital and investment computations.

[24]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 following the Great Depression. The threat of gold clause enforcement exposed many public firms to the risk of a 69% increase in bond payments. Firms exposed to that risk significantly reduced their investment in fixed capital. At the aggregate level, leverage risk explains one-third of the total decline in investment among public firms over 1933 and 1934. In 1935, the Supreme Court upheld the decision to abrogate gold clauses, and the investment rate of firms initially exposed to leverage risk recovered quickly.

Firms with gold denominated liabilities did not rely on bank financing, were not financially constrained, and increased their equity payouts when subjected to leverage risk. 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, emphasized by Bernanke (1983), of slow recovery based on the availability of bank credit, on which public firms did not rely. Our empirical setting, which features the sudden emergence and subsequent elimination of leverage uncertainty (without an actual shock to leverage) is ideal to identify the causal effect of leverage risk on firm investment and provides a unique contribution to the literature.

Our results also highlight a channel through which monetary policy uncertainty can affect the real economy. Because 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)).

Beyond their historical importance, our results also shed new light on issues relevant for developed and developing nations. Members of the European union seeking to exit the union and reintroduce their own local currency would inevitably expose their private sector to leverage risk, with adverse ramifications for capital formation to be expected. In emerging markets where corporations frequently issue bonds denominated in foreign currency, the possibility of a future currency devaluation also generates leverage risk. In light of our findings from the Great Depression era, quantifying the impact of leverage risk during currency crises in today's emerging economies is a promising path for future research.

# Appendix

The appendix presents the construction of variables in our analysis. The Moody's Manual in year $t$ usually reports annual balance sheet and income statement data from year $t-7$ to $t-1$. For variables that require data from multiple years, we use data from the same manual.

We use firm-year observations of the following variables constructed from the hand-collected data in Moody's Manuals:

- Net investment is given by $\frac{\text{Fixed capital}_t}{\text{Fixed capital}_{t-1}} - 1$.
- Total liabilities are total assets minus shareholders' equity.
- 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 the Center for Research in Security Prices (CRSP).
- Pref. shares/assets is the ratio of preferred shares to total assets.
- log(Assets) is the logarithm of total assets.
- Tobin's Q is the sum of total equity market capitalization and total liabilities divided by total assets.
- Payout/fixed capital is the ratio of equity payouts to fixed capital. Equity payout is computed using cash dividends and share repurchases following Boudoukh, Michaely, Richardson, and Roberts (2007). The denominator is computed as the pretreatment average of fixed capital for all years to avoid the effects of annual changes in fixed capital when Payout/fixed capital is used as the dependent variable in Table 6.
- Noncurrent assets/assets is the ratio of total assets net of current assets to total assets.
- Cash/assets is the amount of cash in assets divided by total assets.
- Net income/assets is the ratio of net income from the income statement to total assets.

- Bank debt/liabilities is the ratio of bank debt (the sum of bank loans and notes payable) in liabilities to total liabilities.

- $d$ is the ratio of bond amount outstanding with gold clauses to total liabilities. $d$ is measured in 1932 and is time invariant.

- $\mathbb{I}_{d>0}$ is an indicator function that is one if $d > 0$.

- $\mathbb{I}_{\text{low rating}}$ used in Table 6 is an indicator that the credit rating at the end of 1932 is below a B rating.

- Profitability, which is used as the dependent variable in Table 9, is net income from the income statement divided by the pretreatment average of total assets.

We construct firm-level control variables as averages from the pretreatment period of the regression. These control variables are used to construct characteristic-year interaction terms and pretreatment decile fixed effects. We filter the data in the following order: In each year, we trim observations in the top and bottom percentiles of net investment. All other variables are winsorized at the bottom and top percentile every year. In regressions that use a different dependent variable than net investment (payout/fixed capital and profitability), observations are trimmed at the top- and bottom-half percent of the dependent variable.

We construct the path of investment in the sample plotted in Figure 1 using the following procedure addressing the unbalanced structure of the firm-year panel. For each firm $i$ with available data for both years $t-1$ and $t$, we compute $\text{Net investment level}_{i,t} = \text{Fixed capital}_{i,t} - \text{Fixed capital}_{i,t-1}$. The aggregate investment rate is then given by $\text{IR}_t = \frac{\sum_i \text{Net investment level}_{i,t}}{\sum_i \text{Fixed capital}_{i,t-1}}$. Normalized aggregate capital is $K_t = \prod_{\tau=1931}^{t}(1+\text{IR}_\tau)$, and normalized aggregate investment is $I_t = K_t - K_{t-1}$. Finally, $I_{1931} + I_{1932}$ is normalized to -100 and plotted over 2-year periods (red-dashed line in the upper panel). The investment path for $d = 0$ and $d > 0$ firms in the lower panel are calculated using the same procedure but limiting the sample to the corresponding firms.

# References


Becker, Bo, and Per Strömberg, 2012, Fiduciary duties and equity-debtholder conflicts, *The Review of Financial Studies* 25, 1931–1969.

Bedoya, Alejandro, Celeste González, Sergio Pernice, Jorge M. Streb, Alejo Czerwonko, and Leandro Díaz Santillán, 2007, Database of corporate bonds from Argentina, CEMA Working Papers: Serie Documentos de Trabajo.

Benmelech, Efraim, Carola Frydman, and Dimitris Papanikolaou, 2018, Financial frictions and employment during the great depression, Forthcoming in Journal of Financial Economics.

Bernanke, Ben S, 1983, Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression, *The American Economic Review* 73, 257–276.

Bhamra, Harjoat S, Adlai J Fisher, and Lars-Alexander Kuehn, 2011, Monetary policy and corporate default, *Journal of Monetary Economics* 58, 480–494.

Bloom, Nicholas, 2009, The impact of uncertainty shocks, *Econometrica* 77, 623–685.

Bolton, Patrick, and Howard Rosenthal, 2002, Political intervention in debt contracts, *Journal of Political Economy* 110, 1103–1134.

Boudoukh, Jacob, Roni Michaely, Matthew Richardson, and Michael R Roberts, 2007, On the importance of measuring payout yield: Implications for empirical asset pricing, *The Journal of Finance* 62, 877–915.

Calomiris, Charles W, and Joseph R Mason, 2003, Consequences of bank distress during the Great Depression, *American Economic Review* 93, 937–947.

Chodorow-Reich, Gabriel, 2013, The employment effects of credit market disruptions: Firm-level evidence from the 2008–9 financial crisis, *The Quarterly Journal of Economics* 129, 1–59.

Cole, Harold L, and Lee E Ohanian, 2004, New Deal policies and the persistence of the Great Depression: A general equilibrium analysis, *Journal of Political Economy* 112, 779–816.

Daseking, Christina, Atish R. Ghosh, Alun H. Thomas, and Timothy D. Lane, 2004, *Lessons from the Crisis in Argentina.* (International Monetary Fund).

DeMarzo, Peter M, Michael J Fishman, Zhiguo He, and Neng Wang, 2012, Dynamic agency and the q theory of investment, *The Journal of Finance* 67, 2295–2340.

Diamond, Douglas W, and Zhiguo He, 2014, A theory of debt maturity: the long and short of debt overhang, *The Journal of Finance* 69, 719–762.

Dixit, Avinash, and Robert Pindyck, 1994, *Investment under Uncertainty.* (Princeton University Press).

Edwards, Sebastian, 2018, *American Default: The Untold Story of FDR, the Supreme Court, and the Battle Over Gold.* (Princeton University Press).

Edwards, Sebastian, Francis A. Longstaff, and Alvaro G. Marin, 2015, The US Debt Restructuring of 1933: Consequences and Lessons, Working paper.

Eichengreen, Barry, and Peter Temin, 2000, The Gold Standard and the Great Depression, *Contemporary European History* 9, 183–207.

Fisher, Irving, 1933, The debt-deflation theory of great depressions, *Econometrica* 1, 337–357.

Fleckenstein, Matthias, Francis A Longstaff, and Hanno Lustig, 2017, Deflation risk, *The Review of Financial Studies* 30, 2719–2760.

Friedman, Milton, and Anna J Schwartz, 1963, A Monetary History of the United States, 1867–1960, *NBER Books.*

Giroud, Xavier, Holger M Mueller, Alex Stomper, and Arne Westerkamp, 2011, Snow and leverage, *The Review of Financial Studies* 25, 680–710.

Gomes, Joao, Urban Jermann, and Lukas Schmid, 2016, Sticky leverage, *American Economic Review* 106, 3800–3828.

Graham, John R, Mark T. Leary, and Michael R. Roberts, 2015, A century of capital structure: The leveraging of corporate America, *Journal of Financial Economics* 118, 658–683.

Hausman, Joshua K, Paul W Rhode, and Johannes F Wieland, 2019, Recovery from the Great Depression: The Farm Channel in Spring 1933, *American Economic Review* 109, 427–72.

Hennessy, Christopher A, 2004, Tobin's Q, debt overhang, and investment, *The Journal of Finance* 59, 1717–1742.

Hennessy, Christopher A, Amnon Levy, and Toni M Whited, 2007, Testing Q theory with financing frictions, *Journal of Financial Economics* 83, 691–717.

Hernández, Fernando Daniel, 2019, Cross-border restructurings in Argentina: making inroads in recognition by United States bankruptcy courts, *Emerging Markets Restructuring Journal*.

Hunter, Helen Manning, 1982, The role of business liquidity during the Great Depression and afterwards: differences between large and small firms, *The Journal of Economic History* 42, 883–902.

Kimmel, Lewis Henry, 1939, The Availability of Bank Credit, 1933-1938, National Industrial Conference Board.

Koc, Cagan, and Ercan Ersoy, 2018, How Turkey Created a Debt Crisis, *Bloomberg*.

Koudijs, Peter, and Hans-Joachim Voth, 2016, Leverage and beliefs: personal experience and risk-taking in margin lending, *American Economic Review* 106, 3367–3400.

Kroszner, Randy, 1999, Is it better to forgive than to receive?: Repudiation of the gold indexation clause in long-term debt during the great depression, Working paper.

Lamont, Owen, 1995, Corporate-debt overhang and macroeconomic expectations, *The American Economic Review* pp. 1106–1117.

Lang, Larry, Eli Ofek, and René Stulz, 1996, Leverage, investment, and firm growth, *Journal of Financial Economics* 40, 3–29.

Lutz, Friedrich A., 1945, *Corporate cash balances, 1914–43: Manufacturing and Trade*. (National Bureau of Economic Research).

Mian, Atif, Amir Sufi, and Francesco Trebbi, 2014, Resolving debt overhang: political constraints in the aftermath of financial crises, *American Economic Journal: Macroeconomics* 6, 1–28.

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

## Table 1: Summary statistics

| Variable | Firms | N | Mean | SD | 5% | 25% | 50% | 75% | 95% |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Panel A: 1931–1932 | | | | | |
| Net investment | 473 | 738 | -0.06 | 0.13 | -0.36 | -0.08 | -0.04 | -0.00 | 0.06 |
| Book leverage | 473 | 738 | 0.40 | 0.31 | 0.03 | 0.15 | 0.35 | 0.57 | 0.96 |
| Market leverage | 473 | 738 | 0.55 | 0.31 | 0.07 | 0.27 | 0.58 | 0.86 | 0.98 |
| Pref. shares/assets | 473 | 738 | 0.14 | 0.19 | 0.00 | 0.00 | 0.05 | 0.24 | 0.51 |
| log(Assets) | 473 | 738 | 17.10 | 1.33 | 15.04 | 16.17 | 16.96 | 17.91 | 19.50 |
| Tobin's Q | 473 | 738 | 0.82 | 0.59 | 0.23 | 0.47 | 0.67 | 0.98 | 2.10 |
| Payout/fixed capital | 473 | 738 | 0.13 | 0.31 | -0.00 | 0.00 | 0.02 | 0.11 | 0.72 |
| Noncurrent assets/assets | 473 | 738 | 0.61 | 0.23 | 0.19 | 0.46 | 0.65 | 0.79 | 0.94 |
| Cash/assets | 473 | 738 | 0.12 | 0.13 | 0.01 | 0.04 | 0.08 | 0.16 | 0.35 |
| Net income/assets | 473 | 738 | 0.03 | 0.12 | -0.14 | -0.04 | 0.02 | 0.08 | 0.34 |
| Bank debt/liabilities | 466 | 726 | 0.03 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.21 |
| $d$ | 473 | 738 | 0.16 | 0.26 | 0.00 | 0.00 | 0.00 | 0.29 | 0.78 |
| $\mathbb{I}_{d>0}$ | 473 | 738 | 0.36 | 0.48 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |
| | | | | Panel B: 1933–1934 | | | | | |
| Net investment | 496 | 762 | -0.03 | 0.13 | -0.24 | -0.06 | -0.03 | -0.00 | 0.09 |
| Book leverage | 496 | 762 | 0.48 | 0.44 | 0.05 | 0.17 | 0.39 | 0.66 | 1.19 |
| Market leverage | 496 | 762 | 0.47 | 0.33 | 0.04 | 0.16 | 0.43 | 0.79 | 0.98 |
| Pref. shares/assets | 496 | 762 | 0.15 | 0.22 | 0.00 | 0.00 | 0.04 | 0.24 | 0.55 |
| log(Assets) | 496 | 762 | 17.13 | 1.46 | 14.95 | 16.10 | 17.01 | 17.99 | 19.82 |
| Tobin's Q | 496 | 762 | 1.34 | 1.10 | 0.42 | 0.74 | 0.95 | 1.50 | 4.32 |
| Payout/fixed capital | 496 | 762 | 0.08 | 0.20 | -0.01 | 0.00 | 0.00 | 0.05 | 0.45 |
| Noncurrent assets/assets | 496 | 762 | 0.57 | 0.26 | 0.12 | 0.38 | 0.59 | 0.79 | 0.95 |
| Cash/assets | 496 | 762 | 0.13 | 0.13 | 0.01 | 0.04 | 0.09 | 0.16 | 0.39 |
| Net income/assets | 496 | 762 | 0.05 | 0.11 | -0.08 | -0.00 | 0.03 | 0.08 | 0.32 |
| Bank debt/liabilities | 477 | 731 | 0.04 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.24 |
| $d$ | 496 | 762 | 0.17 | 0.26 | 0.00 | 0.00 | 0.00 | 0.32 | 0.77 |
| $\mathbb{I}_{d>0}$ | 496 | 762 | 0.39 | 0.49 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |
| | | | | Panel C: 1935–1936 | | | | | |
| Net investment | 477 | 773 | -0.01 | 0.11 | -0.16 | -0.04 | -0.01 | 0.02 | 0.15 |
| Book leverage | 477 | 773 | 0.55 | 0.58 | 0.06 | 0.22 | 0.42 | 0.69 | 1.30 |
| Market leverage | 477 | 773 | 0.41 | 0.31 | 0.04 | 0.12 | 0.33 | 0.68 | 0.98 |
| Pref. shares/assets | 477 | 773 | 0.15 | 0.23 | 0.00 | 0.00 | 0.00 | 0.24 | 0.58 |
| log(Assets) | 477 | 773 | 17.09 | 1.42 | 15.09 | 16.10 | 16.91 | 17.96 | 19.74 |
| Tobin's Q | 477 | 773 | 2.24 | 2.51 | 0.57 | 0.94 | 1.36 | 2.35 | 6.54 |
| Payout/fixed capital | 477 | 773 | 0.13 | 0.34 | -0.09 | 0.00 | 0.02 | 0.10 | 1.30 |
| Noncurrent assets/assets | 477 | 773 | 0.50 | 0.28 | 0.00 | 0.28 | 0.51 | 0.73 | 0.95 |
| Cash/assets | 477 | 773 | 0.14 | 0.14 | 0.01 | 0.05 | 0.10 | 0.18 | 0.42 |
| Net income/assets | 477 | 773 | 0.10 | 0.13 | -0.04 | 0.02 | 0.06 | 0.13 | 0.40 |
| Bank debt/liabilities | 462 | 739 | 0.04 | 0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.31 |
| $d$ | 477 | 773 | 0.17 | 0.26 | 0.00 | 0.00 | 0.00 | 0.30 | 0.77 |
| $\mathbb{I}_{d>0}$ | 477 | 773 | 0.39 | 0.49 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |

*Notes*: This table reports summary statistics for firm-year observations for distinct 2-year periods from 1931 to 1936. See the appendix 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 | -0.06 | 0.35 |
| Book leverage | 0.32 | 0.55 | 0.00 |
| Market leverage | 0.45 | 0.73 | 0.00 |
| Pref. shares/assets | 0.14 | 0.13 | 0.39 |
| log(Assets) | 16.78 | 17.65 | 0.00 |
| Tobin's Q | 0.81 | 0.85 | 0.39 |
| Payout/fixed capital | 0.16 | 0.08 | 0.00 |
| Noncurrent assets/assets | 0.56 | 0.70 | 0.00 |
| Cash/assets | 0.13 | 0.09 | 0.00 |
| Net income/assets | 0.04 | 0.02 | 0.05 |
| Bank debt/liabilities | 0.03 | 0.03 | 0.27 |
| $d$ | 0.00 | 0.44 | 0.00 |
| Panel B: 1933–1934 | | | |
| Net investment | -0.02 | -0.05 | 0.00 |
| Book leverage | 0.37 | 0.65 | 0.00 |
| Market leverage | 0.35 | 0.66 | 0.00 |
| Pref. shares/assets | 0.15 | 0.14 | 0.56 |
| log(Assets) | 16.73 | 17.77 | 0.00 |
| Tobin's Q | 1.34 | 1.33 | 0.82 |
| Payout/fixed capital | 0.09 | 0.06 | 0.01 |
| Noncurrent assets/assets | 0.51 | 0.67 | 0.00 |
| Cash/assets | 0.15 | 0.09 | 0.00 |
| Net income/assets | 0.06 | 0.04 | 0.04 |
| Bank debt/liabilities | 0.05 | 0.02 | 0.00 |
| $d$ | 0.00 | 0.43 | 0.00 |
| Panel C: 1935–1936 | | | |
| Net investment | -0.01 | -0.01 | 0.81 |
| Book leverage | 0.43 | 0.73 | 0.00 |
| Market leverage | 0.31 | 0.57 | 0.00 |
| Pref. shares/assets | 0.15 | 0.14 | 0.55 |
| log(Assets) | 16.73 | 17.67 | 0.00 |
| Tobin's Q | 2.24 | 2.24 | 1.00 |
| Payout/fixed capital | 0.16 | 0.09 | 0.01 |
| Noncurrent assets/assets | 0.44 | 0.61 | 0.00 |
| Cash/assets | 0.16 | 0.11 | 0.00 |
| Net income/assets | 0.10 | 0.09 | 0.05 |
| Bank debt/liabilities | 0.05 | 0.03 | 0.01 |
| $d$ | 0.00 | 0.43 | 0.00 |

*Notes*: This table reports averages for firm-year observations for firms with $d = 0$ and $d > 0$ in distinct 2-year periods from 1931 to 1936. The last column reports the $p$-value for the difference between the means for $d = 0$ and $d > 0$ firms. See the appendix for variable definitions.

Table 3: Pretreatment changes in characteristics

| Variable | $d = 0$ | $d > 0$ | $p$-val. |
|---|---|---|---|
| Panel A: Δ1932 | | | |
| Net investment | -0.04 | -0.05 | 0.65 |
| Book leverage | 0.01 | 0.03 | 0.24 |
| Market leverage | 0.01 | 0.02 | 0.66 |
| Pref. shares/assets | 0.02 | 0.01 | 0.28 |
| log(Assets) | -0.13 | -0.12 | 0.74 |
| Tobin's Q | -0.02 | -0.01 | 0.91 |
| Payout/fixed capital | -0.07 | -0.04 | 0.43 |
| Noncurrent assets/assets | -0.00 | 0.01 | 0.35 |
| Cash/assets | 0.01 | 0.02 | 0.84 |
| Net income/assets | -0.04 | -0.04 | 0.98 |
| Bank debt/liabilities | -0.01 | -0.00 | 0.17 |
| Panel B: Δ1934 | | | |
| Net investment | 0.03 | 0.01 | 0.22 |
| Book leverage | 0.03 | 0.06 | 0.43 |
| Market leverage | -0.02 | 0.00 | 0.13 |
| Pref. shares/assets | 0.01 | 0.01 | 0.88 |
| log(Assets) | -0.01 | -0.02 | 0.43 |
| Tobin's Q | 0.13 | 0.11 | 0.72 |
| Payout/fixed capital | 0.02 | 0.01 | 0.04 |
| Noncurrent assets/assets | -0.02 | -0.02 | 0.50 |
| Cash/assets | 0.01 | 0.00 | 0.22 |
| Net income/assets | 0.01 | 0.00 | 0.74 |
| Bank debt/liabilities | 0.01 | 0.00 | 0.19 |

*Notes*: This table reports average 1-year changes (Panel A from 1931 to 1932; Panel B for 1933 and 1934) for firm-year observations for firms with $d = 0$ and $d > 0$. The last column reports the $p$-value for the difference between the mean changes for $d = 0$ and $d > 0$ firms. See the appendix for variable definitions.

Table 4: Impact of leverage risk on investment

| | Panel A | | Panel B | |
|---|---|---|---|---|
| | (1) | (2) | (1) | (2) |
| $d_i p_t$ | -0.059 | -0.058 | 0.051 | 0.051 |
| | [-2.98] | [-3.19] | [2.57] | [2.53] |
| $R^2$ | 0.015 | 0.378 | 0.015 | 0.395 |
| No. of firms | 473 | 473 | 477 | 477 |
| No. of obs. | 1470 | 1470 | 1508 | 1508 |

*Notes*: Columns (1) and (2) of the table reports coefficient estimates on $d_i p_t$ using firm-year observations in the regressions

$$\text{Net investment}_{i,t} = b_0 + b_1 d_i + b_2 p_t + b_3 d_i p_t + u_{i,t} \quad (1),$$

$$\text{Net investment}_{i,t} = \beta_0 + \beta_1 d_i p_t + \alpha_i + \delta_t + u_{i,t} \quad (2),$$

where $i$ is the firm index, $t$ is year, $p_t$ is the post-treatment indicator, $\alpha_i$ represents firm fixed effects (FE), and $\delta_t$ is year FE. Results in Panel A use data from 1931 to 1934, and $p_t = 1$ for 1933 and 1934. Results in Panel B use data from 1933 to 1936, and $p_t = 1$ for 1935 and 1936. $t$-statistics, reported in brackets, are based on standard errors clustered at the 2-digit SIC industry level.

Table 5: Impact of leverage risk on equity payouts

| | Net investment | | Equity payout | |
|---|---|---|---|---|
| | (1) | (2) | (1) | (2) |
| **Panel A** | | | | |
| $d_i p_t$ | -0.058 | -0.051 | 0.030 | 0.027 |
| | [-3.19] | [-2.44] | [1.94] | [1.69] |
| $d_i p_t \mathbb{I}_{\text{low rating},i}$ | | -0.054 | | 0.020 |
| | | [-1.00] | | [2.07] |
| Overall $R^2$ | 0.378 | 0.378 | 0.900 | 0.900 |
| Within $R^2$ | 0.041 | 0.042 | 0.089 | 0.089 |
| No. of firms | 473 | 473 | 464 | 464 |
| No. of obs. | 1470 | 1470 | 1353 | 1353 |
| **Panel B** | | | | |
| $d_i p_t$ | 0.051 | 0.054 | -0.047 | -0.039 |
| | [2.53] | [2.63] | [-3.36] | [-2.66] |
| $d_i p_t \mathbb{I}_{\text{low rating},i}$ | | -0.028 | | -0.064 |
| | | [-0.34] | | [-2.00] |
| Overall $R^2$ | 0.395 | 0.395 | 0.850 | 0.850 |
| Within $R^2$ | 0.033 | 0.033 | 0.040 | 0.042 |
| No. of firms | 477 | 477 | 460 | 460 |
| No. of obs. | 1508 | 1508 | 1397 | 1397 |

*Notes*: Columns (1) and (2) of the table reports coefficient estimates on $d_i p_t$ and $d_i p_t \mathbb{I}_{\text{low rating},i}$ using firm-year observations in the regressions

$$y_{i,t} = \beta_0 + \beta_1 d_i p_t + \alpha_i + \delta_t + u_{i,t} \quad (1)$$
$$y_{i,t} = \beta_0 + \beta_1 d_i p_t + \beta_2 d_i p_t \mathbb{I}_{\text{low rating},i} + \alpha_i + \delta_t + u_{i,t} \quad (2)$$

where $y$ is net investment or equity payout (payout/fixed capital), $i$ 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 credit rating below B, $\alpha_i$ represents firm fixed effects (FE) and $\delta_t$ is year FE. Results in Panel A use data from 1931 to 1934, and $p_t = 1$ for 1933 and 1934. Results in Panel B use data from 1933 to 1936, and $p_t = 1$ for 1935 and 1936. $t$-statistics reported in brackets are based on standard errors clustered at the 2-digit SIC 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

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | | | | Panel A | | | | |
| $d_i p_t$ | -0.046 | -0.051 | -0.052 | -0.041 | -0.051 | -0.063 | -0.043 | -0.041 |
| | [-2.18] | [-2.33] | [-2.15] | [-2.38] | [-2.30] | [-3.67] | [-2.13] | [-2.39] |
| Overall $R^2$ | 0.400 | 0.387 | 0.397 | 0.398 | 0.394 | 0.396 | 0.397 | 0.401 |
| Within $R^2$ | 0.076 | 0.056 | 0.071 | 0.073 | 0.066 | 0.069 | 0.071 | 0.077 |
| No. of firms | 473 | 473 | 473 | 473 | 473 | 473 | 473 | 473 |
| No. of obs. | 1470 | 1470 | 1470 | 1470 | 1470 | 1470 | 1470 | 1470 |
| | | | | Panel B | | | | |
| $d_i p_t$ | 0.063 | 0.050 | 0.064 | 0.056 | 0.054 | 0.053 | 0.062 | 0.063 |
| | [3.15] | [2.40] | [2.90] | [2.67] | [2.65] | [2.62] | [3.27] | [3.71] |
| Overall $R^2$ | 0.410 | 0.419 | 0.404 | 0.413 | 0.410 | 0.413 | 0.413 | 0.412 |
| Within $R^2$ | 0.057 | 0.072 | 0.048 | 0.063 | 0.058 | 0.062 | 0.063 | 0.060 |
| No. of firms | 477 | 477 | 477 | 477 | 477 | 477 | 477 | 477 |
| No. of obs. | 1508 | 1508 | 1508 | 1508 | 1508 | 1508 | 1508 | 1508 |

*Notes*: This 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, $j$ represents characteristics, $t$ is year, $p_t$ is the post-treatment indicator, $\alpha_i$ is firm fixed effects (FE), and $\delta_t$ is year FE. In Column (1), $X_{j,i}$ represents pretreatment values for log(Assets), Tobin's Q, book leverage, financial leverage, cash/assets, net income/assets, and noncurrent assets/assets. In Columns (2) to (8), $X_{j,i}$ is a decile fixed effect based on the pretreatment distribution of a variable: (2) book leverage, (3) market leverage, (4) log(Assets), (5) Tobin's Q, (6) net income/assets, (7) cash/assets, and (8) noncurrent assets/assets. $\mathbb{I}_{t=\tau}$ is an indicator function for the current year. Results in Panel A use data from 1931 to 1934, and $p_t = 1$ for 1933 and 1934. Results in Panel B use data from 1933 to 1936, and $p_t = 1$ for 1935 and 1936. $t$-statistics, reported in brackets, are based on standard errors clustered at the 2-digit SIC industry level. Within $R^2$ refers to explained variation at the firm level. Overall $R^2$ includes variation within and across firms.

Table 7: Leverage risk and financial constraints

| | Panel A | | Panel B | |
|---|---|---|---|---|
| | (1) | (2) | (1) | (2) |
| $d_i p_t$ | 0.026 | -0.058 | -0.033 | 0.058 |
| | [0.50] | [-3.06] | [-0.61] | [2.73] |
| Overall $R^2$ | 0.374 | 0.379 | 0.392 | 0.397 |
| Within $R^2$ | 0.036 | 0.043 | 0.028 | 0.036 |
| No. of firms | 473 | 444 | 477 | 447 |
| No. of obs. | 1470 | 1377 | 1508 | 1405 |

*Notes*: This table reports coefficient estimates on $d_i p_t$ in the regression

$$\text{Net investment}_{i,t} = \beta_0 + \beta_1 d_i p_t + \alpha_i + \delta_t + u_{i,t},$$

where $i$ indexes firms, $t$ is year, $p_t$ is the post-treatment indicator, $\alpha_i$ represents firm fixed effects (FE), and $\delta_t$ is year FE. In (1), $d_i$ is the 1933 share of bank debt in total liabilities. In (2), we repeat the baseline specification (2) in Table 4 but exclude firms with bonds maturing in 1933 and 1934. Results in Panel A use data from 1931 to 1934, and $p_t = 1$ for 1933 and 1934. Results in Panel B use data from 1933 to 1936, and $p_t = 1$ for 1935 and 1936. $t$-statistics reported in brackets are based on standard errors clustered at the 2-digit SIC industry level. Within $R^2$ refers to explained variation at the firm level. Overall $R^2$ includes variation within and across firms.

Table 8: Impact of leverage risk on investment with industry-year fixed effects

| | Panel A | | Panel B | |
|---|---|---|---|---|
| | (1) | (2) | (1) | (2) |
| $d_i p_t$ | -0.054 | -0.054 | 0.049 | 0.056 |
| | [-2.26] | [-1.92] | [2.04] | [2.42] |
| Overall $R^2$ | 0.450 | 0.465 | 0.465 | 0.478 |
| Within $R^2$ | 0.152 | 0.176 | 0.144 | 0.166 |
| No. of firms | 473 | 473 | 477 | 477 |
| No. of obs. | 1470 | 1470 | 1508 | 1508 |
| Controls | No | Yes | No | Yes |

*Notes*: This 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, $\alpha_i$ is firm fixed effects (FE), and $\delta_t$ is year FE. Results in Panel A use data from 1931 to 1934, and $p_t = 1$ for 1933 and 1934. Results in Panel B use data from 1933 to 1936, and $p_t = 1$ for 1935 and 1936. All regressions include industry x year FE. In (1), $X_{i,j}$ represents industry FE. In (2), $X_{i,j}$ represents industry FE and pretreatment values for log(Assets), Tobin's Q, book leverage, financial leverage, cash/assets, net income/assets, and noncurrent assets/assets. $\mathbb{I}_{t=\tau}$ is an indicator function for the current year. Industries are based on the 2-digit SIC classification. $t$-statistics reported in brackets are based on standard errors clustered at the 2-digit SIC industry level. Within $R^2$ refers to explained variation at the firm level. Overall $R^2$ includes variation within and across firms.

Table 9: Impact of leverage risk on profits

| | Panel A | Panel B |
|---|---|---|
| $d_i p_t$ | 0.001 | 0.007 |
| | [0.20] | [1.02] |
| Overall $R^2$ | 0.782 | 0.833 |
| Within $R^2$ | 0.184 | 0.224 |
| No. of firms | 457 | 463 |
| No. of obs. | 1316 | 1393 |

*Notes*: This table reports coefficient estimates on $d_i p_t$ in the regression

$$\text{Profit}_{i,t} = \beta_0 + \beta_1 d_i p_t + \alpha_i + \delta_t + u_{i,t},$$

where $i$ indexes firms, $t$ is year, $p_t$ is the post-treatment indicator, $\alpha_i$ represents firm fixed effects (FE), and $\delta_t$ is year FE. Results in Panel A use data from 1931 to 1934, and $p_t = 1$ for 1933 and 1934. Results in Panel A use data from 1933 to 1936, and $p_t = 1$ for 1935 and 1936. Profits are computed as net income divided by the pretreatment average of fixed capital. $t$-statistics reported in brackets are based on standard errors clustered at the 2-digit SIC industry level. Within $R^2$ refers to explained variation at the firm level. Overall $R^2$ includes variation within and across firms.

Table 10: Robustness analysis

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | | | Panel A | | | |
| $d_i p_t$ | -0.036 | -0.059 | -0.062 | -0.047 | -0.100 | 0.015 |
| | [-2.27] | [-2.63] | [-2.92] | [-2.72] | [-2.80] | [0.56] |
| Overall $R^2$ | 0.376 | 0.377 | 0.369 | 0.377 | 0.377 | 0.375 |
| Within $R^2$ | 0.039 | 0.038 | 0.044 | 0.041 | 0.040 | 0.037 |
| No. of firms | 473 | 473 | 439 | 473 | 473 | 473 |
| No. of obs. | 1470 | 1470 | 1367 | 1470 | 1470 | 1470 |
| | | | Panel B | | | |
| $d_i p_t$ | 0.045 | 0.050 | 0.073 | 0.047 | 0.091 | -0.012 |
| | [2.41] | [2.20] | [3.42] | [2.78] | [1.74] | [-0.64] |
| Overall $R^2$ | 0.396 | 0.380 | 0.401 | 0.395 | 0.394 | 0.392 |
| Within $R^2$ | 0.034 | 0.032 | 0.041 | 0.034 | 0.032 | 0.029 |
| No. of firms | 477 | 477 | 440 | 477 | 477 | 477 |
| No. of obs. | 1508 | 1508 | 1377 | 1508 | 1508 | 1508 |

*Notes*: This table reports coefficient estimates on $d_i p_t$ in the regression

$$\text{Net investment}_{i,t} = \beta_0 + \beta_1 d_i p_t + \alpha_i + \delta_t + u_{i,t},$$

where $i$ indexes firms, $t$ is year, $p_t$ is the post-treatment indicator, $\alpha_i$ is firm fixed effects (FE), and $\delta_t$ is year FE. Results in Panel A use data from 1931 to 1934, and $p_t = 1$ for 1933 and 1934. Results in Panel B use data from 1933 to 1936, and $p_t = 1$ for 1935 and 1936. In Column (1), we define book debt net of preferred shares in the calculation of $d_i$. In Column (2), we use the log investment rate as the dependent variable. In Column (3), we omit other regulated industries: transportation, communication, and utilities. In (4), we define book debt net of cash in the calculation of $d_i$. In Column (5), we define $d_i$ using total assets as the denominator instead of total liabilities. In Column (6), we replace $d_i$ by the share of the sum of preferred shares and bond amount outstanding without gold clauses in total liabilities. $t$-statistics reported in brackets are based on standard errors clustered at the 2-digit SIC 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 % | -4.15 | -2.58 | -0.05 | 1.13 |
| Leverage risk effect in % | -1.28 | -1.36 | 1.11 | 1.13 |
| Panel B: $d > 0$ firms | | | | |
| Total net investment in % | -5.07 | -3.68 | -0.16 | 0.62 |
| Leverage risk effect in % | -1.76 | -1.92 | 1.65 | 1.72 |

*Notes*: This table reports the total net investment rate from 1933 to 1936, given by

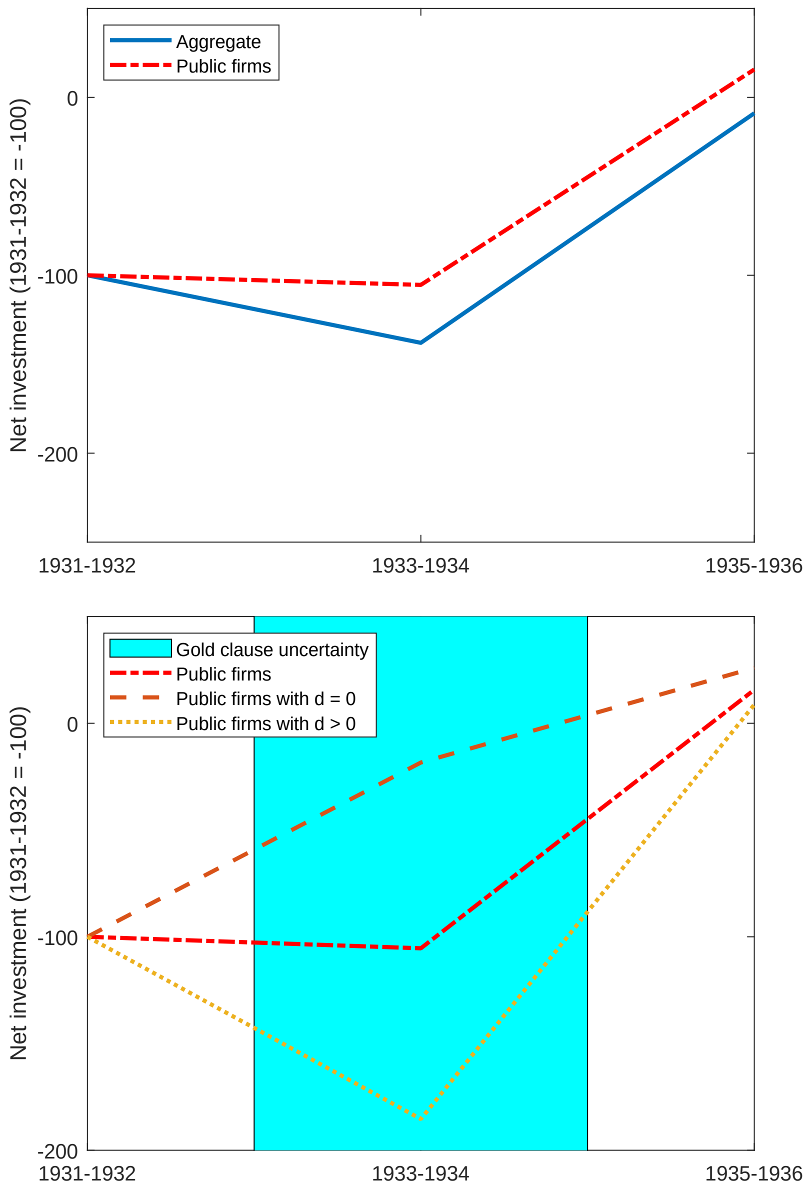
$$\frac{\sum_i \text{Fixed capital}_t}{\sum_i \text{Fixed capital}_{t-1}} - 1,$$

and estimates of the leverage risk effect, given by

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

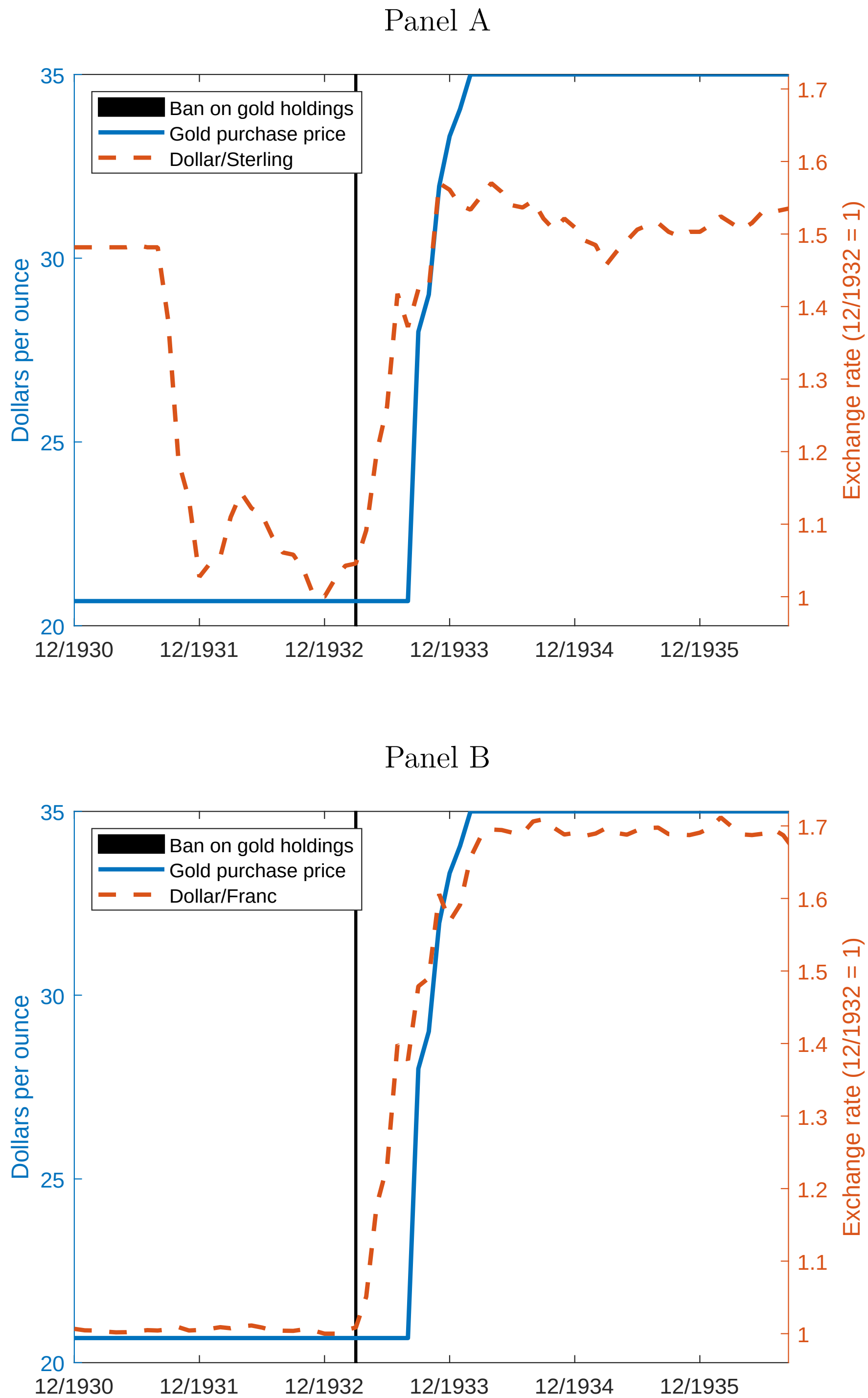
where $i$ indexes firms and $\beta_1$ is the estimate of the leverage risk effect reported in Panel A, Column (2), Table 4, for 1933 and 1934 and Panel B for 1935 and 1936. Panel A reports results for all firms, and Panel B reports results for the subsample of $d > 0$ firms.

Figure 1: Aggregate investment and total investment in the sample



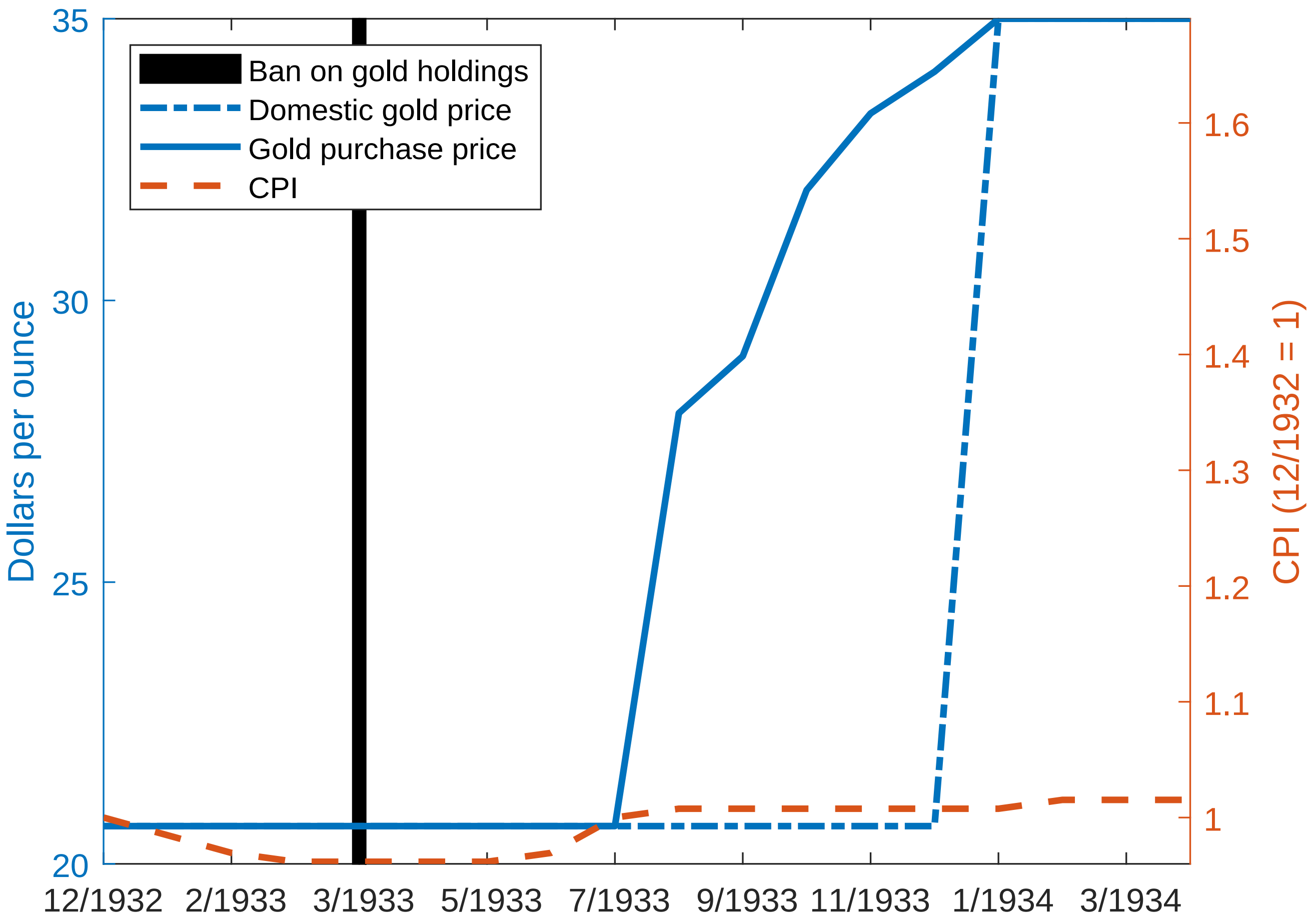

*Notes*: This figure plots the path of investment in three 2-year periods: 1931–1932, 1933–1934, and 1935–1936. Aggregate investment is the net fixed private domestic investment from the Bureau of Economic Analysis (BEA). Public firms' investment is the total net investment by firms in our sample adjusted for variations in the size of our panel. The lower panel plots the total investment among firms with no ($d = 0$) and a positive amount ($d > 0$) of bonds with gold clauses in 1932. All quantities are normalized to -100 in 1931–1932. See the appendix for details.

Figure 2: Gold price and exchange rates from 1931 to 1936



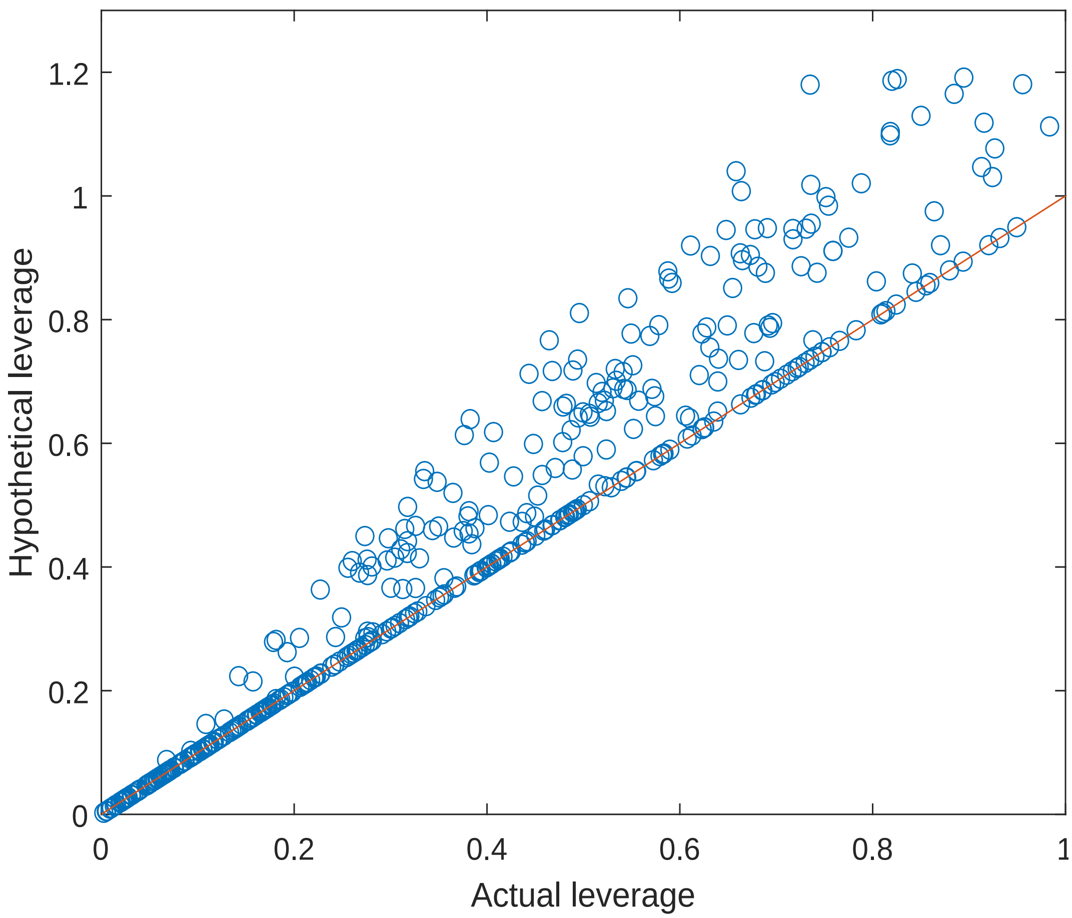

*Notes*: The red-dashed line represents the dollar/sterling (Panel A) and dollar/franc (Panel B) exchange rates normalized to 1 in December 1932. The black vertical line represents the start of the requirement to return all gold holdings to the U.S. government. The solid-blue line represents the gold price in the U.S. government's purchasing programs. All variables are at a monthly frequency.

Figure 3: Gold price and inflation in 1933 and 1934




*Notes*: The blue-dotted line represents the official domestic gold price in the United States. The vertical black line represents the start of the requirement to return all gold holdings to the government in the United States. The solid-blue line is the gold price in the U.S. government's purchasing programs. The red-dashed line is the Consumer Price Index (CPI) normalized to 1 in December 1932.

Figure 4: Impact of gold clause reinstatement on financial leverage




*Notes*: This figure plots the observed financial (book) leverage of firms in our sample in 1932 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 with gold clauses divided by total assets.