Bankruptcy Resolution and Credit Cycles*

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Abstract

We study how the macroeconomic dynamics following credit cycles vary with business bankruptcy institutions. Using data on bankruptcy efficiency and business credit around the world, we document that business credit booms are followed by severe declines in output, investment, and consumption in environments with poorly functioning business bankruptcy. On the contrary, in settings with well functioning business bankruptcy, the aftermath of credit booms is characterized by moderate changes in economic activities. We use a simple model to lay out how and when efficient bankruptcy systems can mitigate the negative consequences of credit booms.

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1 Introduction

Credit cycles have been a leading topic in discussions about macroeconomic stability and macroprudential policies over the past decade. Following a growing body of evidence that credit booms often lead to economic turmoil (Schularick and Taylor, 2012; Jordà, Schularick, and Taylor, 2013; Mian, Sufi, and Verner, 2017; Greenwood, Hanson, Shleifer, and Sørensen, 2022; Ivashina, Kalemli-Özcan, Laeven, and Müller, 2024), researchers and policymakers have considered using macroprudential policies to restrain credit expansions and prevent crises. However, macroprudential policies also have costs (e.g., they can introduce regulatory burdens or lead to misallocations). Therefore, a critical task for guiding these policies is to identify the settings where credit booms are more or less likely to create real damage. In the aftermath of credit booms, real damage often arises from firms suffering through inefficient resolution of distress and default, which can disrupt economic activities and aggravate output losses. Accordingly, institutions for the resolution of distress and default can be important for the design of macroprudential policies.

In this paper, we study how institutions for business bankruptcy relate to the macroeconomic dynamics in credit cycles. Using data on bankruptcy efficiency and business credit across 39 countries, we document that business credit booms are followed by severe economic contractions in environments with poorly functioning business bankruptcy. On the contrary, in settings with well functioning business bankruptcy, the aftermath of credit booms is characterized by moderate changes in output, investment, and unemployment. We use a simple model to lay out how bankruptcy resolution affects macro outcomes, and why more efficient bankruptcy systems can mitigate the negative consequences of credit booms.

At a high level, institutions for business bankruptcy resolve firms' distress and default through two main approaches. A traditional approach is to terminate firms' operations, liquidate their assets, and pay out the proceeds. This option is available in most countries. Another relatively more modern approach is to restructure viable firms where the continuation value from operations (i.e., "going-concern value") is greater than the liquidation value. For instance, in U.S. Chapter 11 restructuring, viable firms continue to operate, and creditors' payoffs are given by the going-concern value as verified and approved in court. Well functioning restructuring systems are important as they reduce inefficiencies from liquidation, which can be substantial due to the loss of valuable organizational capital and the costs of redeploying specialized assets (Ramey and Shapiro, 2001; Bernstein, Colonnelli, and Iverson, 2019; Corbae and D'Erasmo, 2021; Crouzet, Eberly, Eisfeldt, and Papanikolaou, 2022; Kermani and Ma, 2023). However, these systems are challenging to build and relatively rare.

To measure the quality of a country's bankruptcy system, we follow the work of Djankov, Hart, McLiesh, and Shleifer (2008a) and the extension to 166 countries from 2003 to 2019 by World Bank (2020). This measure assesses the amount of value that can be preserved for a viable company in financial distress. Bankruptcy efficiency is higher if the viable company can continue to operate, and the procedure does not take too long or incur too much costs. Default resolution for a viable company is economically important, given large dead weight loss from inefficient liquidation. It is also challenging to implement (well-functioning restructuring is difficult), and can reflect bankruptcy institutions' capacity to handle other issues more generally (e.g., their efficiency for liquidating nonviable companies), as we discuss in Section 3.1. The data show that bankruptcy efficiency varies substantially around the world. For a standardized case where the company has continuation value 100 and liquidation value 70, the value that can be preserved after bankruptcy is 39 on average, with a standard deviation of 25.

Our empirical analysis proceeds by estimating state-dependent local projections, which trace out how economic activities evolve following changes in business credit to GDP, in countries with high and low efficiency of business bankruptcy. We obtain data on business credit from the Bank of International Settlements (BIS), including both loans and bonds (Dembiermont, Drehmann, and Muksakunratana, 2013). We use data on macroeconomic outcomes including GDP, investment, unemployment rate, and consumption from the World Economic Outlook and the World Bank World Development Indicator databases (International Monetary Fund, 1999-2024; World Bank, 2024). The combined sample has 39 countries due to the coverage of the BIS credit data.

We find that countries with better bankruptcy systems are less vulnerable to credit cycles. For instance, following a 10 percentage point increase in business credit to GDP over the past 5 years, output in the next 5 years declines by around 3 percentage points if bankruptcy efficiency is at the bottom quartile. In contrast, the decline is negligible when bankruptcy efficiency is at the top quartile. We also observe substantial declines of investment and consumption, as well as increases of unemployment in countries with low bankruptcy efficiency, but to a limited extent in countries with high bankruptcy efficiency. We perform a large set of robustness checks to verify that the differences in macroeconomic outcomes are not due to bankruptcy efficiency being correlated with other factors that affect macroeconomic stability, including development status, exchange rate pegging, countercycliacality of monetary and fiscal policies, or general rule of law. The results are similar when we instrument bankruptcy efficiency with legal origins following Djankov et al. (2008a). The results also hold when controlling for the size of the credit market (the level of business credit to GDP). Our exposition uses credit booms (i.e., positive changes in business credit to GDP) for simplicity, given the emphasis in the literature; the results are symmetric for negative changes in business credit to GDP after the first 2 years, and stronger for credit booms before that.

To interpret our empirical findings, we develop a simple model that links credit cycles and bankruptcy efficiency. In the model, firms finance investments with defaultable debt. Following default, firms either liquidate or reorganize. Weaker bankruptcy institutions increase the likelihood of inefficient liquidation, which generates greater output losses. This setup resembles the baseline bankruptcy efficiency measure (Djankov et al., 2008a; World Bank, 2020), and is supported by empirical evidence on substantial losses from liquidation (Ramey and Shapiro, 2001; Bris, Welch, and Zhu, 2006; Bernstein, Colonnelli, and Iverson, 2019; Kermani and Ma, 2023). We use the model to study both "fundamental" credit booms driven by rational expectations of increases in firms' productivity, and "nonfundamental" credit booms driven by increases in credit supply or credit demand due to changes in discount rates or biased beliefs.[1]

Our model analysis shows two main results. First, nonfundamental credit booms are followed by lower output and more defaults. Both our analyses and previous empirical studies of credit cycles (Schularick and Taylor, 2012; Mian, Sufi, and Verner, 2017) observe such a pattern for credit booms overall. In this case, more efficient bankruptcy systems mitigate the negative consequences of these credit booms, by decreasing the likelihood of inefficient liquidation in default; this is also consistent with our main empirical evidence. Second, in our model, fundamental credit booms are followed by higher output and fewer defaults. In this case, a more efficient bankruptcy system dampens the positive impact of a credit boom, since a more efficient bankruptcy system leaves less room for increases in firms' productivity when the amount of defaults and inefficient liquidations decrease. In the data, we draw on the findings by Müller and Verner (2023) and Ivashina et al. (2024) that credit booms in nontradable sectors appear nonfundamental (they are followed by worse macroeconomic outcomes), whereas credit booms in tradable sectors appear fundamental (they are followed by better macroeconomic outcomes). Interestingly, we also observe that bankruptcy efficiency dampens the negative effects of nontradable credit booms, and dampens the positive effects of tradable credit booms, exactly as our model predicts.[2]

Taken together, our analysis highlights the importance of incorporating default risk and bankruptcy

[1]As in the empirical analyses, our exposition here uses credit booms (i.e., increases in business credit) for simplicity, but the model predictions are symmetric for decreases in business credit too.

[2]We do not find that the prevalence of nontradable and tradable credit booms differs by the degree of bankruptcy efficiency.

institutions into models used for macroprudential policy design. Nonfundamental credit booms appear dominant both in our data and in previous research. In this setting, bankruptcy efficiency ameliorates the negative consequences of credit booms.

The importance of bankruptcy institutions for credit cycles is illustrated vividly by the experience of Japan in the last two decades of the 20th century. Bankruptcy institutions in Japan were relatively underdeveloped until the late 1990s, with a tedious process and a focus on liquidation (Tan, 2004; Anderson, 2006). Business lending in Japan traditionally relied heavily on real estate, and a sharp business credit boom occurred when real estate prices surged in the late 1980s. The boom ended with the collapse of real estate prices, and Japan suffered substantially from negative macroeconomic consequences (Gan, 2007; Caballero, Hoshi, and Kashyap, 2008). With an inefficient bankruptcy system, bad debt problems were challenging to resolve. Correspondingly, firms were strained by debt overhang, while banks were burdened by nonperforming loans and often opted to evergreen such loans as default resolution was cumbersome. These issues exacerbated credit contractions, resource misallocations, and economic downturns. As bad debt problems proliferated, Japanese policymakers recognized the importance of bankruptcy institutions and embarked on a major bankruptcy reform that lasted from 1996 to 2005.

In the U.S., where business bankruptcy institutions are among the most developed in the world, business debt has not been a primary source of macroeconomic instability. Instead, households and financial institutions, where default resolution has been much more challenging, have played a central role in credit cycles that ended in economic turmoil (Gertler and Gilchrist, 2018). However, business bankruptcy institutions perform poorly in many countries Djankov et al. (2008a), and corporate credit booms appear to have been an important contributor to macroeconomic instability around the world in the 20th century (Ivashina et al., 2024).

Literature review Our paper relates to several strands of literature. First, we extend the work on financial frictions and economic fluctuations. An influential line of research highlights that frictions in debt enforcement can exacerbate economic fluctuations (Kiyotaki and Moore, 1997; Bernanke, Gertler, and Gilchrist, 1999). A growing body of empirical work documents the negative consequences of credit booms in general (Schularick and Taylor, 2012; Jordà, Schularick, and Taylor, 2013; Greenwood et al., 2022) and corporate credit booms in particular (Müller and Verner, 2023; Ivashina et al., 2024). The most closely related research is Jordà, Kornejew, Schularick, and Taylor (2022), who focus on recessions and show that greater frictions in corporate debt resolution are associated with slower recoveries. We do not restrict to recessions, and we study a variety of macroeconomic outcomes following changes in business credit to GDP in general (e.g., what happens after credit booms or contractions). Indeed, we observe that, in countries with lower bankruptcy efficiency, credit booms are followed by a higher likelihood of recessions in the first place. Moreover, in countries with lower bankruptcy efficiency, macro outcomes following credit booms are worse even without recessions. We also provide a model to delineate how bankruptcy efficiency matters for the macroeconomic impact of credit cycles.

Second, we connect law and macroeconomics. An important literature has examined how financial markets and firm outcomes are affected by legal systems in general (La Porta, Vishny, de Silanes, and Shleifer, 1998), as well as bankruptcy institutions in particular (Acharya and Subramanian, 2009; Gilson, 2012; Vig, 2013; Ponticelli and Alencar, 2016; Becker and Josephson, 2016; Iverson, 2018; Bernstein et al., 2019; Becker and Ivashina, 2022). We focus on the macro consequences of credit cycles, which represent one of the most important challenges for economic stability. It is natural that the legal systems affect financial frictions, which in turn affect macroeconomic outcomes.

Third, we provide a new perspective on macroprudential policies. The traditional approach relies on regulatory tools to prevent credit booms, in order to avoid costly recessions in the aftermath of these booms (Hanson, Kashyap, and Stein, 2011; Bianchi and Lorenzoni, 2022). Our evidence suggests that the macroeconomic dynamics following credit booms depend on institutions for default resolution. Improving these institutions is another approach for enhancing macroeconomic stability. To the extent that existing macroprudential tools could be blunt or costly (Ottonello, Perez, and Varraso, 2022; Andreasen et al., 2023; Dávila and Walther, 2024), they may be less necessary in environments with high bankruptcy efficiency.

The rest of the paper is organized as follows. Section 2 outlines the economic functions of insitutions for business bankruptcy. Section 3 describes the data. Section 4 provides the empirical results on how bankruptcy efficiency relates to the macroeconomic consequences of credit booms. Section 5 uses a simple model to illustrate the mechanisms. Section 6 concludes.

2 The Economics of Business Bankruptcy

Why are legal institutions for business bankruptcy important? We proceed in two steps in this section. In Section 2.1, we discuss the relevance of default resolution for firm and macroeconomic outcomes. In Section 2.2, we then discuss the relevance of legal institutions on business bankruptcy for default resolution.

In Section 2.3, we illustrate the importance of bankruptcy institutions for macroeconomic outcomes with the case of Japan.

2.1 Default Resolution and Economic Implications

Human civilizations have used debt contracts to support business activities for thousands of years. Since the earliest days, it has been well recognized that lenders are only willing to supply funding if they can expect to be paid back. There are several approaches of debt enforcement if borrowers default.

One approach is to impose severe punishment, such as debtors' prison (in ancient times) or autarky analyzed in many studies of sovereign default (Eaton and Gersovitz, 1981; Bulow and Rogoff, 1989). This approach is perhaps rare for commercial credit in today's world. It can be rather inefficient, especially for "honest but unfortunate debtors," such as a viable company hit by adverse liquidity shocks (or firms during Covid).

Another approach is that firms pledge physical assets in order to borrow, which creditors can seize in the case of default. This approach exists in most countries, and has influenced many macroeconomic models (Kiyotaki and Moore, 1997; Bernanke, Gertler, and Gilchrist, 1999). It is natural if property rights over assets can be enforced, but cash flows are not verifiable. However, it can be inefficient too in the case of viable companies in financial distress (Diamond, 2023).

A third approach is to implement financial restructuring, and remunerate lenders with the continuation value of the company. This approach can be beneficial for viable companies in financial distress (Gilson, 2010). It tends to rely more on cash flow verifiability. For instance, in Chapter 11 restructuring in the U.S., viable firms continue to operate (instead of being liquidated), and creditors' payoffs are given by the "going-concern value" (i.e., the value of cash flows from ongoing operations) of the company post reorganization as verified and approved in court.

Default resolution affects "ex post" economic outcomes during distress. First, it has a direct impact on resource allocation. Ideally, viable companies in financial distress should be kept alive, and nonviable companies in economic distress should be liquidated. However, inefficient default resolution may liquidate viable companies, or keep around nonviable firms whose assets have better use elsewhere. Second, poor business performance due to inefficient default resolution can trigger real or financial amplifications (e.g., by reducing demand or asset prices), and exacerbate distress for other companies (Kiyotaki and Moore, 1997; Bernanke, Gertler, and Gilchrist, 1999; Benmelech and Bergman, 2011; Bernstein et al., 2019). Third, inefficient default resolution can distort banks' lending decisions, by creating stronger incentives for ailing banks to evergreen nonperforming loans instead of resolving them (Becker and Ivashina, 2022). For these reasons, inefficient default resolution can exacerbate recessions.

Default resolution also affects "ex ante" credit availability and the determinants of firms' debt capacity. For example, with well-functioning restructuring system, creditors' payoffs in default are tied to the going-concern value of the company, which facilitates borrowing against earnings (Lian and Ma, 2021). Conversely, when liquidation dominates, pledging physical assets is especially important for borrowing, and companies' debt capacity can be more sensitive to real estate value.

What shapes the feasibility of each approach of default resolution? As mentioned above, the liquidation approach relies on property rights over assets, and the restructuring approach often relies on cash flow verifiability. In addition to these basic components, additional support from the legal system can be necessary, especially for restructuring which tends to be a more complex process. We discuss the role of the legal institutions for business bankruptcy in the following.

2.2 The Role of Bankruptcy Institutions for Default Resolution

Bankruptcy is a legal process aimed to facilitate the resolution of financial and economic distress.[3] In the absence of legal institutions for business bankruptcy, private parties may encounter information frictions regarding the value of the debtors' assets and liabilities, as well as coordination frictions among different claimholders. Both types of frictions can shrink the total size of the pie ex post, and affect debt availability ex ante (Morris and Shin, 2004; Smith and Strömberg, 2005; Dou, Taylor, Wang, and Wang, 2021; Guntin, 2023). Legal institutions, with a combination of statues and court implementation, can improve the provision and verification of information and aid coordination.

In the case of liquidation, the key objective is to organize an orderly wind-down process. In this process, it is useful to verify the debtor's total assets and liabilities, as well as the priority structure among different claimholders. It may also be useful to coordinate the liquidation process to maximize the receipts from

[3] Although the term "bankrupt" is often associated with business failure in popular culture, business bankruptcy is not the same as business failure. First, many businesses exit without bankruptcy proceedings. Formally, bankruptcy needs a petition to start, but business failures do not. Second, business bankruptcies in advanced economies may focus on restructuring financial obligations and streamline operations, and the company continues to operate instead of winding down.

asset sales (e.g., when assets pledged to different parties have complementarity).

In the case of restructuring, addressing information frictions and coordination frictions is even more important. In this process, it is crucial to verify the debtor's assets, liabilities, and cash flows. In addition, a significant amount of coordination among claimholders may be required to reach a restructuring plan. Unilateral actions taken by creditors to seize their collateral (out of concerns regarding the value of their assets, the priority they have with respect to other creditors, or actions taken by other creditors) can disrupt continuing operations and destroy viable businesses.

Finally, adjudicating whether a company is viable requires reliable information and considerable coordination. Coordination frictions are typically more severe for large companies with complex operations and liability structures. Information frictions can apply to both large and small companies.

The legal process for business bankruptcy addresses information frictions and coordination frictions in several ways. First, the court can provide a centralized forum for information gathering and disclosure. In the U.S., debtors submit a variety of information to the court at the time of filing, including financial information, organizational structure, lists of claimholders, among others. The court may also appoint trustees to collect additional information. In restructuring, the court approves the assessed value of the company, which is the basis of payments to claimholders. Second, the court may prohibit unilateral actions by claimholders that jeopardize orderly resolution or disrupt continuing operations of viable firms. In the U.S., business bankruptcy features the automatic stay, which forbids asset seizure and debt collection upon bankruptcy filing.[4] Third, the court can design voting rules to help different claimholders reach an agreement. In the U.S., claimholders with similar priority are grouped into one class, and each class needs to approve a restructuring plan with two thirds in value and one half in number. This voting rule aims to alleviate holdout problems and prevent powerful senior creditors from imposing their desires upon junior creditors (or vice versa).

The court may also help support the financing of firms' operations during restructuring. In the U.S., the court can approve "debtor-in-possession" financing with super priority over pre-petition claims (typically paid off when restructuring is completed), to provide liquidity and overcome debt overhang. In addition, the court can allow critical vendors to get paid for the goods and services they supply during the restructuring process (whereas other claimholders are not paid until restructuring is completed), to minimize production

[4]Meanwhile, to ensure that creditors' rights are protected, payments will not be less than the liquidation value of their collateral.

disruptions. Finally, bankruptcy laws often include provisions that allow the court to claw back payments made by the debtor during a certain time interval before the bankruptcy filing. Such provisions aim to prevent fraudulent behavior or unequal treatment of claimholders (e.g., the company tunneling funds towards certain parties in anticipation of the bankruptcy filing), and to correct such actions if they do occur.

Achieving these functions is a complicated endeavor, which requires a combination of sophisticated statues and competent judges (Aghion, Hart, and Moore, 1992; Smith and Strömberg, 2005; Ponticelli and Alencar, 2016; Antill, 2022; Iverson et al., 2023). Often times, bankruptcy laws are historically developed to liquidate failed businesses, and are slow to serve the need of resolving financial distress for viable companies, as restructuring is a complex process that involves more information gathering, financial analyses, operational expertise, and coordination. Court implementation can be plagued by bureaucracy, or hampered by the lack of financial expertise. Therefore, despite the importance of their tasks, legal institutions for business bankruptcy function poorly in many countries. In Section 3, we turn to the measurement of the performance of these institutions around the world.

2.3 Business Bankruptcy and Macroeconomic Outcomes: The Case of Japan

Japan provides a vivid illustration of the relevance of bankruptcy institutions for macroeconomic outcomes. Until the 1990s, Japanese bankruptcy institutions were relatively under-developed. Traditionally, the bankruptcy framework focused on liquidation rather than restructuring, and the legal process was complex and tedious. Accordingly, formal bankruptcy was barely used and private enforcement was common (Tan, 2004; Anderson, 2006). In that environment, business lending relied heavily on pledging real estate. The real estate price boom in the late 1980s led to a sharp increase in business credit, and the subsequent collapse of real estate prices resulted had substantial negative consequences (Gan, 2007; Caballero, Hoshi, and Kashyap, 2008). Credit supply and business investment experienced sharp and persistent declines.

In the 1990s, as bad debt problems proliferated, policymakers thought that the slow recovery was partly due to the difficulties of bankruptcy resolution. "Lenders were not collecting outstanding debts partially due to the inefficiencies and costs believed to be involved in formal insolvency proceedings" (Anderson, 2006). Accordingly, firms were strained by debt overhang, while banks were burdened by nonperforming loans and often opted to evergreen such loans as default resolution was cumbersome (resulting in zombie lending). These issues exacerbated credit contractions, resource misallocations, and economic downturns. In 1996, Japan started a comprehensive reform of its bankruptcy system, which was completed in 2005. The reform improved the efficiency of the bankruptcy system and its ability to implement restructuring. “Proceeding times decreased radically and successful rehabilitations became the norm rather than extremely rare exceptions" (Anderson, 2006). Over this period, Japan went from having one of the lowest rates of business bankruptcy filings in the developed world to having filing numbers comparable to other countries (Tan, 2004; Anderson, 2006).

The Japanese case shows that bankruptcy institutions matter for the macroeconomic consequences of credit booms, and its relevance is recognized by policymakers. We examine this relationship systematically in the rest of this paper.

3 Data

We describe the main datasets in this section.

3.1 Bankruptcy Efficiency

Data source The quality of the institutions for business bankruptcy varies substantially around the world. Djankov et al. (2008a) pioneered the measurement of the performance of these institutions. Building on their work, the World Bank has constructed a systematic country-year level dataset covering 166 countries from 2003 to 2019 (World Bank, 2020). We use the World Bank dataset, and correspondingly our empirical analyses focus on this sample period.

Baseline measure To make the measurement comparable across countries, this line of work presents a schematic case to legal professionals in each country, and asks them to assess the likely outcomes. Having a uniform case is useful because the observed bankruptcy cases can differ a lot by country. The benchmark case features a viable firm in financial distress, which is worth 100 if it continues to operate and 70 if it liquidates. The legal professionals assess whether such a company in their country can continue to operate (i.e., as a “going concern" instead of being disbanded and liquidated piecemeal), and estimate the total payoffs to claimholders (after resolution costs) as well as the likely duration of the bankruptcy case.

We measure bankruptcy efficiency using the total recovery rate, i.e., total payment to claimholders net of total bankruptcy costs normalized by 100 (the full value from continuing operation).[5] Table 1 presents the summary statistics. In the full sample, the average country can preserve 39% of the maximum value of the firm from continuing operation. The standard deviation is 25%. In the sample we use for analysis later in Section 4, which is restricted by business credit data from the BIS, the average bankruptcy efficiency is higher at 63%. Even in this case, the average loss of value is substantial. In the data, variations in bankruptcy efficiency are mainly across countries rather than within countries over time during the World Bank (2020) sample period (e.g., country fixed effects have R^2 around 0.9). Legal origins are important (Djankov et al., 2008a), with R^2 around 0.33.

There are two important reasons for low bankruptcy efficiency: 1) failure to preserve the viable firm, and 2) long and costly bankruptcy process. In Figure 1, we plot the total recovery rate on the y-axis for 2019, the latest year of data. The x-axis is the likely duration of the bankruptcy case across countries. The solid blue dots indicate countries where the viable company can continue to operate, and the hollow red dots indicate places where it cannot. We see that the viable company is expected to survive in only about half of the countries. The recovery is naturally higher in these settings. In many countries, however, the company cannot survive, and the bankruptcy case is expected to take a long time. Accordingly, recovery is very low.

In Figure IA1, we construct a proxy of realized default recovery rate, and compare it with our bankruptcy efficiency measure. Specifically, we take the ratio of loan impairments relative to nonperforming loans in a given year from the BIS MiDAS Credit Loss Database introduced by Ong, Schmieder, and Wei (2023), and use 1 minus this ratio as the imputed recovery rate. This imputation can be imprecise since we do not know the exact timing for nonperforming loans to translate into impairments. We observe a positive relationship between this imputed default recovery rate and the bankruptcy efficiency measure.

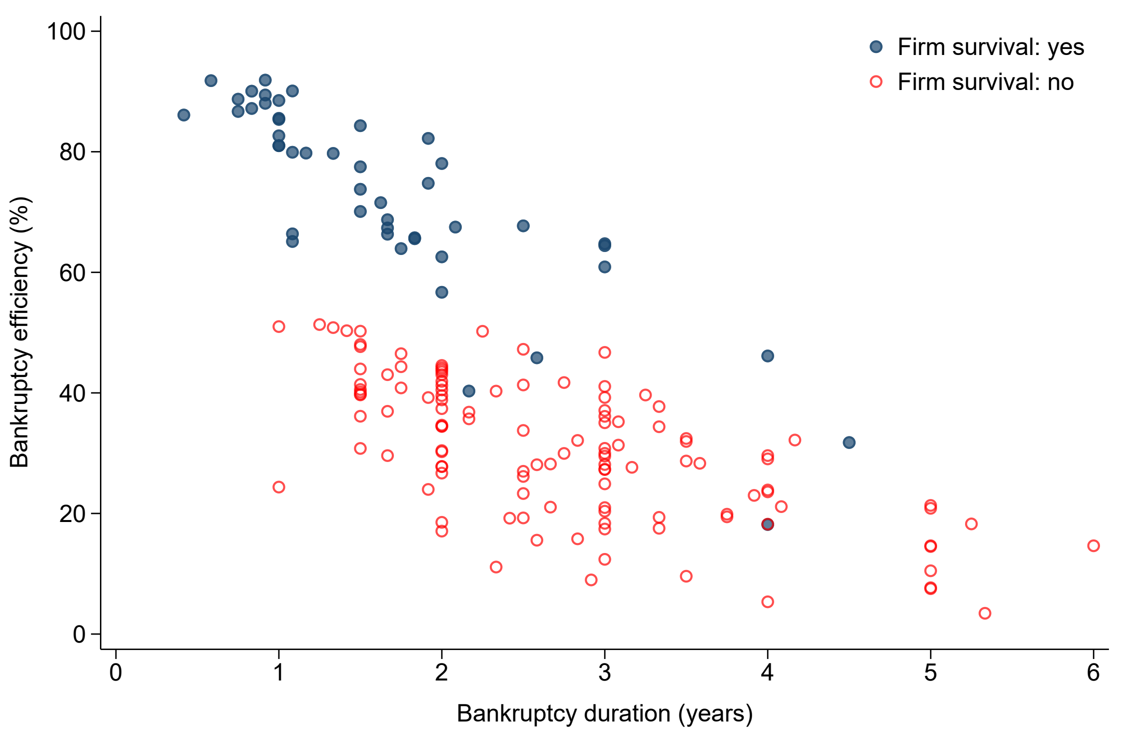
The baseline bankruptcy efficiency measure from World Bank (2020) focuses on default resolution for a viable company. Default resolution for a viable company is economically important because the dead

[5]The formula in Djankov et al. (2008a) is

$$\frac{100GC + 70(1 - GC) - 100c}{(1 + r)^t}, \tag{1}$$

where GC takes value 1 if the company can continue to operate (0 if it shuts down), c captures the bankruptcy cost as a share of total value, r in the appropriate annual discount rate (the prevailing lending rate), and t denotes the bankruptcy duration in years. World Bank (2020) does not explicitly provide a formula, but provides a similar verbal description about the calculation of the total recovery rate here.

Figure 1. Bankruptcy Efficiency around the World



Notes: This figure shows a scatter plot for 166 countries in 2019, where each dot is a country. The data come from the World Bank Doing Business database World Bank (2020) following the methodology of Djankov et al. (2008a). The blue dots represent countries where the business can continue to operate, and the red dots represent countries where the business is expected to be liquidated. Bankruptcy efficiency uses the fraction of economic value that can be preserved in bankruptcy. It measures total recovery less bankruptcy costs, discounted by resolution duration divided by the value from continuing operation (100).

weight loss from inefficient liquidation is substantial, due to high asset specificity (production assets are often specialized or immobile, so the liquidation value to second best users can be limited) and valuable organizational capital. Ramey and Shapiro (2001) estimate that the average resale value of aerospace manufacturing equipment is 28 cents per dollar of replacement cost. Kermani and Ma (2023) find that the going-concern value from continuing operation is twice as much as the estimated total liquidation value (including cash, working capital, fixed assets, etc.) for nonfinancial firms in Chapter 11 bankruptcy, and about three times as much for U.S. public nonfinancial firms in general.[6]

Efficiency of resolving nonviable companies Another aspect of bankruptcy efficiency is default resolution for a nonviable company. Our baseline measure does not capture this aspect, but the efficiency

[6]These estimates from collecting liquidation value data suggest an even larger gap between the liquidation value and the continuation value relative to the assumptions in the World Bank (2020) case (where the liquidation value is assumed to be 70% of the continuation value). This is in part because the firm in the World Bank (2020) design is a hotel (a type of firm that exists in every country), and correspondingly its assets can be more generic than manufacturers for example.

of default resolution for viable and nonviable companies is likely correlated.

First, if nonviable companies go through liquidation during the bankruptcy process, the efficiency is correlated with our baseline measure, as both are affected by the bankruptcy system's speed and expertise. The dataset from the original Djankov et al. (2008b) work contains information for one question about the fraction of total liquidation value that can be obtained from liquidating a nonviable company.[7] In Figure 2, we observe a positive relationship between our baseline measure (y-axis), and the efficiency of liquidating a nonviable company (x-axis); both are for the year 2006 from the original Djankov et al. (2008a) dataset. These two measures are 0.88 correlated.[8] Later in Section 4.1, we show that among these two variables, the efficiency measure for a viable company is more important for differentiating macroeconomic outcomes following credit booms.

During the bankruptcy process, inefficient continuation of nonviable companies may not be common (Bernstein, Colonnelli, and Iverson, 2019; Bernstein et al., 2019; Dou et al., 2021). Liquidating a company is more straightforward for courts to implement than keeping the firm alive. In addition, restructuring procedures often explicitly require that all creditors get paid no less than what they would obtain in liquidation.[9] Indeed, in the Djankov et al. (2008a) measure on the x-axis of Figure 2, all countries report that the nonviable firm will be liquidated.

Second, inefficient continuation outside the bankruptcy process due to lenders evergreening their nonperforming loans may be more common (see for example Caballero, Hoshi, and Kashyap (2008) and the literature on zombie lending reviewed by Acharya et al. (2022)). Lenders are more likely to keep these firms continuing if bankruptcy processes are lengthy and costly, which are associated with lower bankruptcy efficiency in our baseline measure (as shown in Figure 1). Indeed, recent work finds that

[7] The formula to compute the efficiency of resolving a nonviable firm is analogous to how Djankov et al. (2008a) compute the efficiency for resolving a viable firm:

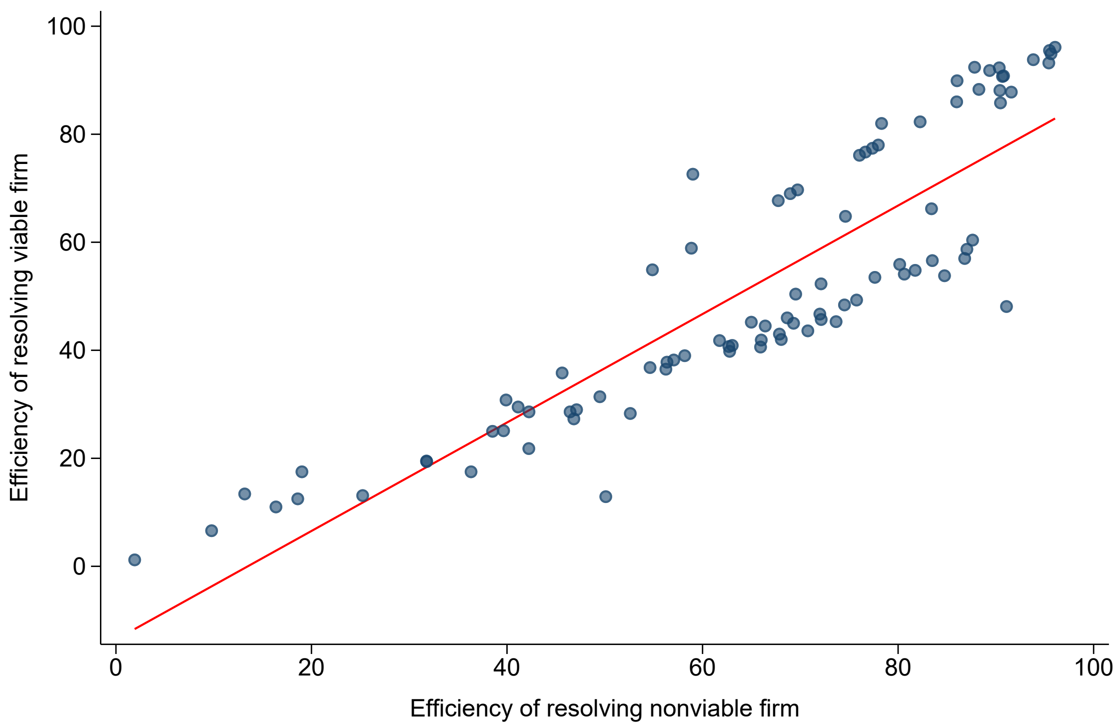
$$\frac{100L + X(1-L) - 100c}{(1+r)^t}, \tag{2}$$

where L takes value 1 if the company is liquidated, X is the value of continuing operation (which is not reported in the paper and which cannot be backed out from the data since $L = 1$ for all countries), c captures the bankruptcy cost as a share of maximal value, r in the appropriate annual discount rate, and t denotes the bankruptcy duration in years.

[8] For countries that liquidate the viable company, the y-axis and the x-axis are both directly affected by the liquidation efficiency. For countries where the viable company can continue to operate, the y-axis and the x-axis are both affected by the speed of the judicial system, and the y-axis gets shifted up since the liquidation dead weight loss is avoided.

[9] Recent work finds that inefficient continuation seems rare in a country like the U.S., even though the U.S. bankruptcy institution has a strong emphasis on restructuring. Dou et al. (2021) estimate different sources of inefficiencies in U.S. corporate bankruptcy, and find that inefficiencies from excess continuation are quite small. Bernstein, Colonnelli, and Iverson (2019) and Bernstein et al. (2019) use the random assignment of bankruptcies to different judges, and find that economic outcomes are better (worse) for those assigned to judges who are more prone to restructure (liquidate).

Figure 2. Efficiency of Resolving Viable Firm and Nonviable Firm



Notes: This figure shows a scatter plot for 88 countries in 2006, where each dot is a country. The data come from Djankov et al. (2008a). The x-axis shows the efficiency of liquidating a nonviable company, i.e., the share of a nonviable company's liquidation value obtained in bankruptcy. The y-axis shows the efficiency of resolving a viable company, i.e., the share of a viable firm's full value from continuing operation that can be preserved in bankruptcy.

stronger bankruptcy institutions are associated with fewer zombie firms (Becker and Ivashina, 2022; Altman, Dai, and Wang, 2024).

In summary, default resolution for a viable company is economically important, given the high costs of inefficient liquidation. It is also a hard test, which can reflect bankruptcy institutions' capacity to handle other issues more generally (e.g., their efficiency in liquidating nonviable companies). Accordingly, previous data collection efforts have focused on this case. Our baseline measure follows them due to both data availability and economic relevance.

3.2 Other Data

We obtain data on business credit from the Bank of International Settlements (BIS). This dataset contains both business credit issued by banks and credit extended by nonbanks (e.g., corporate bonds, see Dembiermont, Drehmann, and Muksakunratana, 2013). Some work focuses on bank credit (Müller

Table 1 – Summary Statistics

	(A) Full sample						(B) Regression sample					
	N	Mean	SD	Q25	Q50	Q75	N	Mean	SD	Q25	Q50	Q75
Bankruptcy efficiency (%)	1759	39.3	24.6	21.3	32.4	51.0	560	63.1	23.5	42.9	68.6	83.0
Business debt-to-GDP ratio (%)	649	80.7	40.7	49.4	76.6	107.1	560	83.0	40.0	53.9	80.4	109.4
Business debt-to-GDP ratio, 5-year change (pp.)	621	6.5	15.0	-2.0	5.5	14.1	560	6.9	15.3	-2.0	6.1	14.6
Real GDP growth, annual (%)	1964	4.1	8.8	1.4	4.0	7.3	560	2.8	3.8	1.0	2.7	4.6
Real investment growth, annual (%)	1836	4.5	22.6	-1.8	4.8	11.5	560	2.8	9.6	-1.1	3.4	7.3
Unemployment rate (%)	1915	6.9	4.8	3.6	5.4	9.1	560	7.4	4.3	4.6	6.8	8.7

Notes: The table presents descriptive statistics for our main variables for years 2003 to 2019. Panel A shows statistics for all countries covered by a given variable. Panel B shows statistics for our regression sample, i.e., countries jointly covered by all 5 variables. The bankruptcy efficiency measure is from World Bank (2020). Business debt to GDP is from the BIS. Real GDP, real investment, and unemployment rate are from the World Economic Outlook and the World Development Indicator databases.

and Verner, 2023; Ivashina et al., 2024). We focus on all business credit combined. We use data on GDP, investment, unemployment rate, and consumption from the World Economic Outlook reports and the World Bank World Development Indicator database (International Monetary Fund, 1999-2024; World Bank, 2024). We drop countries with less than 5 million people as small economies tend to be disproportionately exposed to international capital flows and their economic performance can be more affected by external conditions.

Table 1 presents the summary statistics. Panel A shows the summary statistics for all country-years with respective data. Panel B shows the summary statistics for the regression sample that we use in Section 4, where we need data on bankruptcy efficiency, business credit, and economic outcomes. The size of the regression sample is limited by the coverage of the BIS business credit data. Figure IA2 shows the list of countries covered by the baseline regression sample.

4 Bankruptcy Resolution and the Macroeconomic Impact of Credit Booms: Empirical Evidence

Credit cycles represent one of the most important challenges for macroeconomic stability. A growing volume of studies document that credit booms predict recessions and crises. We analyze how macroeconomic outcomes following credit booms vary with the efficiency of business bankruptcy institutions.

We follow the standard empirical specification in recent work on credit cycles, which performs a regression of subsequent economic outcomes on changes in credit as the key independent variable (Mian, Sufi, and Verner, 2017).[10] We include an interaction term between changes in credit and bankruptcy efficiency, to test how the relationship between changes in credit and subsequent economic outcomes varies with bankruptcy efficiency. Specifically, we estimate state-dependent local projections:

$$\Delta_h Y_{i,t+h} = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}, \tag{3}$$

for annual horizons of $h = 1, ..., 5$. The outcome variable $\Delta_h Y_{i,t+h}$ begins with the change in log real GDP; we also study log real investment, unemployment rate, and log real private consumption later on. The independent variable $\Delta_5 c_{i,t}$ is the change in business credit to GDP in the past 5 years in country i and year t using BIS data, and $B_{i,t}$ is the measure of bankruptcy efficiency.[11] We control for 5 lags of real GDP growth as well as the cumulative change in household credit relative to GDP since year $t-5$. We include horizon-specific country fixed effects $\alpha_{i,h}$. The sample covers annual data from an unbalanced panel of 39 countries over the period of 2003 to 2019.We use Driscoll and Kraay (1998) standard errors with 5 lags.

4.1 Basic Results

Table 2 presents regression results for the path of GDP as the outcome variable. We interact the bankruptcy efficiency measure with the change in business credit to GDP over the past 5 years, as in Equation (3). The regressions show that future output is significantly lower following increases in business credit when bankruptcy efficiency is low. Meanwhile, future output would stay roughly unchanged if bankruptcy efficiency were 100%.[12]

Figure 3 visualizes the GDP trajectory following a 10 percentage point increase in business credit to GDP over the past 5 years. The left (right) panel shows the result for low (high) bankruptcy efficiency, namely $B_{i,t}$ at the 25th (75th) percentile of the regression sample. Again, the economic magnitude is substantial. A business credit boom on the scale of a 10 percentage point increase in business credit to GDP

[10] We provide detailed discussions about the sources of credit booms and whether they matter in Section 5.

[11] We follow the literature and measure credit cycles using changes in credit to GDP (Schularick and Taylor, 2012; Mian, Sufi, and Verner, 2017; Müller and Verner, 2023, among others). An alternative measure is the "Credit Gap" published by Bank for International Settlements (2024), which is the cyclical component in the credit to GDP ratio from a one-sided, backward-looking HP filter. Our results are very similar when using this measure.

[12] Using data on bank debt of nonfinancial businesses collected by Müller and Verner (2023), we obtain similar results that are even stronger quantitatively. We also compare the average relationship between business credit growth and future output in our sample with results in Mian, Sufi, and Verner (2017). We find that the negative relationship is approximately twice as large as that in Mian, Sufi, and Verner (2017), but the 95% confidence interval includes their original point estimate.

Table 2 – Change in Log Real GDP

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.143***	0.319***	0.546***	0.633***	0.669***
	(0.048)	(0.080)	(0.114)	(0.134)	(0.172)
Δ_5 Business credit/GDP	-0.146***	-0.310***	-0.490***	-0.555***	-0.576***
	(0.046)	(0.072)	(0.103)	(0.119)	(0.145)
Bankruptcy efficiency	-0.939	-1.385	-0.700	-0.260	-0.082
	(0.954)	(1.185)	(1.965)	(2.887)	(3.293)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.14	0.18	0.21	0.25
Observations	560	522	484	446	408

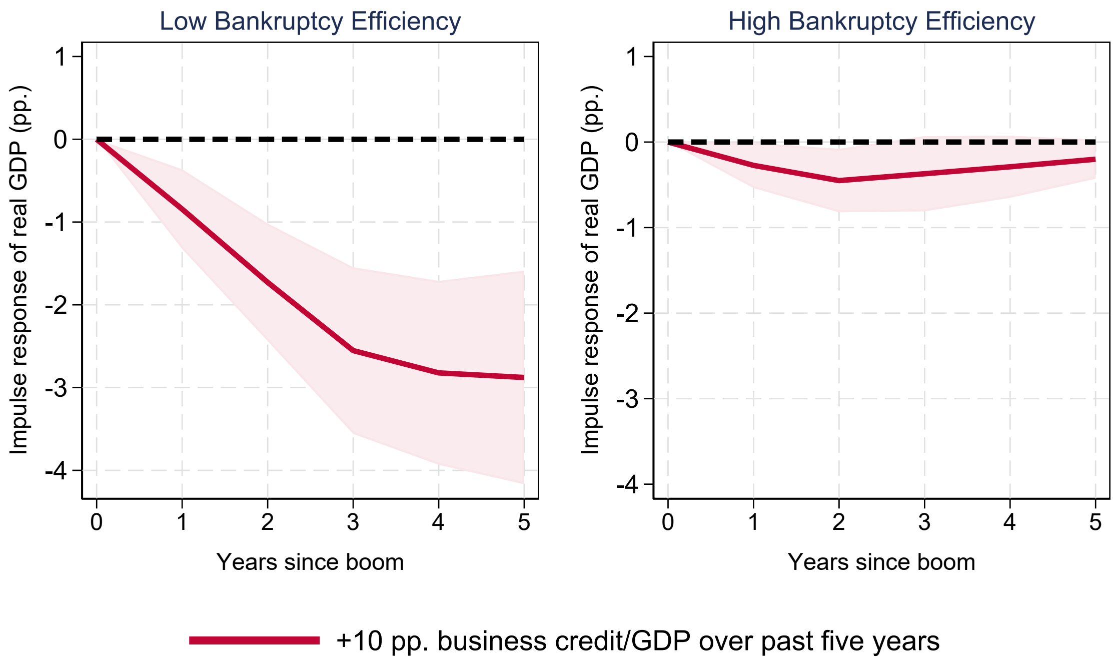
Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

occurs in roughly a third of our sample observations. Following a boom of this size, real GDP declines by about 3 percentage points in the next 5 years for a country at the bottom quartile of bankruptcy efficiency (left panel), whereas real GDP barely declines for a country at the top quartile of bankruptcy efficiency (right panel). The cumulative output loss over 5 years is about 9 percentage points larger under low bankruptcy efficiency than under high bankruptcy efficiency.[13] Interestingly, in low bankruptcy efficiency countries, real GDP does not yet recover by year 5. We verify in Figure IA3 that the recovery gradually occurs between year 6 and year 10. However, since the bankruptcy efficiency data only began in 2003, the number of observations falls for longer-term local projections, so we use local projections for subsequent 5 years in the baseline results.

In recent work, Jordà et al. (2022) find that *recessions* following business credit booms are more severe in countries with low bankruptcy efficiency. Their analysis conditions on the occurrence of recessions (i.e., negative GDP growth). Our previous analysis does not. Indeed, we observe that the results are not limited to *recession severity*. First, Figure 4 shows that, in low bankruptcy efficiency countries, recessions

[13] The cumulative output loss is equal to the integral of the impulse responses in Figure 3 (cf. Ramey, 2016). Under low bankruptcy efficiency, the annual losses over the first 5 years accumulate to around 10.8 percent of real GDP at $h = 0$. By contrast, they accumulate to only around 1.5 percent under high bankruptcy efficiency.

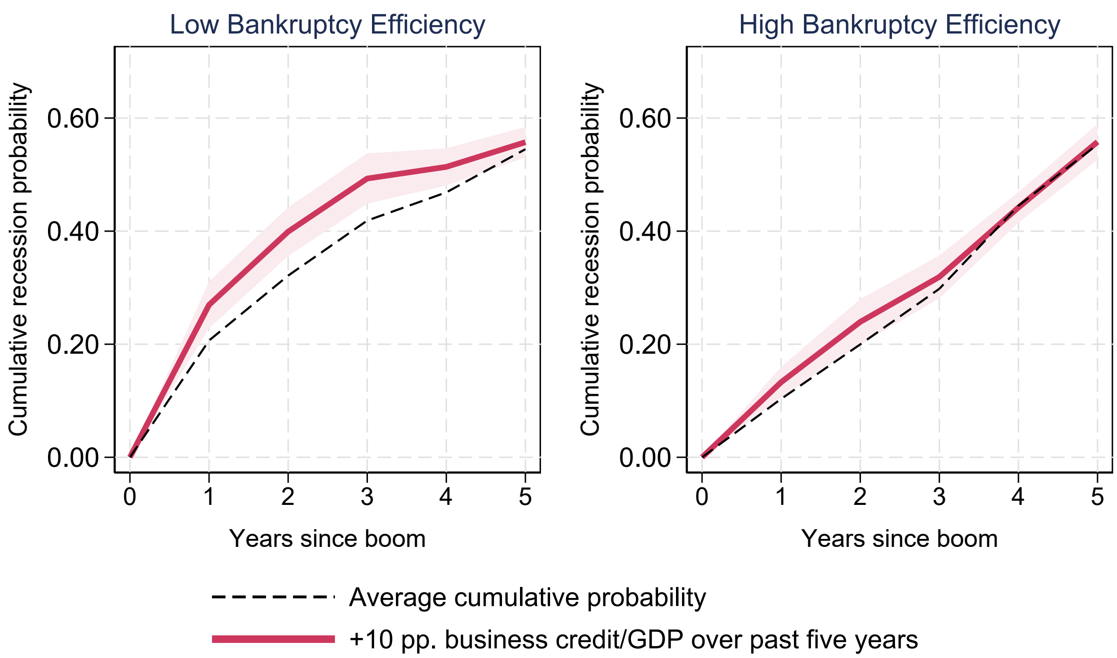
Figure 3. GDP following Business Credit Booms



Notes: This figure shows the GDP trajectory following a 10 percentage point increase in the business credit to GDP ratio over the preceding 5 years. We estimate state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log real GDP in country i from year t to year $t + h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t - 5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t - 5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas mark 90% confidence intervals based on Driscoll-Kraay standard errors.

are more likely to occur following credit booms. For example, 3 years after a 10 percentage point increase of business credit to GDP, countries at the bottom quartile of bankruptcy efficiency have higher cumulative recession probability by about 7.4 percentage points, whereas there is no significant effect for countries at the top quartile of bankruptcy efficiency. Second, Table IA1 shows that macro outcomes are also worse outside recessions. Relatedly, Figure IA4 and Table IA2 examine Equation (3) with quantile regressions. We observe that both the 80th percentile and the 20th percentile outcomes are worse following credit booms in low bankruptcy efficiency countries. Taken together, the data suggest that low bankruptcy efficiency countries experience a systematic decline in output following credit booms: inefficient default resolution can generate more dead weight loss and reduce output in general. This makes economic outcomes worse both in and outside recessions, and a weaker economy also implies that recessions are more likely.

Figure 4. Recession Risk following Business Credit Booms



Notes: This figure shows the cumulative probability of a recession with (solid red line) and without (dashed black line) a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate linear probability models using state-dependent local projections: $\mathbb{1}(\text{recession since } t)_{i,t+h} = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h}B_{i,t} + \gamma_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the occurrence of a recession in country i from year t to year $t + h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t - 5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and recession indicators, as well as the cumulative change in household credit to GDP since year $t - 5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas mark 90% confidence intervals based on Driscoll-Kraay standard errors.

Robustness checks We perform a number of robustness checks in the rest of this section. First, we examine a large set of variables that can influence macroeconomic stability, and verify that our main results are not driven by bankruptcy efficiency being correlated with these factors. Specifically, we add these variables and their interactions with the change in business credit ($\Delta_5 c_{i,t}$) to Equation (3). Tables IA3 and IA4 start with country characteristics: Tables IA3 considers development status and log real GDP per capita; Table IA4 controls for the general volatility of GDP growth. Tables IA5 and IA6 turn to macroeconomic policies: Table IA5 considers exchange rate pegging; Table IA6 controls for the countercyclicality of monetary policy (i.e., the country specific coefficient of regressing the changes in the policy rate on real output growth) and fiscal policy (i.e., the country specific coefficient of regressing changes in government spending to GDP on real output growth). Tables IA7, IA8, and IA9 turn to other aspects of legal institutions, including general rule of law, government effectiveness, regulatory quality, time to start a business, and time to enforce contracts.[14] In all cases, we find that macroeconomic outcomes following credit booms are substantially worse in countries with low bankruptcy efficiency. The results suggest that bankruptcy efficiency is a distinct factor from development status, standard macroeconomic stabilization policies, and general legal institutions.[15]

Second, a possible concern is reverse causality: maybe bad economic conditions lead to low observed bankruptcy efficiency (e.g., courts get overcrowded when economic conditions are difficult). To address this concern, we also use bankruptcy efficiency fixed at the beginning of the sample in Figure IA5 and Table IA10, and examine macroeconomic outcomes thereafter. The results are similar to those in Figure 3 and Table 2.

Third, we follow previous work and instrument bankruptcy efficiency with legal origins. We use 4 indicator variables for legal origins: English, French, German, and Nordic as in Djankov et al. (2008a). These legal origin variables explain about 30% of the variations in bankruptcy efficiency. The results instrumenting bankruptcy efficiency with legal origins are shown in Figure IA6 and Table IA11. The key patterns and magnitudes here are similar to those in the baseline results in Figure 3 and Table 2. Since legal origins may also affect general rule of law, in Panel B of Figure IA6 and Table IA11, we additionally control for rule of law and its interaction with changes in business credit (like in Table IA7), and obtain similar results. Indeed, bankruptcy efficiency is significantly related to legal origins, which often influence judicial philosophies, even when controlling for the general rule of law index. As Djankov et al. (2008a) document, French and German legal origins are especially unfriendly towards reorganization, automatic stay, and allowing existing management to remain, which tend to make it more challenging to preserve the continuing operation of the company as discussed in Section 2.2.

Fourth, a possible question is whether countries with low bankruptcy efficiency happen to have high debt burden, so they are more vulnerable to negative shocks. We perform several checks. First, Figure IA8 plots business credit to GDP against bankruptcy efficiency. If anything, we observe a positive correlation: countries with high bankruptcy efficiency are those that bear more corporate debt relative to output. This is also consistent with the theoretical prediction in the model section below (Proposition 1) where a more efficient bankruptcy system leads to a larger credit market. Second, the baseline results are similar if we

[14]Bankruptcy efficiency is correlated with other aspects of the legal system, but this measure should be the most relevant statistic for the quality of default resolution.

[15]We also consider Lasso regressions with all the control variables together, and find that bankruptcy efficiency appears to be the most effective measure for differentiating output trajectory following credit booms.

additionally control for the level of business credit to GDP at horizon 0 and its interaction with the change in business credit, as shown in Figure IA9. In other words, for the same debt level, countries with low bankruptcy efficiency still experience worse macroeconomic outcomes subsequently.

Fifth, as mentioned in Section 3.1, our baseline bankruptcy efficiency measure provides information about default resolution for a viable company. Figure 2 shows that our baseline measure is correlated with a secondary measure in Djankov et al. (2008a) on the value preserved in default resolution for a nonviable company. In Table IA12, we compare the efficiency for resolving viable and nonviable companies. We take both variables measured for year 2006 from Djankov et al. (2008a), and use the fixed value for each country throughout the sample.[16] We observe that the efficiency of resolving a viable company appears more related to the path of output following credit booms. As discussed in Section 3.1, there can be a lot more to lose from inefficient default resolution for a viable company.

Finally, Figure IA7 shows that the main results are similar if we measure changes of business credit to GDP over alternative windows, such as the past 3 years or 8 years instead of the past 5 years above. Panel A (B) shows the path of output after a 6 (16) percentage point increase in business credit to GDP over the past 3 (8) years; in other words, we scale the change in business credit to GDP to 2 percentage points per year.

Nontradable and tradable booms Recent work by Müller and Verner (2023) and Ivashina et al. (2024) find that business credit booms driven by nontradable sectors are followed by worse macroeconomic outcomes, whereas business credit booms driven by nontradable sectors are followed by sustained output growth. Müller and Verner (2023) argue that nontradable sectors are more sensitive to nonfundamental shocks like "easy credit." In Table IA13, we show that bankruptcy efficiency is associated with less economic damage following nontradable booms: the change in nontradable credit to GDP has a significantly negative coefficient on future output, but its interaction with bankruptcy efficiency has a significantly positive coefficient (i.e., the negative outcomes are milder in high bankruptcy efficiency countries). Later in Section 5, we analyze booms driven by nonfundamental shocks (e.g., lower discount rate of borrowers or lenders) and fundamental shocks (e.g., higher future productivity). In the former case, future output will be lower, but less so when bankruptcy efficiency is high; in the latter case, future output can be higher. The results in Table IA13 are consistent with these predictions.

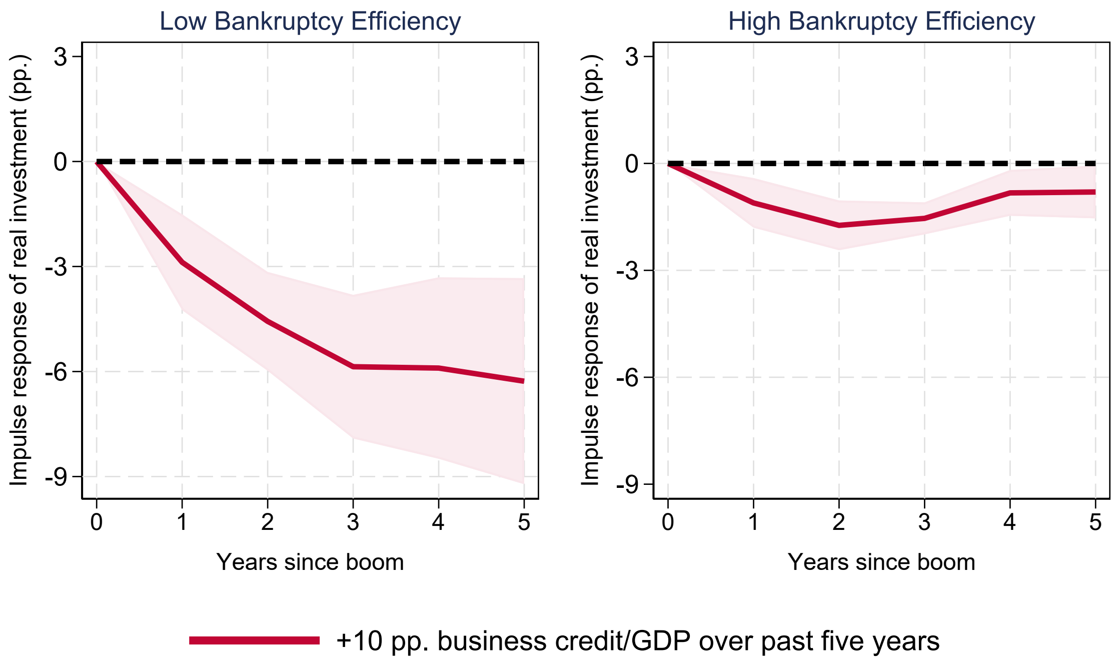
[16] As mentioned in Section 3.1, the efficiency of resolving a nonviable company is not covered in the World Bank (2020) extension of Djankov et al. (2008a). Accordingly, we can only use the value for 2006 Djankov et al. (2008a). For the efficiency of resolving a viable company in Table IA12, we can alternatively use the annual data from World Bank (2020), or the fixed value for 2006 from Djankov et al. (2008a), and the results are similar.

A common question is whether countries with high versus low bankruptcy efficiency experience different types of booms. We also examine this question for nontradable and tradable booms. In Table IA14, column (1) shows that bankruptcy efficiency is positively associated with a higher share of nontradable credit (in total nontradable and tradable business credit), although the magnitude is economically small. Columns (2) and (3) show that how the share of nontradable credit changes in a credit boom is not significantly different for high versus low bankruptcy efficiency countries.[17] In other words, we do not observe that high bankruptcy efficiency countries have more or less nontradable credit booms in the first place. In sum, fundamental shocks that trigger good booms (e.g., positive TFP news) and nonfundamental shocks that trigger bad booms (e.g., movements in discount rates or beliefs) can occur for other reasons, and bankruptcy efficiency does not have to be related to the relative prevalence of these shocks. Once nonfundamental shocks hit and trigger bad booms, bankruptcy efficiency is especially relevant for subsequent macroeconomic outcomes.

Symmetry of credit booms and contractions Our exposition illustrates the results using credit booms for simplicity given the emphasis on the adverse effects of credit booms in the literature. The underlying regressions in Equation (3) use $\Delta_5 c_{i,t}$ directly, so the observations are not limited to credit expansions (i.e., $\Delta_5 c_{i,t} > 0$). For the case of credit expansions, the intuition is that *higher subsequent defaults* would contribute to larger (smaller) output decreases when bankruptcy efficiency is lower (higher). Analogously, for the case of credit contractions, the intuition is that *lower subsequent defaults* would contribute to larger (smaller) output increases when bankruptcy efficiency is lower (higher). We test whether the data show symmetric results for credit expansions and contractions (i.e., positive and negative changes in business credit to GDP). Figure IA10 Panel A and Panel B show the path of output following credit expansions and contractions, respectively. Table IA15 follows Ben Zeev, Ramey, and Zubairy (2023) to test against symmetric paths after credit booms and contractions. In particular, we use an indicator variable for credit booms (i.e., positive change in business credit to GDP over the past 5 years), and add a triple interaction of this indicator variable with credit booms and bankruptcy efficiency. In the first two years ($h = 1$ and $h = 2$), we observe stronger results for credit expansions. After that ($h = 3, 4$ and 5), the results are not significantly different for credit expansions and contractions.

[17] In Table IA14 we measure the credit boom using 3-year changes in business credit to GDP instead of 5-year changes as in the baseline regressions. This is because the Müller and Verner (2023) data on nontradable versus tradable credit end in 2014, which further shrink the sample period. Using 3-year change allows us to retain more years in the sample.

Figure 5. Investment following Business Credit Booms



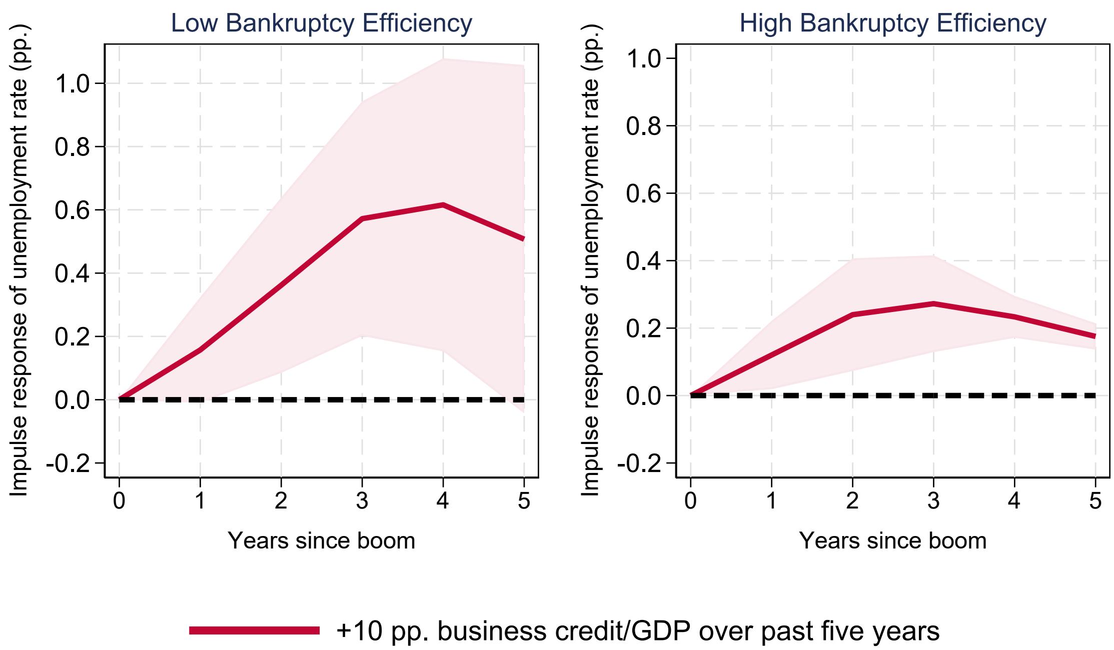
Notes: This figure shows the investment trajectory following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent local projections: $\Delta_h \log(\text{real investment}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h} B_{i,t} + \gamma_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log real investment in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and real investment growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas are 90% confidence intervals based on Driscoll-Kraay standard errors.

4.2 Other Outcomes

We study a number of other outcomes in addition to aggregate output. In Figures 5 and 6, we turn to the path of investment and employment following business credit booms. We observe that investment declines substantially and unemployment rises moderately in countries with low bankruptcy efficiency. These negative outcomes are less pronounced in countries with high bankruptcy efficiency. In Figure IA11, we look at productivity using TFP from the Penn World Tables. We observe larger TFP declines following credit booms in low bankruptcy efficiency countries.

The negative consequences of firms' financial distress can be propagated across the economy in several ways. First, reductions in investment and employment can depress aggregate demand and in turn decrease consumption. In Figure 7, we plot the path of consumption following business credit booms. We

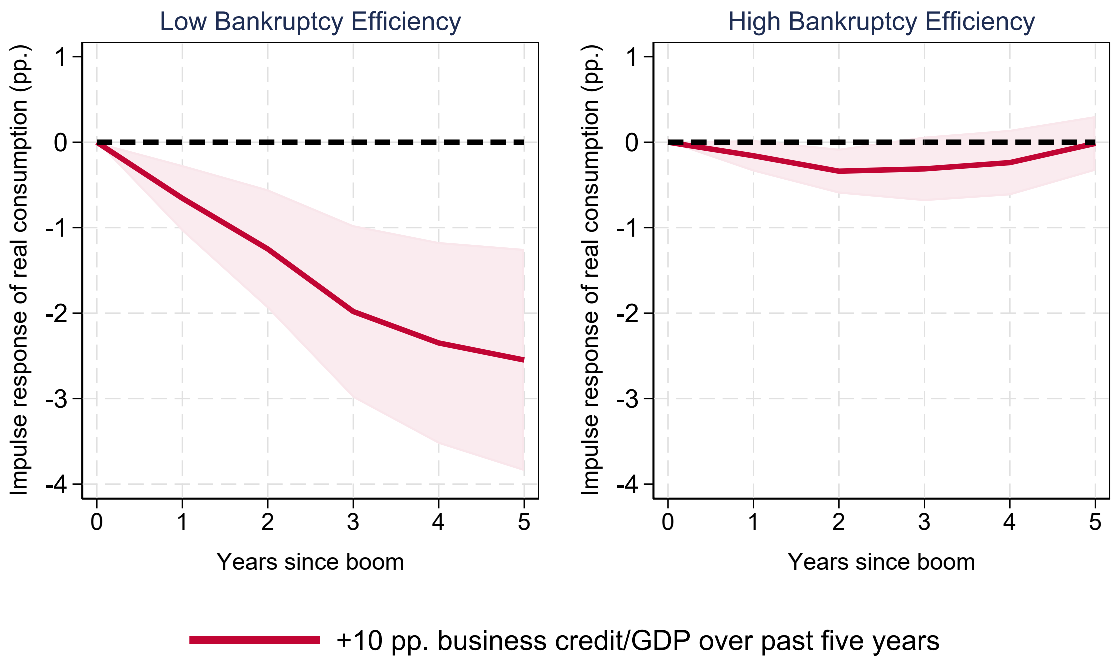
Figure 6. Unemployment Rate following Business Credit Booms



Notes: This figure shows the unemployment rate trajectory following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent local projections: $\Delta_h$unemployment rate$_{i,t+h} = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in unemployment rate in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and unemployment rate changes, as well as the cumulative change in household credit relative to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas mark 90% confidence intervals based on Driscoll-Kraay standard errors.

observe that consumption declines substantially in countries with low bankruptcy efficiency. In contrast, consumption remains largely stable in countries with high bankruptcy efficiency. Second, financial trouble among firms can depress capital markets and raise the cost of financing. In Figure IA12, we look at the path of stock prices of nonfinancial corporations (using data from various sources compiled by Baron, Verner, and Xiong (2021) and Jordà et al. (2021) for 36 countries), and credit spreads (using data from Global Financial Data and other sources compiled by Mian, Sufi, and Verner (2017) and Baron, Verner, and Xiong (2021) for 20 countries, updated to 2019). We observe that stock prices decline and credit spreads rise in low bankruptcy efficiency countries, but not in high bankruptcy efficiency countries; the standard errors are slightly larger in the smaller sample with asset price data. Deteriorating capital market conditions in countries with low bankruptcy efficiency could further exacerbate economic downturns.

Figure 7. Private Consumption following Business Credit Booms



Notes: This figure shows the trajectory of real private consumption following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent local projections: $\Delta_h \log(\text{real consumption})_{i,t+h} = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h}B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log real private consumption in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and real consumption growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas mark 90% confidence intervals based on Driscoll-Kraay standard errors.

Given the prominence of financial crises in recent research (Schularick and Taylor, 2012; Chodorow-Reich, 2014; Greenwood et al., 2022; Frydman and Xu, 2023), we also examine the likelihood of financial crises following business credit booms in Figure IA13. We use financial crisis coding by Baron, Verner, and Xiong (2021). In our sample, business credit booms do not predict financial crises, regardless of bankruptcy efficiency. This is likely because our sample period is 2003 to 2019 (due to the availability of bankruptcy efficiency data), and the main financial crises during this time frame are related to the Global Financial Crisis which is more tied to household credit than business credit. Using a longer sample since 1940, Ivashina et al. (2024) find that corporate credit booms have substantial predictive power for financial crises. If bankruptcy efficiency measures can be extended further back in time, it is possible that financial crises are more likely to occur following business credit booms in countries with low bankruptcy efficiency.

5 Bankruptcy Resolution and the Macroeconomic Impact of Credit Booms: A Simple Theoretical Framework

Empirical evidence in the previous section shows that business credit booms are followed by severe economic downturns in countries with low bankruptcy efficiency, but not in countries with high bankruptcy efficiency. In this section, we use a simple model to lay out how bankruptcy resolution affects macroeconomic outcomes, and why more efficient bankruptcy systems can mitigate the negative consequences of credit booms. It also analyzes different sources of credit booms and their corresponding implications. The model is stylized and aims to provide a parsimonious illustration of the economic mechanisms.

5.1 Environment

Time is discrete, and there are two periods, $t \in \{1, 2\}$. The economy is populated by a representative unit mass of creditors and firms. Creditors are identical, and have preferences described by $\mathbb{E}[c_1 + \beta c_2]$, where $\beta \in (0, 1)$ denotes the creditors' subjective discount factor and c_t denotes their consumption in period t. Firms' objective is to maximize $\mathbb{E}[\text{div}_{j1} + \beta_f \text{div}_{j2}]$, where $\beta_f \in (0, \beta)$ is their discount factor and div_{jt} are dividends transferred by firm j to its owners in period t.[18]

In the first period, each firm j has access to a risky investment opportunity, which requires an initial investment of $I > 0$ consumption goods and yields a stochastic cash flow of z_j consumption goods in the second period. To obtain analytical results, we assume that the cash flow of the risky project of firm j, z_j, is drawn from an i.i.d. uniform distribution with a measure 1 support, $[\underline{z}, \bar{z}]$, where $\underline{z} \geq 0$. That is, the probability density function is given by $\phi(z_j) = 1$ for $z_j \in [\underline{z}, \bar{z}]$, and the cumulative distribution function is given by $\Phi(z_j) = z_j - \underline{z}$ for $z_j \in [\underline{z}, \bar{z}]$.

Firms can borrow from creditors in competitive markets. In the second period, each firm j faces a non-negative dividend constraint ($\text{div}_{j2} \geq 0$), which implies that debt is defaultable. Following a default, the firm obtains a dividend of 0. With probability $\xi \in (0, 1)$, the project can continue to operate (for simplicity, we assume that continuing operation is efficient) and maintain the cash flow z_j. With probability $1 - \xi$, the project gets liquidated inefficiently, obtaining a value $z^{\text{liq}} = \underline{z}$, which, for simplicity, is set to

[18] We assume that creditors are more patient than firms to ensure that firms borrow in equilibrium. For simplicity, we abstract from explicitly mentioning firms' owners, which can be thought of as an agent with preferences $\mathbb{E}[c_{f1} + \beta_f c_{f2}]$.

be the lowest realization of cash flow if the firm continues to operate. The parameter ξ, which governs the probability of continuing operation, captures bankruptcy efficiency in the economy and is the main focus of the comparative statics linked to our empirical evidence.[19] This setup aligns with the design of the bankruptcy efficiency measure. As discussed in Section 3.1, empirical studies have found that the liquidation value of nonfinancial firms is fairly low (Ramey and Shapiro, 2001; Kermani and Ma, 2023). In light of the evidence, $z^{\text{liq}} = \underline{z}$ is a reasonable assumption for the baseline model. In Appendix IA2.6, we relax this assumption and consider the case that $z^{\text{liq}} \in (\underline{z}, \bar{z})$, which allows the possibility of inefficient continuation. In that extension, we define bankruptcy efficiency as the probability of choosing the right outcome: continuation if $z > z^{\text{liq}}$ and liquidation if $z < z^{\text{liq}}$ (which nests the baseline model if $z^{\text{liq}} = \underline{z}$). We show that the main result Proposition 1 remains.

5.2 Optimality

The expected value for a firm j pursuing the investment opportunity is given by

$$V_f(\beta, \beta_f, \xi) = \max_{b \geq 0} \left(\text{div}_1 + \beta_f \mathbb{E}[\text{div}_2]\right) \tag{4}$$

$$\text{s.t. } \text{div}_1 + I = q(b, \beta, \xi)b, \tag{5}$$

$$\text{div}_2 = \begin{cases} z_j - b & \text{if } b \leq z_j, \\ 0 & \text{if } b > z_j. \end{cases} \tag{6}$$

where b is the face value of debt in period 2, and $q(b, \beta, \xi)$ is the debt price schedule faced by firms in period 1 (discussed further below). Equation (5) is the period-1 flow-of-funds constraint, which indicates that dividend payments and investment have to be financed with proceeds from borrowing. Equation (6) is the period-2 flow-of-funds constraint, which indicates that if the firm does not default, it transfers a dividend payment that is equal to the cash flow net of debt payment; otherwise, if the firm defaults, it does not transfer dividend payments. From Equation (4), it follows that firms are willing to pursue the investment opportunity if and only if $V_f \geq 0$.

The debt price schedule is determined by the free entry of creditors to the lending market, and given

[19] Note that in the limit case when $\xi = 1$, the model features no costs of default and the firm wants to borrow as much as possible. This extreme case is outside the range of the parameters considered. It is also simple to extend the model to feature deadweight losses from continuing operations in default.

by:

$$q(b,\beta,\xi)=\beta\mathbb{E}\left[\mathbb{I}_{\{b\leq z_j\}}+\mathbb{I}_{\{b>z_j\}}\frac{(1-\xi)z^{\text{liq}}+\xi z_j}{b}\right], \tag{7}$$

where $\mathbb{I}$ is the indicator function.

Finally, we make the following parametric assumption, which guarantees that the firm prefers investing to not investing in the first period:

Assumption 1. *The investment cost is such that* $I<\frac{\beta}{2}\left(\frac{1-\xi\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\right)+\beta\underline{z}$.

5.3 Macroeconomic Impact of Bankruptcy Resolution Efficiency

The default resolution and bankruptcy procedure described above also lead to the expression for aggregate output, given the face value of debt b chosen in the first period (since all firms are ex ante identical, they choose the same face value of debt in the first period) and bankruptcy efficiency ξ. That is, for $b\in[\underline{z},\bar{z}]$ (which holds for the optimally chosen face value of debt $b^*(\beta,\beta_f,\xi)$ in (4)):

$$Y(b,\xi)=\mathbb{E}[z_j]-\underbrace{(1-\xi)\int_{\underline{z}}^{b}\left(z_j-z^{\text{liq}}\right)\phi(z_j)\,dz_j}_{\text{output loss from inefficient liquidation}}, \tag{8}$$

where the second term captures the output loss from inefficient liquidation, which depends on the probability of liquidation conditional on bankruptcy $(1-\xi)$ and the output loss conditional on liquidation (liquidating a firm with cash flow z_j results in output loss of z_j-z^{liq}). From this expression, we can see that a more efficient bankruptcy system leads to higher aggregate output, conditional on the amount of borrowing. For $b\in(\underline{z},\bar{z}]$,

$$\frac{\partial Y(b,\xi)}{\partial\xi}=\int_{\underline{z}}^{b}\left(z_j-z^{\text{liq}}\right)\phi(z_j)\,dz_j>0. \tag{9}$$

That is, a higher ξ leads to more efficient allocations of resources: firms can continue to operate efficiently, instead of undergoing inefficient liquidation, which leads to higher aggregate output.

We now use the model to shed light on our empirical evidence. We consider both nonfundamental credit booms driven by increases in credit supply or demand due to changes in discount rates or biased beliefs and fundamental credit booms driven by rational expectations of increases in firms' productivity.

We start with nonfundamental credit booms. We examine booms driven by credit supply, due to shocks to creditors' discount rates. In this case, a one unit increase in total business credit, $b^*\left(\beta, \beta_f, \xi\right)$, results from a $1/\frac{\partial b^*\left(\beta,\beta_f,\xi\right)}{\partial \beta}$ unit increase in the discount factor β. We also examine booms driven by credit demand, due to shocks to firms' discount rates. In this case, a one unit increase in total business credit, $b^*\left(\beta, \beta_f, \xi\right)$, results from a $1/\frac{\partial b^*\left(\beta,\beta_f,\xi\right)}{\partial \beta_f}$ unit increase in the discount factor β_f. In Appendix IA2, we additionally study the case where nonfundamental credit booms are driven by shocks to creditors' or firms' beliefs (rather than by shocks to their discount rates) as modeled in Dávila and Walther (2023), which does not affect our main results in Proposition 1.

Nonfundamental credit booms Our empirical analysis examines macroeconomic outcomes following a one unit change in total business credit (e.g., the response of output $Y^*\left(\beta, \beta_f, \xi\right) \equiv Y\left(b^*\left(\beta, \beta_f, \xi\right), \xi\right)$), which corresponds to

$$\varepsilon\left(\beta, \beta_f, \xi\right) = \frac{\frac{\partial Y^*\left(\beta,\beta_f,\xi\right)}{\partial \beta}}{\frac{\partial b^*\left(\beta,\beta_f,\xi\right)}{\partial \beta}} = \frac{\frac{\partial Y^*\left(\beta,\beta_f,\xi\right)}{\partial \beta_f}}{\frac{\partial b^*\left(\beta,\beta_f,\xi\right)}{\partial \beta_f}} = \frac{\partial Y\left(b^*\left(\beta, \beta_f, \xi\right), \xi\right)}{\partial b} \tag{10}$$

in the model. Because credit booms only affect aggregate output $Y\left(b^*\left(\beta, \beta_f, \xi\right), \xi\right)$ through the impact on total business credit $b^*\left(\beta, \beta_f, \xi\right)$, the effect $\varepsilon\left(\beta, \beta_f, \xi\right)$ does not depend on whether the boom is driven by credit demand or credit supply.

We now examine the macroeconomic implications of a more efficient bankruptcy system.

Proposition 1. *Under Assumption 1,*

1. A more efficient bankruptcy system (a higher ξ) is associated with a larger credit market: $\frac{\partial b^*\left(\beta,\beta_f,\xi\right)}{\partial \xi} > 0$.

2. Nonfundamental credit booms have negative effects on macroeconomic outcomes: $\varepsilon\left(\beta, \beta_f, \xi\right) < 0$. *Furthermore, a more efficient bankruptcy system (a higher ξ) dampens the negative impact of nonfundamental credit booms on macroeconomic outcomes:* $\frac{\partial \varepsilon\left(\beta,\beta_f,\xi\right)}{\partial \xi} > 0$.

Part 1 of the Proposition shows that a more efficient bankruptcy system leads to a larger credit market. An increase in bankruptcy efficiency, ξ, enhances the debt valuation given the face value of debt b, $q_b\left(b, \beta, \xi\right)$, because it increases creditors' payoffs in the event of bankruptcy. This higher debt valuation incentivizes firms to borrow more, which generates a larger credit market: $\frac{\partial b^*\left(\beta,\beta_f,\xi\right)}{\partial \xi} > 0$.

Part 2 of the Proposition shows that the impact of credit boom $\varepsilon\left(\beta, \beta_f, \xi\right) < 0$ is negative because it increases the promised debt payment $b^*(\beta, \beta_f, \xi)$ in the second period and leads to more defaults, which may be resolved inefficiently and negatively impact aggregate output $Y^*(\beta, \beta_f, \xi)$. Moreover, Part 2 shows that a more efficient bankruptcy system mitigates the negative impact of a credit boom on macroeconomic outcomes and attenuates the credit cycle (even though the credit market is larger). To understand this, from Equation (10), we recognize that the efficiency of the bankruptcy system, ξ, influences the impact of a credit boom, $\varepsilon(\beta, \beta_f, \xi)$, through two channels:

$$\underbrace{\frac{\partial \varepsilon(\beta, \beta_f, \xi)}{\partial \xi}}_{>0} = \underbrace{\frac{\partial^2 Y(b^*(\beta, \beta_f, \xi), \xi)}{\partial b \partial \xi}}_{>0} + \underbrace{\frac{\partial^2 Y(b^*(\beta, \beta_f, \xi), \xi)}{\partial b^2} \frac{\partial b^*(\beta, \beta_f, \xi)}{\partial \xi}}_{<0}. \tag{11}$$

First, holding the size of the credit market fixed at $b^*(\beta, \beta_f, \xi)$, a more efficient bankruptcy system mitigates the negative impact of a credit boom on aggregate output. That is, the first term in Equation (11) is positive. Recall that the impact of a credit boom on aggregate output, $\frac{\partial Y(b^*(\beta, \beta_f, \xi), \xi)}{\partial b} < 0$ is negative because it leads to more defaults, which will generate inefficient liquidations with probability $1 - \xi$. A higher ξ lowers the probability of inefficient liquidations, and dampens the negative impact of a credit boom on aggregate output: $\frac{\partial^2 Y(b^*(\beta, \beta_f, \xi), \xi)}{\partial b \partial \xi} > 0$. Second, by increasing the size of the credit market, $b^*(\beta, \beta_f, \xi)$, a more efficient bankruptcy system could exacerbate the negative impact of a credit boom. That is, the second term in (11) is negative because $\frac{\partial b^*(\beta, \beta_f, \xi)}{\partial \xi} > 0$ and $\frac{\partial^2 Y(b^*(\beta, \beta_f, \xi), \xi)}{\partial b^2} < 0$. A larger promised debt payment, $b^*(\beta, \beta_f, \xi)$, means that the marginal firms that default have higher cash flows (firms with cash flows z_j up to $b^*(\beta, \beta_f, \xi)$ default), and suffer more output loss after inefficient liquidations. This exacerbates the negative impact of a credit boom on aggregate output. Part 2 of the Proposition shows that the first channel dominates the second channel, consistent with our empirical evidence.[20]

We note that the predictions in Proposition 1 are symmetric: the comparative statics apply to both credit booms and contractions. That is, the impact of credit contractions on macroeconomic outcomes is positive, because credit contractions lead to fewer subsequent defaults and inefficient liquidations. A more efficient bankruptcy system now dampens the positive impact of credit contractions: when default is less likely to end in inefficient liquidations, the efficiency gain from fewer subsequent defaults (after credit

[20]As our discussant Dean Corbae points out, the impact of bankruptcy efficiency ξ on the *level* of aggregate output $Y(b^*(\beta, \beta_f, \xi), \xi)$ could be ambiguous. First, a higher ξ lowers the probability of inefficient liquidations given default, which increases aggregate output, similar to the first term in (11), Second, a higher ξ increases the number of defaults (by increasing the size of the credit market), which potentially decreases aggregate output, similar to the second term in (11). The net impact of the two channels can be either positive or negative for output (even though the first channel always dominates for the response of aggregate output to credit booms as in Part 2 of Proposition 1).

contractions) is smaller. In the data, we observe symmetry for horizons 3 years and above (Figure IA10 and Table IA15).

Finally, Appendix IA2 shows how Proposition 1 extends to alternative environments. First, we show that the results in the second part of Proposition 1 are robust to considering other sources of nonfundamental credit booms. We study booms driven by shocks to creditors' or firms' beliefs (rather than by shocks to their discount rates), following the long tradition of belief-driven credit cycles (Kindleberger, 1972; Minsky, 1986). We establish that higher bankruptcy efficiency still dampens the negative impact of credit booms in this setting. Second, we show that Proposition 1 extends to settings where the cash flow of the risky project z_j is drawn from a general class of distributions, not limited to the uniform distribution case examined in the main analysis. Third, we consider $z^{\text{liq}} \in (\underline{z}, \bar{z})$. In this extension, low bankruptcy efficiency can come from either liquidating a viable firm (inefficient liquidation), or keeping alive a nonviable firm (inefficient continuation). We show that Proposition 1 still holds.

Our model focuses on direct channels through which bankruptcy efficiency affects economic activity. In practice, some but not necessarily all firms experience distress following credit booms, and spillovers from firms in distress to other firms may also contribute to the empirical patterns we observe in Section 4. To account for such spillovers, our baseline framework could be extended to incorporate various amplification mechanisms, such as aggregate demand forces, financial amplification, or input-output linkages (Kiyotaki and Moore, 1997; Bernanke, Gertler, and Gilchrist, 1999; Christiano, Eichenbaum, and Evans, 2005; Baqaee and Farhi, 2019).

Overall, the predictions in Proposition 1 are consistent with the empirical evidence. First, credit booms are followed by worse macroeconomic outcomes, consistent with the growing literature on credit cycles (Schularick and Taylor, 2012; Mian, Sufi, and Verner, 2017; Greenwood et al., 2022). Second, the negative outcomes are especially severe under inefficient bankruptcy systems, as shown in Section 4.1.

Fundamental credit booms We then turn to credit booms driven by rational expectations of an increase in firms' future productivity. Formally, each firm j's risky cash flow z_j is now drawn i.i.d. from the uniform distribution $[\underline{z} + \Delta, \bar{z} + \Delta]$, where Δ captures shocks to firms' future productivity. Define aggregate output/GDP $Y^* (\Delta, \xi) \equiv Y (\Delta, b^* (\Delta, \xi), \xi)$ based on the optimally chosen face value of debt $b^*(\Delta, \xi)$, where β and β_f are eliminated as arguments because they are fixed here.

Here, a one unit increase in total business credit, $b^* (\Delta, \xi)$, results from a $1/\frac{\partial b^*(\Delta,\xi)}{\partial \Delta}$ unit increase in

Δ. The impact of a one unit increase in total business credit on subsequent macroeconomic outcomes is then given by:

$$\varepsilon\left(\Delta,\xi\right)=\frac{\frac{\partial Y^{*}(\Delta,\xi)}{\partial\Delta}}{\frac{\partial b^{*}(\Delta,\xi)}{\partial\Delta}}=\underbrace{\frac{\partial Y(\Delta,b^{*}(\Delta,\xi),\xi)}{\partial\Delta}\cdot\left(\frac{\partial b^{*}(\Delta,\xi)}{\partial\Delta}\right)^{-1}}_{\text{direct productivity effect, }>0}+\underbrace{\frac{\partial Y\left(\Delta,b^{*}\left(\Delta,\xi\right),\xi\right)}{\partial b}}_{\text{effect through credit changes, }<0}.$$

Compared to (10), the impact of fundamental driven credit boom has an extra direct productivity effect. Indeed, this term dominates and it overturns Proposition 1. As formalized in Proposition IA3 in Appendix IA2.4, the impact of a fundamental driven credit boom on macroeconomic outcomes is now positive: $\varepsilon\left(\Delta,\xi\right)>0$. The increase in firms' productivity means that fundamental driven credit booms are followed by fewer defaults and higher output because of fewer inefficient liquidations. Moreover, a more efficient bankruptcy system (a higher ξ) now dampens the positive impact of a credit boom on macroeconomic outcomes: $\frac{\partial\varepsilon(\Delta,\xi)}{\partial\xi}<0$. This is because a more efficient bankruptcy system leaves less room for increases in firms' productivity to improve macroeconomic outcomes by decreasing the number of defaults and inefficient bankruptcies.[21]

For these predictions, we draw on findings by Müller and Verner (2023) and Ivashina et al. (2024) that credit booms in nontradable sectors appear nonfundamental (they are followed by worse macroeconomic outcomes), whereas credit booms in tradable sectors appear fundamental (they are followed by better macroeconomic outcomes). Interestingly, we see in Table IA13 that bankruptcy efficiency dampens the negative effects of nontradable credit booms, and dampens the positive effects of tradable credit booms, exactly as our model predicts. Overall, nontradable credit booms appear to dominate (Müller and Verner, 2023), so business credit booms on average are followed by worse macroeconomic outcomes (Ivashina et al., 2024), and follow the predictions of nonfundamental credit booms in Proposition 1.

In summary, the model analysis in the section suggests that higher bankruptcy efficiency helps ameliorate the impact of nonfundamental credit cycles. Such credit cycles are well recognized to undermine macroeconomic stability. Accordingly, our results point to the importance of incorporating default risks and bankruptcy institutions in the theory and practice of macroprudential policy design.

[21]The predictions in Proposition IA3 are again symmetric: the comparative statics apply to both fundamental driven credit booms and contractions.

6 Conclusion

Legal institutions can influence the severity of financial frictions and in turn the contour of macroeconomic fluctuations. We explore these connections in the context of how business bankruptcy relates to the consequences of credit booms. The evidence supports the view that credit booms are especially detrimental when default resolution functions poorly. Indeed, this view has motivated reforms of bankruptcy institutions like in the case of Japan.

In general, understanding default resolution in practice can be useful for macroeconomic analyses. In many macro models, default resolution is akin to liquidation. Models that feature restructuring are less common. In ongoing work, we aim to develop a quantitative model to analyze the macro implications of restructuring versus liquidation, and evaluate how much different schemes of default resolution can affect economic fluctuations.

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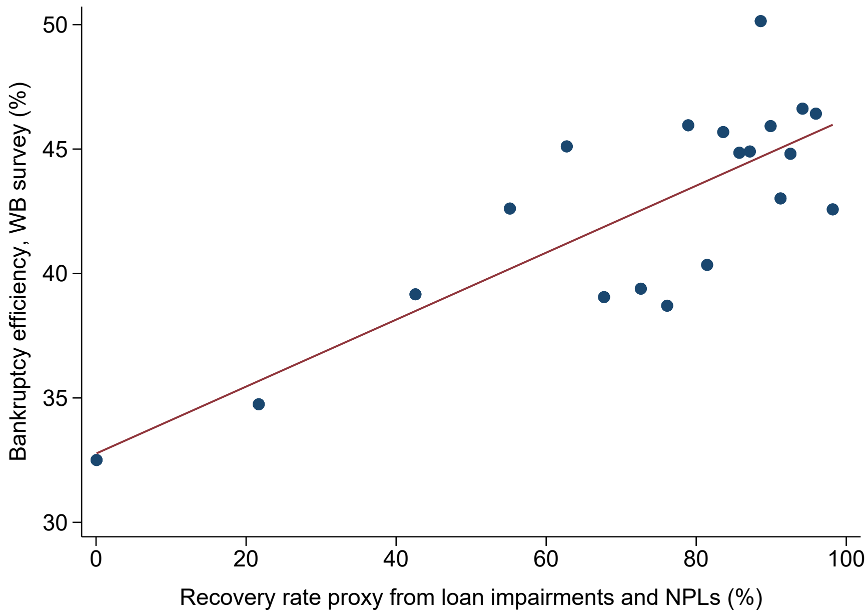
Internet Appendix: For Online Publication

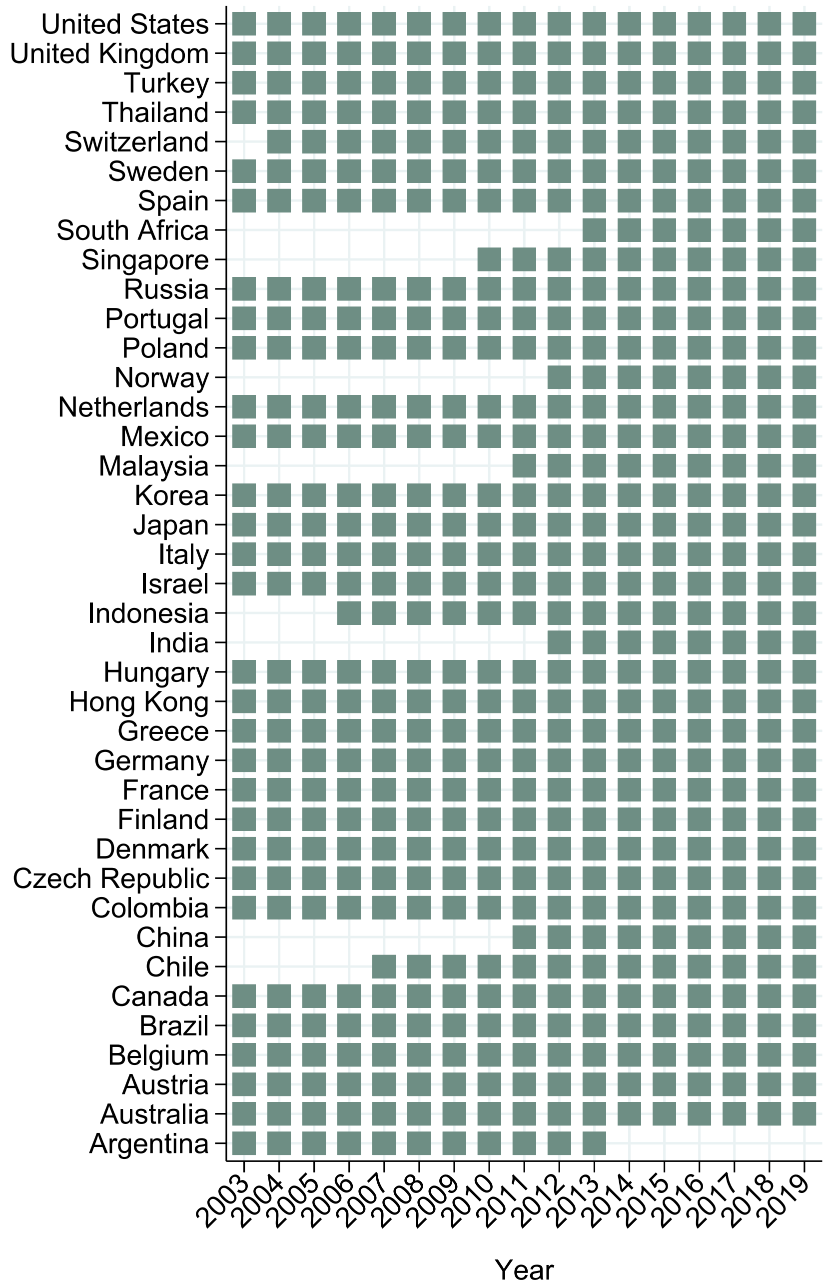
IA1 Additional Results

Figure IA1. Bankruptcy Efficiency and Imputed Realized Default Recovery Rate



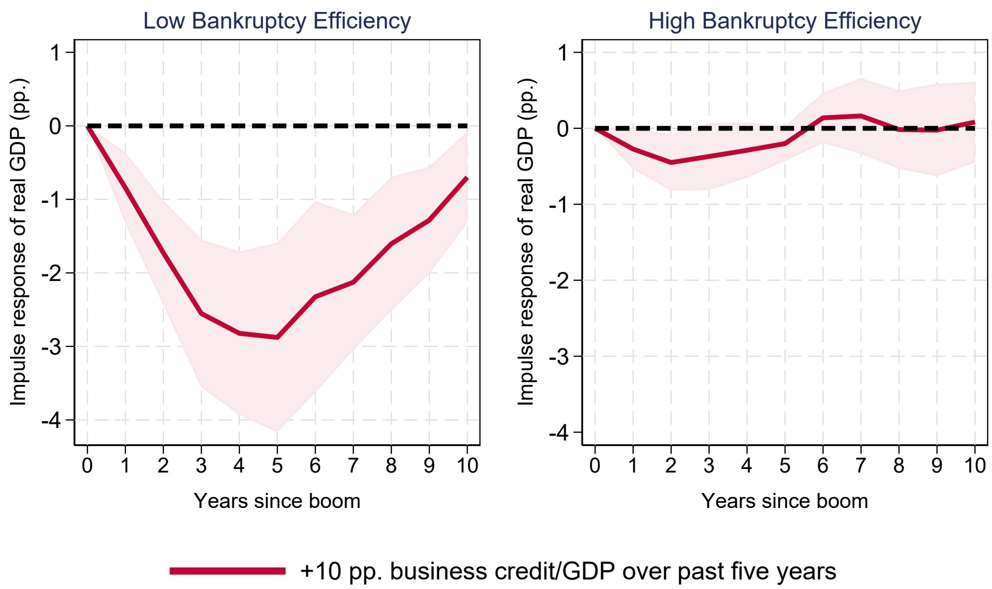
Notes: This figure shows a binned scatter plot of bankruptcy efficiency from World Bank (2020) against a proxy of realized default recovery rate. We construct the proxy as the difference between 100% and the ratio of loan impairments relative to nonperforming loans in a given year sourced from the BIS MiDAS Credit Loss Database introduced by Ong, Schmieder, and Wei (2023). The sample contains annual data from an unbalanced panel of 153 countries. The sample period is 2005 (the start of the MiDAS data) to 2019.

Figure IA2. Regression Sample



Notes: This figure shows the sample of countries and years covered in the baseline local projection regressions for GDP.

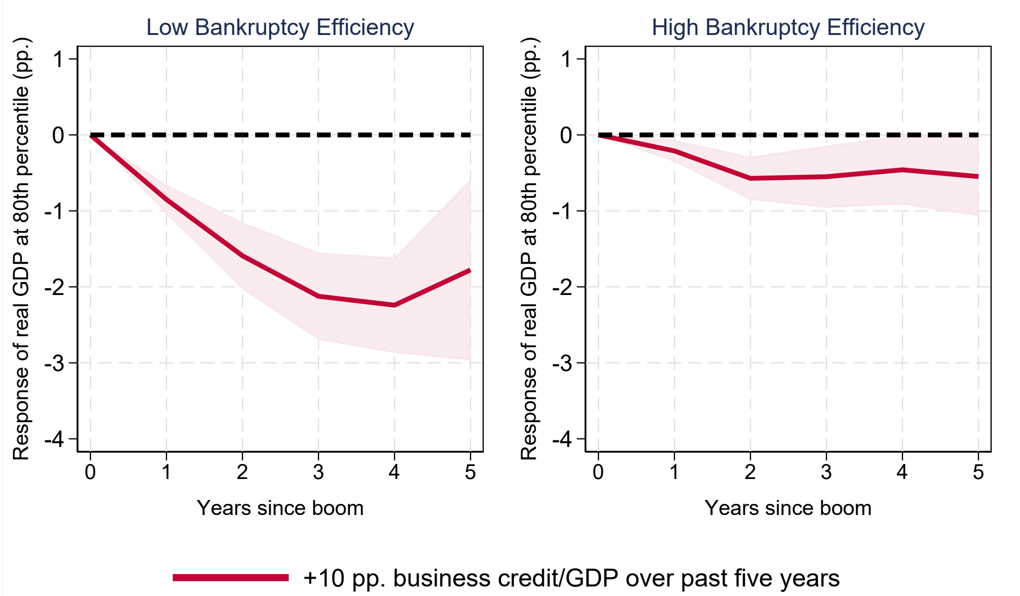
Figure IA3. GDP following Business Credit Booms in the Longer Term



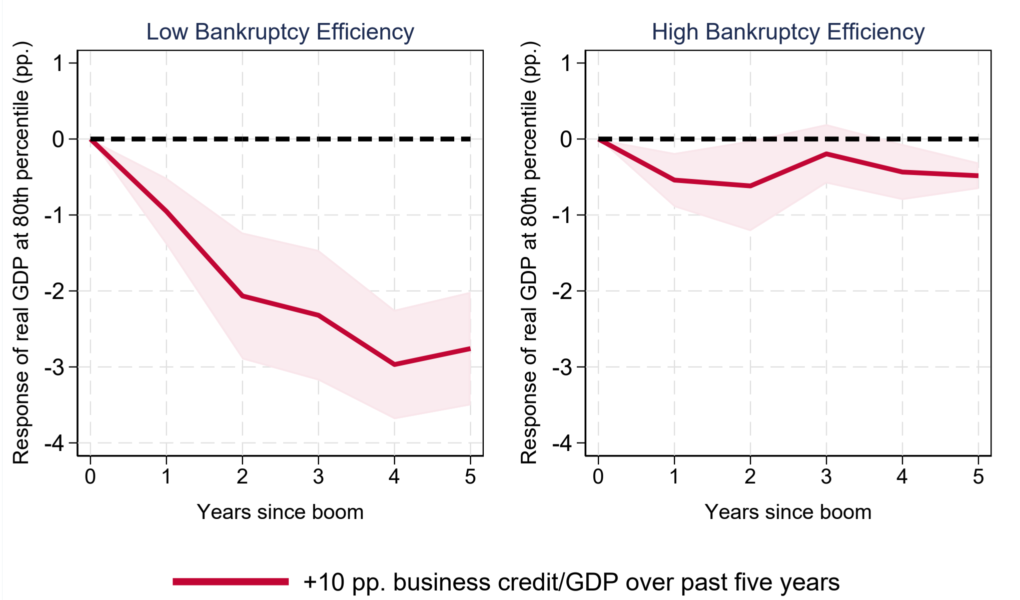
Notes: This figure shows the longer-term GDP trajectory following a 10 percentage point increase in the business credit-to-GDP ratio over the past 5 years. We estimate state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_i) + \beta_{3,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 10$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas are 90% confidence intervals based on Driscoll-Kraay standard errors.

Figure IA4. GDP following Business Credit Booms: Quantile Regressions

Panel A. Response at the 80th Percentile

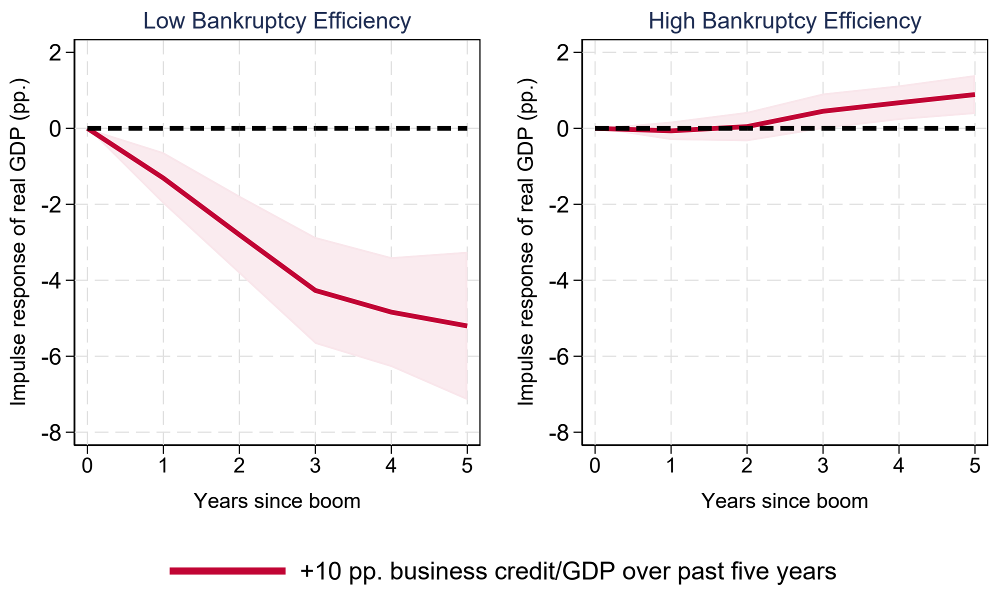


Panel B. Response at the 20th Percentile



Notes: The figure shows the trajectory of the 80th and 20th percentile of cumulative GDP growth following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent quantile local projections: $Q_{\Delta_h \log(\text{real GDP}_{i,t+h})}(q) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The target variable for the quantile function is the change in log real GDP in country i from year t to year $t+h$ evaluated at quantile $q \in [0.2, 0.8]$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t. $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and real investment growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panels evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas are 90% confidence intervals based on Driscoll-Kraay standard errors.

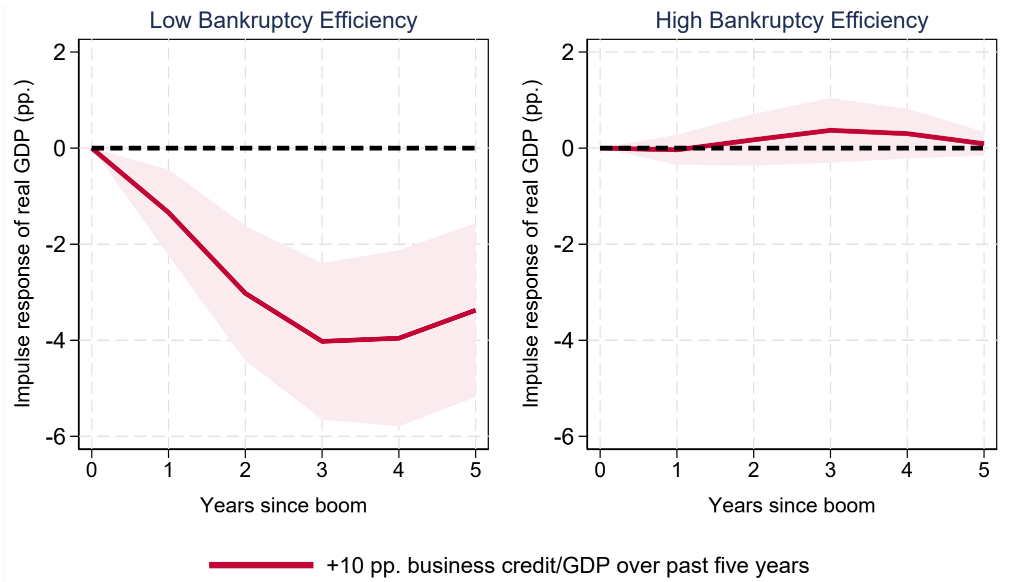
Figure IA5. GDP following Business Credit Booms with Fixed Bankruptcy Efficiency Measure



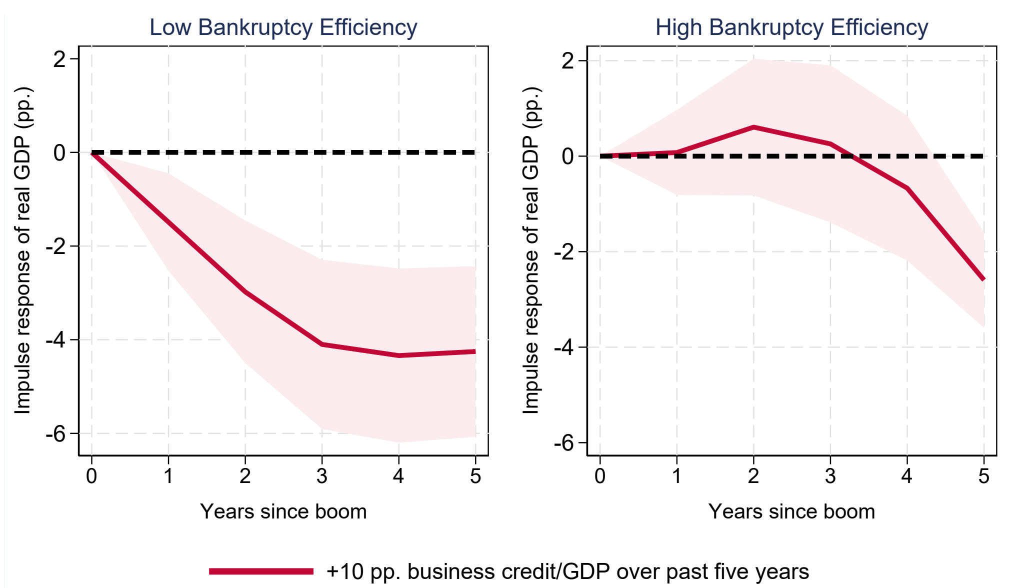
Notes: This figure shows the trajectory of GDP following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_i) + \beta_{3,h}B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and B_i is bankruptcy efficiency measured at the start of the sample. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas mark 90% confidence intervals based on Driscoll-Kraay standard errors.

Figure IA6. GDP following Business Credit Booms, Instrumenting Bankruptcy Efficiency

Panel A. Baseline



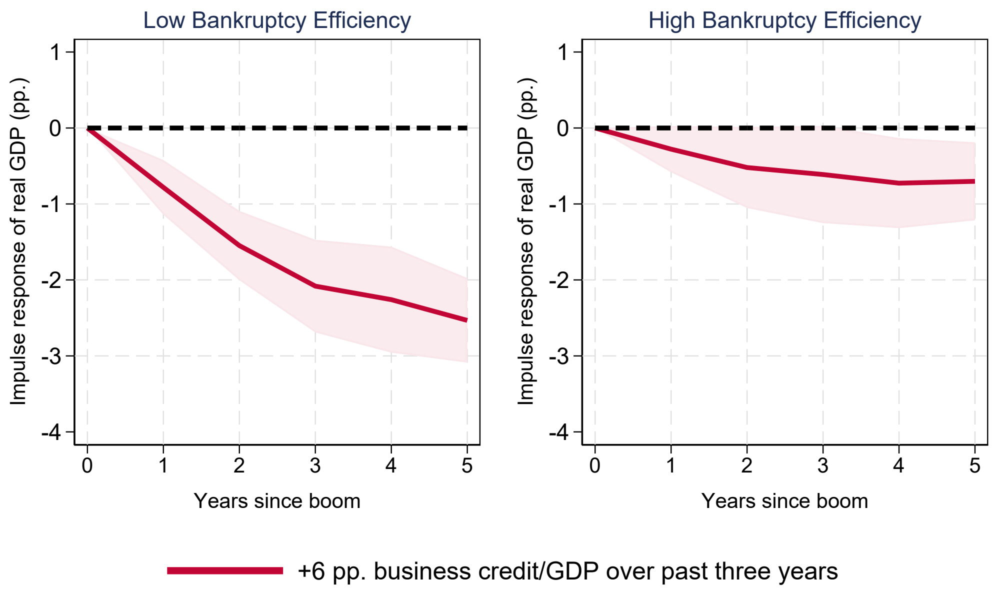
Panel B. Controlling for Rule of Law



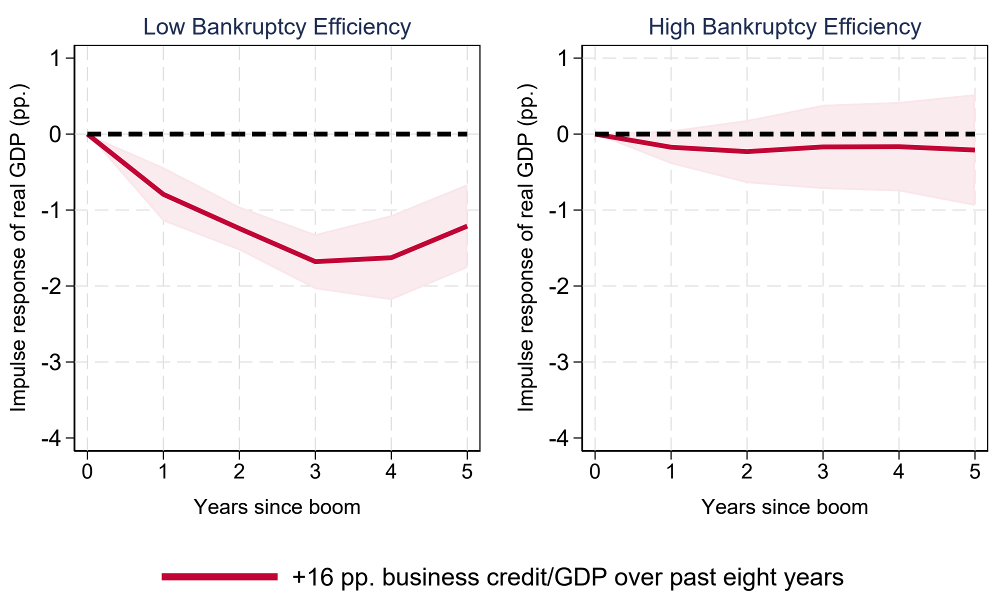
Notes: This figure shows the trajectory of GDP following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent instrumental variable local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\widehat{\Delta_5 c_{i,t} \times B_i}\right) + \beta_{3,h}\hat{B}_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t and $B_{i,t}$ is the bankruptcy efficiency measure, instrumented by 3 dummies indicating English, French, or German legal origin with Nordic legal origin as base category. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Panel B additionally controls for the rule of law index (Kaufmann and Kraay, 2023) and its interaction with business credit fluctuations $\Delta_5 c_{i,t}$. Since the legal origin instruments are time-invariant, we cannot identify the base coefficient $\beta_{3,h}$ for bankruptcy efficiency alongside country fixed effects. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas mark 90% confidence intervals based on Driscoll-Kraay standard errors.

Figure IA7. Measuring Credit Booms over Alternative Windows

Panel A. Change in Business Credit to GDP over Past 3 Years

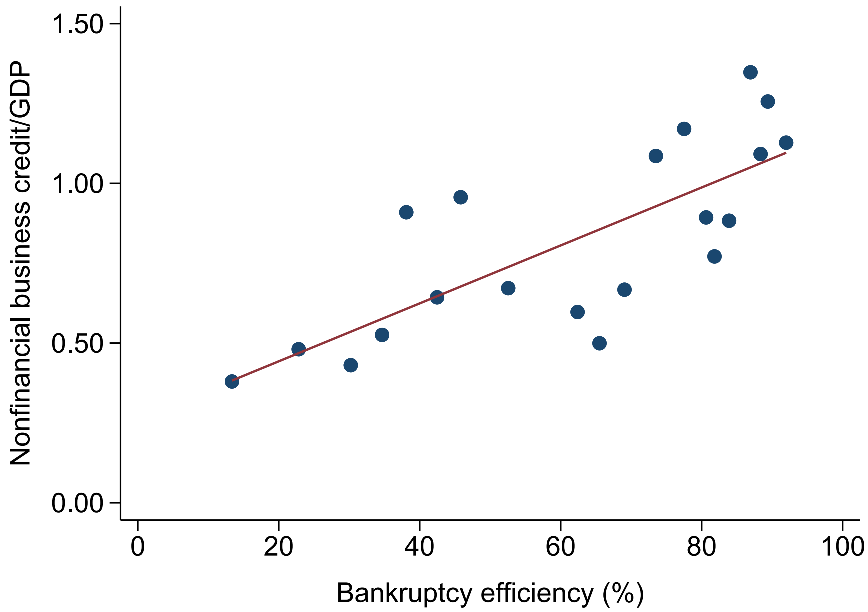


Panel B. Change in Business Credit to GDP over Past 8 Years



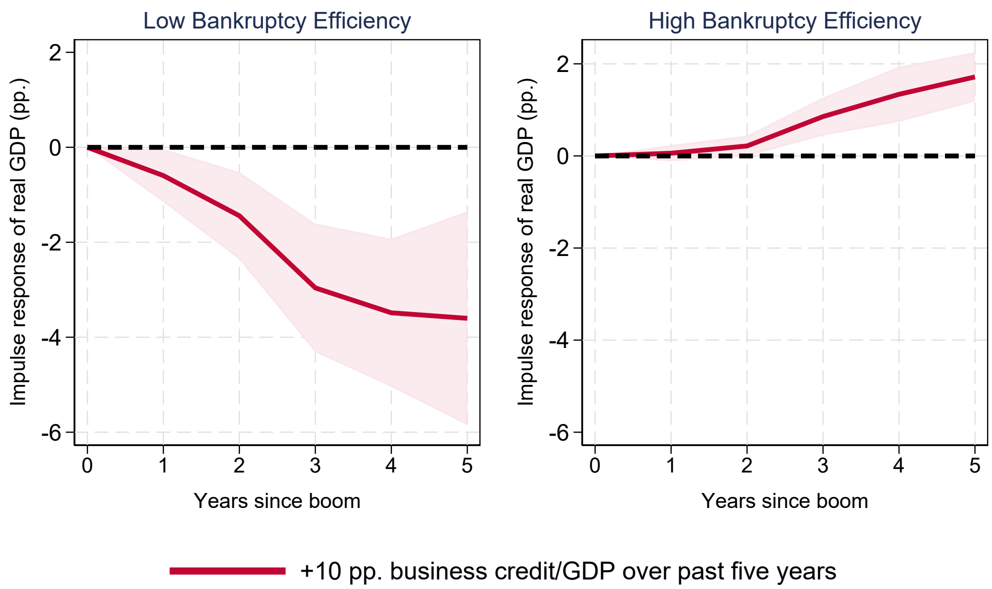
Notes: Panel A (B) shows the GDP trajectory following a 6 (16) percentage point increase in the business credit to GDP ratio over the past 3 (8) years. We normalize the change in business credit to GDP to 2 percentage points per year of the measurement window, following the baseline figures (10 percentage points over the past 5 years). We estimate state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_l c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-l$ to year t where $l \in \{3, 8\}$. $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and real investment growth, as well as the cumulative change in household credit to GDP since year $t-l$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panels evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas are 90% confidence intervals based on Driscoll-Kraay standard errors.

Figure IA8. Bankruptcy Efficiency and Level of Business Credit/GDP



Notes: This figure shows a binned scatter plot for the relationship between bankruptcy efficiency and credit to nonfinancial businesses relative to GDP. The sample comprises data from 39 countries over the period of 2003 to 2019. The line represents the linear prediction.

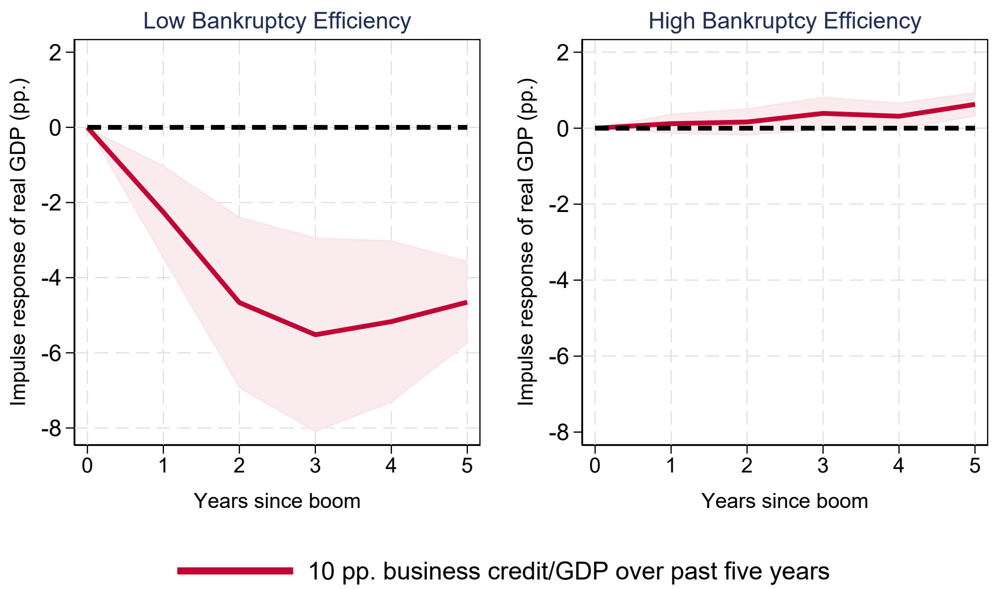
Figure IA9. Controlling for Debt Levels



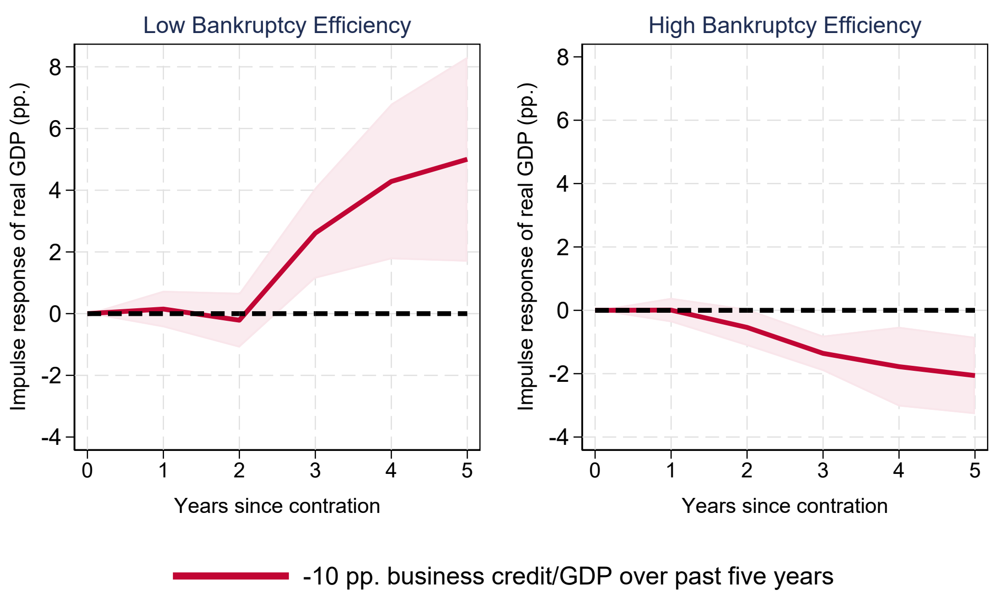
Notes: The figure shows the GDP trajectory following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}B_{i,t} + \beta_{4,h}c_{i,t} + \beta_{5,h}(c_{i,t} \times B_{i,t}) + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variables $c_{i,t}$ and $\Delta_5 c_{i,t}$ denote the level of business credit to GDP in country i in year t, and the change of business credit to GDP in country i from year $t-5$ to year t. $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and real investment growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panels evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas are 90% confidence intervals based on Driscoll-Kraay standard errors.

Figure IA10. GDP following Business Credit Expansions and Contractions

Panel A. Business Credit Expansions

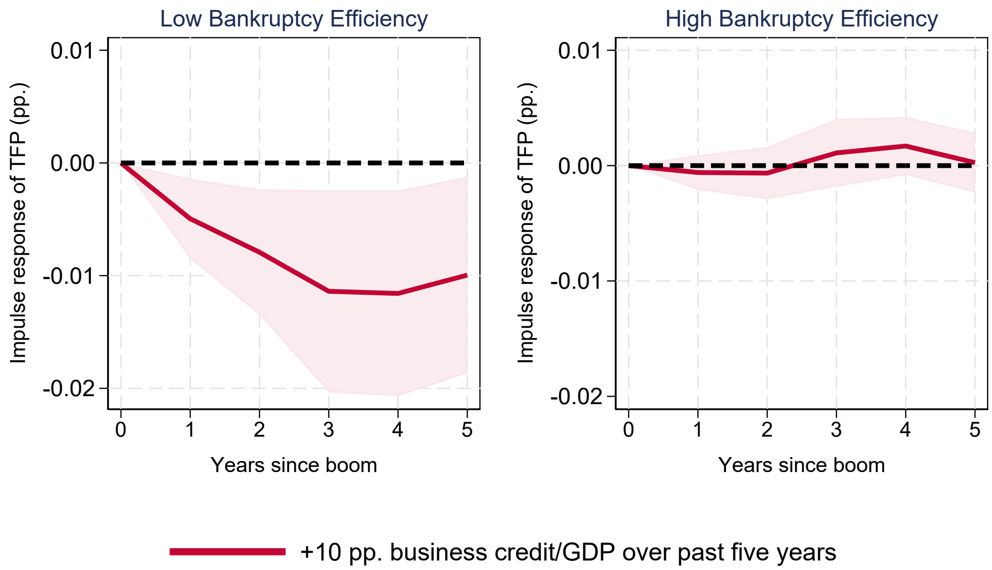


Panel B. Business Credit Contractions



Notes: Panel A (B) of this figure shows the GDP trajectory following a 10 percentage point increase (decrease) in the business credit to GDP ratio over the past 5 years. We estimate state-dependent local projections implementing sign dependence following Ben Zeev, Ramey, and Zubairy (2023): $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \Delta^+\left[\beta^+_{1,h}B_{i,t} + \beta^+_{2,h}\Delta_5 c_{i,t} + \beta^+_{3,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \boldsymbol{\gamma}^+_h \boldsymbol{x}_{i,t}\right] + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The indicator variable Δ^+ takes value 1 if $\Delta_5 c_{i,t} > 0$, i.e., having a credit boom. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and real investment growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas are 90% confidence intervals based on Driscoll-Kraay standard errors.

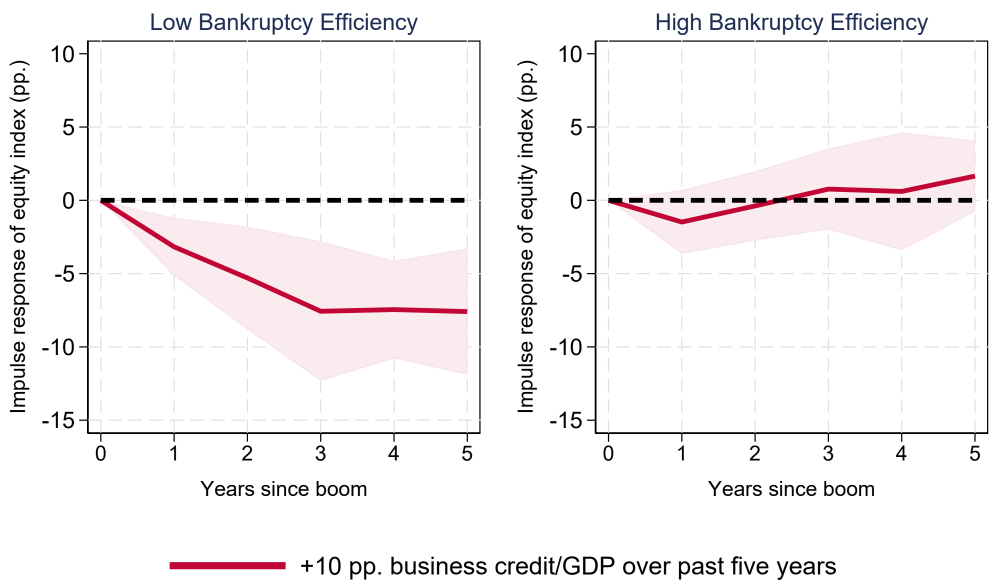
Figure IA11. Total Factor Productivity following Business Credit Booms



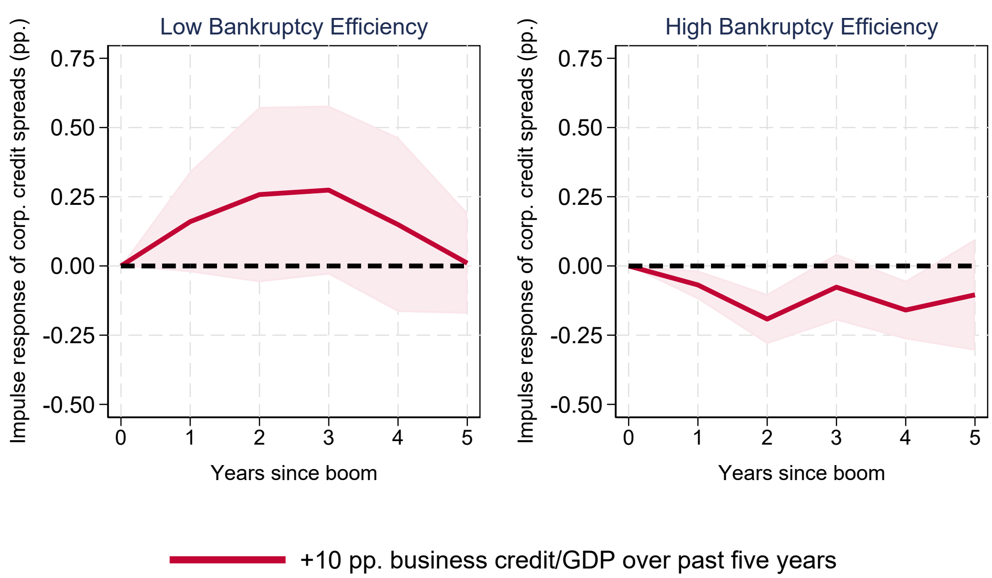
Notes: This figure shows the trajectory of total factor productivity (TFP) following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent local projections: $\Delta_h \log(\text{TFP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h}B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log TFP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and TFP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas mark 90% confidence intervals based on Driscoll-Kraay standard errors.

Figure IA12. Asset Prices following Business Credit Booms

Panel A. Stock Prices following Business Credit Booms

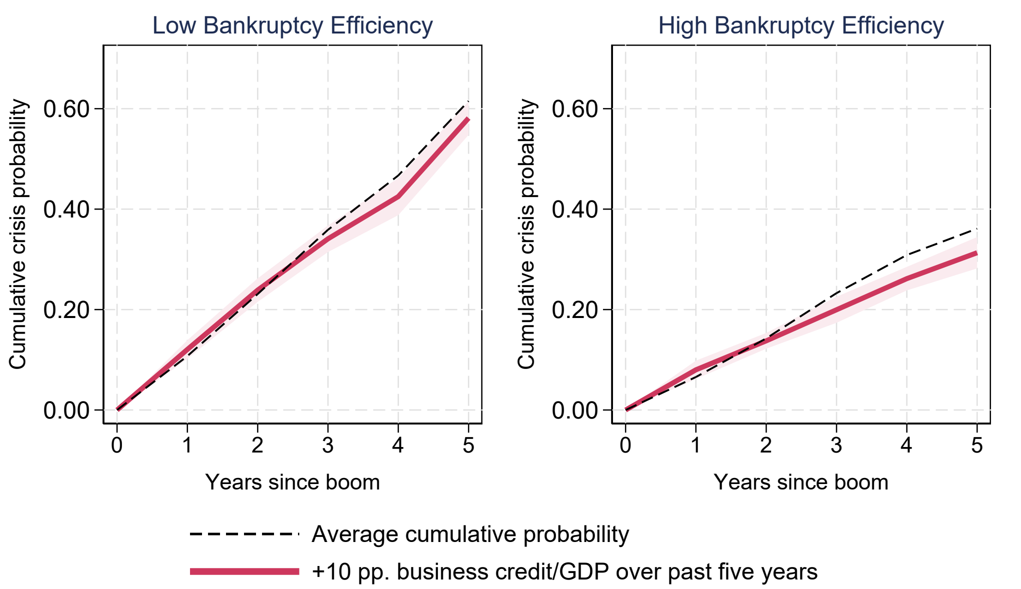


Panel B. Credit Spreads following Business Credit Booms



Notes: This figure shows the trajectory of real stock prices (Panel A) and credit spreads between long-term corporate and the government bonds (Panel B) following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent local projections: $\Delta_h \text{asset price}_{i,t+h} = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h} B_{i,t} + \gamma_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log real stock price index (Panel A) and credit spread (Panel B) in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and the asset price change, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 36 advanced and emerging economies in Panel A, and 20 primarily advanced economies in Panel B. The sample period is 2003 to 2019. Shaded areas are 90% confidence intervals based on Driscoll-Kraay standard errors.

Figure IA13. Crisis Probability following Business Credit Booms



Notes: This figure shows the cumulative probability of a financial crisis with (solid red line) and without (dashed black line) a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate linear probability models using state-dependent local projections: $\mathbb{1}(\text{crisis since } t)_{i,t+h} = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the occurrence of a financial crisis in country i from year t to year $t + h$ as chronicled by Baron, Verner, and Xiong (2021). The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t - 5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and crisis indicators, as well as the cumulative change in household credit to GDP since $t - 5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas mark 90% confidence intervals based on Driscoll-Kraay standard errors.

Table IA1 – Change in Log Real GDP: Recessions and Non-Recessions

Panel A. Recessions

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.715***	1.239***	1.773***	1.779**	1.449**
	(0.129)	(0.281)	(0.530)	(0.590)	(0.639)
Δ_5 Business credit/GDP	-0.622***	-1.084***	-1.549***	-1.569**	-1.264**
	(0.119)	(0.255)	(0.449)	(0.505)	(0.548)
Bankruptcy efficiency	-0.400	1.962	14.077	26.695**	19.008**
	(3.828)	(7.142)	(9.056)	(10.130)	(6.731)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.39	0.50	0.59	0.64	0.69
Observations	85	82	82	78	71

Panel B. Non-Recessions

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.111***	0.250***	0.503***	0.631***	0.703***
	(0.037)	(0.067)	(0.098)	(0.111)	(0.142)
Δ_5 Business credit/GDP	-0.113**	-0.237***	-0.426***	-0.516***	-0.579***
	(0.042)	(0.067)	(0.096)	(0.107)	(0.127)
Bankruptcy efficiency	-0.542	-1.214	-1.700	-3.168	-5.417
	(1.473)	(2.090)	(3.842)	(4.323)	(4.156)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.12	0.14	0.18	0.22	0.25
Observations	475	440	402	368	337

Notes: This table shows results from state-dependent local projections for the sample of recession years in Panel A (i.e., negative real annual GDP growth at $h = 0$) and non-recessions in Panel B (i.e., positive real annual GDP growth at $h = 0$): $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h}B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA2 – Change in Log Real GDP: Quantile Regressions

Panel A. Response at the 80th Percentile

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.160***	0.255***	0.393***	0.445***	0.307
	(0.033)	(0.070)	(0.094)	(0.116)	(0.190)
Δ_5 Business credit/GDP	-0.154***	-0.269***	-0.382***	-0.416***	-0.310**
	(0.024)	(0.054)	(0.071)	(0.084)	(0.151)
Bankruptcy efficiency	-2.267**	-3.371	-7.449**	-5.300	-6.326
	(1.010)	(2.106)	(3.065)	(5.209)	(7.858)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2	0.42	0.52	0.60	0.66	0.71
Observations	560	522	484	446	408

Panel B. Response at the 20th Percentile

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.103	0.362**	0.531***	0.633***	0.569***
	(0.070)	(0.142)	(0.130)	(0.112)	(0.113)
Δ_5 Business credit/GDP	-0.140***	-0.362***	-0.460***	-0.569***	-0.520***
	(0.053)	(0.105)	(0.105)	(0.089)	(0.093)
Bankruptcy efficiency	-0.429	1.056	-0.540	-0.533	-4.973
	(1.479)	(5.392)	(4.051)	(3.292)	(5.556)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2	0.42	0.52	0.60	0.66	0.71
Observations	560	522	484	446	408

Notes: This table shows results for the 80th (Panel A) and 20th percentile (Panel B) of the cumulative GDP growth from state-dependent quantile local projections: $Q_{\Delta_h \log(\text{real GDP}_{i,t+h})}(q) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h} B_{i,t} + \gamma_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The target variable for the quantile function is the change in log real GDP in country i from year t to year $t+h$ evaluated at quantile $q \in [0.2, 0.8]$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t. $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and real investment growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA3 – Change in Log Real GDP, Controlling for Development Status

Panel A. Binary Indicator for Development Status

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.176**	0.347***	0.487***	0.425**	0.293
	(0.075)	(0.116)	(0.154)	(0.183)	(0.195)
Δ_5 Business credit/GDP × Advanced economy	-0.058	-0.105	-0.064	0.028	0.123***
	(0.047)	(0.064)	(0.081)	(0.066)	(0.037)
Δ_5 Business credit/GDP	-0.115***	-0.227***	-0.377***	-0.411***	-0.393**
	(0.036)	(0.056)	(0.096)	(0.113)	(0.145)
Bankruptcy efficiency	-0.869	-0.863	0.743	2.989**	4.708*
	(0.907)	(1.206)	(1.007)	(1.103)	(2.240)
Advanced economy	-2.043*	-5.279**	-7.058**	-9.159***	-11.465***
	(0.968)	(1.977)	(2.350)	(2.942)	(3.275)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.16	0.19	0.22	0.25	0.29
Observations	560	522	484	446	408

Panel B. Log Real GDP per capita in USD

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.145***	0.300***	0.467***	0.560***	0.566***
	(0.041)	(0.064)	(0.089)	(0.090)	(0.093)
Δ_5 Business credit/GDP × Log real GDP p.c.	-0.017	-0.032	-0.026	-0.068	-0.082
	(0.020)	(0.049)	(0.069)	(0.081)	(0.080)
Δ_5 Business credit/GDP	0.048	0.080	-0.097	0.308	0.479
	(0.200)	(0.509)	(0.717)	(0.866)	(0.915)
Bankruptcy efficiency	3.776**	7.897***	13.533***	18.481***	23.422***
	(1.288)	(1.966)	(2.950)	(3.847)	(3.520)
Log real GDP per capita in USD	-8.324***	-17.853***	-28.636***	-40.664***	-52.362***
	(1.819)	(4.867)	(7.103)	(7.072)	(4.315)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.18	0.21	0.27	0.32	0.38
Observations	560	522	484	446	408

Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}(\Delta_5 c_{i,t} \times AE_{i,t}) + \beta_{4,h}B_{i,t} + \beta_{5,h}AE_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. In Panel A, the variable $AE_{i,t}$ is an indicator for high income countries. In Panel B, the variable $DM_{i,t}$ is log real GDP per capita in US Dollars. For both tables, the outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA4 – Change in Log Real GDP, Controlling for General GDP Volatility

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.117*	0.295**	0.493***	0.508**	0.431*
	(0.057)	(0.121)	(0.162)	(0.182)	(0.222)
Δ_5 Business credit/GDP $\times$ GDP volatility	-1.094	-1.045	-2.190	-5.088	-9.693**
	(1.392)	(3.049)	(4.330)	(3.960)	(4.058)
Δ_5 Business credit/GDP	-0.098	-0.264	-0.392*	-0.327	-0.147
	(0.068)	(0.157)	(0.217)	(0.233)	(0.273)
Bankruptcy efficiency	-0.956	-1.427	-0.820	-0.458	-0.317
	(0.953)	(1.261)	(2.133)	(3.012)	(3.081)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.15	0.18	0.22	0.27
Observations	560	522	484	446	408

Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}\left(\Delta_5 c_{i,t} \times sd(\Delta \log(\text{real GDP})_{i,t})_i\right) + \beta_{4,h}B_{i,t} + \beta_{5,h}sd(\Delta \log(\text{real GDP})_{i,t})_i + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The variable $sd(\Delta \log(\text{real GDP})_{i,t})_i$ captures a country's standard deviation of real GDP growth. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA5 – Change in Log Real GDP, Controlling for Exchange Rate Regime

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.175**	0.427***	0.688***	0.763***	0.776***
	(0.063)	(0.106)	(0.144)	(0.168)	(0.189)
Δ_5 Business credit/GDP × Currency peg	-0.025	-0.088**	-0.118**	-0.111*	-0.096
	(0.021)	(0.038)	(0.053)	(0.062)	(0.054)
Δ_5 Business credit/GDP	-0.156***	-0.341***	-0.532***	-0.591***	-0.604***
	(0.049)	(0.077)	(0.107)	(0.123)	(0.146)
Bankruptcy efficiency	-1.514*	-2.748**	-2.746	-1.795	-0.928
	(0.841)	(1.106)	(1.873)	(2.733)	(3.101)
Currency peg	1.426	3.312*	5.528**	4.731*	2.852
	(0.813)	(1.580)	(2.242)	(2.440)	(2.010)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.16	0.19	0.22	0.25
Observations	560	522	484	446	408

Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h}\left(\Delta_5 c_{i,t} \times \text{peg}_{i,t}\right) + \beta_{4,h} B_{i,t} + \beta_{5,h}\text{peg}_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The indicator variable $\text{peg}_{i,t}$ is 1 if the country has a fixed exchange rate, i.e., a value of 1 to 4 on the scale of foreign exchange regimes classified by Ilzetzki, Reinhart, and Rogoff (2019). The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA6 – Change in Log Real GDP, Controlling of Policy Countercyclicality

Panel A. Fiscal Policy Countercyclicality

	(1) $h = 1$	(2) $h = 2$	(3) $h = 3$	(4) $h = 4$	(5) $h = 5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.127***	0.280***	0.481***	0.564***	0.598***
	(0.042)	(0.066)	(0.096)	(0.121)	(0.162)
Δ_5 Business credit/GDP × Fiscal cyclicality	-0.014	-0.058**	-0.102***	-0.128***	-0.151***
	(0.015)	(0.021)	(0.032)	(0.028)	(0.020)
Δ_5 Business credit/GDP	-0.142***	-0.304***	-0.480***	-0.548***	-0.576***
	(0.046)	(0.070)	(0.100)	(0.113)	(0.140)
Bankruptcy efficiency	-0.840	-1.092	-0.324	0.165	0.288
	(0.977)	(1.303)	(2.121)	(2.959)	(3.236)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.15	0.19	0.22	0.25
Observations	551	514	477	440	403

Panel B. Monetary Policy Countercyclicality

	(1) $h = 1$	(2) $h = 2$	(3) $h = 3$	(4) $h = 4$	(5) $h = 5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	-0.009	0.110	0.332*	0.385**	0.454**
	(0.072)	(0.149)	(0.163)	(0.153)	(0.183)
Δ_5 Business credit/GDP × Monetary cyclicality	0.002***	0.003*	0.003*	0.004**	0.003*
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
Δ_5 Business credit/GDP	-0.080*	-0.221***	-0.406***	-0.458***	-0.505***
	(0.040)	(0.074)	(0.077)	(0.084)	(0.123)
Bankruptcy efficiency	-4.805***	-9.253***	-12.254***	-13.471***	-13.939***
	(0.956)	(2.485)	(3.095)	(2.254)	(2.045)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.13	0.15	0.21	0.23	0.26
Observations	375	349	323	297	271

Notes: Both tables show results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}(\Delta_5 c_{i,t} \times \text{cyc}_i) + \beta_{4,h} B_{i,t} + \beta_{5,h}\text{cyc}_i + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. In Panel A (Panel B), the variable cyc_i is the country specific coefficient of regressing changes in government spending to GDP (changes in the monetary policy rate) on contemporaneous real output growth. For both tables, the outcome variable is the change in log real GDP in country i from year t to year $t + h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t - 5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t - 5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA7 – Change in Log Real GDP, Controlling for Rule of Law

	(1) $h = 1$	(2) $h = 2$	(3) $h = 3$	(4) $h = 4$	(5) $h = 5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.065	0.208**	0.391***	0.435**	0.367*
	(0.051)	(0.088)	(0.122)	(0.143)	(0.196)
Δ_5 Business credit/GDP $\times$ Rule of law	0.037*	0.055*	0.079*	0.105**	0.160***
	(0.020)	(0.029)	(0.044)	(0.045)	(0.051)
Δ_5 Business credit/GDP	-0.105**	-0.253***	-0.411***	-0.455***	-0.424**
	(0.041)	(0.069)	(0.100)	(0.115)	(0.144)
Bankruptcy efficiency	-0.235	-0.203	1.610	3.621	6.223
	(0.957)	(1.222)	(2.311)	(3.702)	(4.390)
Rule of law	-0.184	-0.432	-1.827	-4.008*	-7.579*
	(0.872)	(1.120)	(1.423)	(2.149)	(4.084)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.15	0.19	0.22	0.26
Observations	560	522	484	446	408

Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}(\Delta_5 c_{i,t} \times R_{i,t}) + \beta_{4,h} B_{i,t} + \beta_{5,h} R_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The variable $R_{i,t}$ measures the strength of the rule of law (Kaufmann and Kraay, 2023). The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA8 – Change in Log Real GDP, Controlling for Institutional Quality (I)

Panel A. Government Effectiveness

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.038	0.144*	0.281**	0.315*	0.262
	(0.041)	(0.074)	(0.117)	(0.147)	(0.208)
Δ_5 Business credit/GDP × Government effectiveness	0.053***	0.088***	0.136**	0.165***	0.211***
	(0.015)	(0.027)	(0.045)	(0.050)	(0.052)
Δ_5 Business credit/GDP	-0.089**	-0.218***	-0.356***	-0.400***	-0.382**
	(0.039)	(0.060)	(0.092)	(0.106)	(0.138)
Bankruptcy efficiency	-0.120	-0.036	1.309	2.095	2.587
	(1.048)	(1.247)	(1.842)	(2.616)	(2.901)
Government effectiveness	-0.061	1.567	5.093	8.628	9.807
	(0.849)	(1.988)	(3.706)	(5.825)	(6.429)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.15	0.16	0.21	0.25	0.29
Observations	560	522	484	446	408

Panel B. Regulatory Quality

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.071	0.238***	0.415***	0.460***	0.431**
	(0.047)	(0.072)	(0.110)	(0.135)	(0.179)
Δ_5 Business credit/GDP × Regulatory quality	0.040*	0.045*	0.075**	0.101***	0.149***
	(0.022)	(0.024)	(0.029)	(0.033)	(0.037)
Δ_5 Business credit/GDP	-0.109**	-0.270***	-0.429***	-0.477***	-0.469***
	(0.040)	(0.063)	(0.098)	(0.115)	(0.139)
Bankruptcy efficiency	-0.641	-1.215	-0.747	-0.489	-0.057
	(1.101)	(1.491)	(2.779)	(4.302)	(4.755)
Regulatory quality	0.441	1.236	3.592	5.216	5.724
	(0.512)	(1.033)	(2.812)	(4.654)	(6.306)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.15	0.19	0.22	0.26
Observations	560	522	484	446	408

Notes: Both tables show results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}(\Delta_5 c_{i,t} \times Q_{i,t}) + \beta_{4,h}B_{i,t} + \beta_{5,h}Q_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. In Panel A (Panel B), the variable $Q_{i,t}$ is government effectiveness (regulatory quality) measured by Kaufmann and Kraay (2023). For both tables, the outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA9 – Change in Log Real GDP, Controlling for Institutional Quality (II)

Panel A. Time Required to Start a Business

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.119**	0.233**	0.367***	0.395***	0.367**
	(0.053)	(0.079)	(0.099)	(0.110)	(0.148)
Δ_5 Business credit/GDP × Time to start business	0.003	-0.011	-0.046**	-0.067**	-0.092***
	(0.014)	(0.018)	(0.019)	(0.023)	(0.018)
Δ_5 Business credit/GDP	-0.136**	-0.251***	-0.344***	-0.350***	-0.301**
	(0.055)	(0.075)	(0.092)	(0.094)	(0.116)
Bankruptcy efficiency	0.920	3.284**	6.916***	9.039***	10.427**
	(1.190)	(1.521)	(1.738)	(2.377)	(3.711)
Time to start business	1.370***	3.502***	5.623***	7.034***	7.978***
	(0.213)	(0.445)	(0.432)	(0.436)	(0.341)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.17	0.21	0.27	0.30	0.34
Observations	560	522	484	446	408

Panel B. Time of Contract Enforcement

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.129***	0.286***	0.480***	0.545***	0.570***
	(0.038)	(0.060)	(0.090)	(0.095)	(0.124)
Δ_5 Business credit/GDP × Time to enforce contract	-0.001	-0.003	-0.007	-0.009	-0.011*
	(0.002)	(0.004)	(0.006)	(0.006)	(0.006)
Δ_5 Business credit/GDP	-0.120**	-0.239**	-0.332**	-0.332***	-0.327***
	(0.051)	(0.091)	(0.124)	(0.105)	(0.102)
Bankruptcy efficiency	-0.827	-1.269	-0.873	-1.511	-3.251
	(1.180)	(1.773)	(2.798)	(3.934)	(4.802)
Time to enforce contract	0.010	0.003	-0.068	-0.270**	-0.602***
	(0.034)	(0.069)	(0.095)	(0.111)	(0.154)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.15	0.19	0.22	0.27
Observations	560	522	484	446	408

Notes: Both tables show results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}(\Delta_5 c_{i,t} \times Q_{i,t}) + \beta_{4,h} B_{i,t} + \beta_{5,h} Q_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. In Panel A (Panel B), the variable $Q_{i,t}$ measures the months to start a business (enforce a contract) from the World Bank Doing Business database (World Bank, 2020). For both tables, the outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA10 – GDP following Business Credit Booms with Fixed Bankruptcy Efficiency Measure

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency (fixed)	0.125***	0.285***	0.472***	0.551***	0.609***
	(0.037)	(0.059)	(0.078)	(0.085)	(0.129)
Δ_5 Business credit/GDP	-0.131***	-0.280***	-0.427***	-0.484***	-0.520***
	(0.039)	(0.058)	(0.079)	(0.081)	(0.109)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.14	0.18	0.21	0.25
Observations	560	522	484	446	408

Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_i) + \beta_{3,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and B_i is bankruptcy efficiency measured at the start of the sample. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA11 – Change in GDP, Instrumenting Bankruptcy Efficiency

Panel A. Baseline

	(1) $h = 1$	(2) $h = 2$	(3) $h = 3$	(4) $h = 4$	(5) $h = 5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency (instr.)	0.217**	0.532***	0.732***	0.710***	0.578***
	(0.088)	(0.149)	(0.170)	(0.181)	(0.162)
Δ_5 Business credit/GDP	-0.199***	-0.462***	-0.622***	-0.609***	-0.511***
	(0.071)	(0.115)	(0.132)	(0.147)	(0.141)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
First stage F	24.77	21.95	17.94	14.58	13.98
R^2 (within)					
Observations	560	522	484	446	408

Panel B. Controlling for Rule of Law

	(1) $h = 1$	(2) $h = 2$	(3) $h = 3$	(4) $h = 4$	(5) $h = 5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency (instr.)	0.261*	0.598***	0.726***	0.611***	0.276*
	(0.141)	(0.216)	(0.209)	(0.214)	(0.150)
Δ_5 Business credit/GDP	-0.227**	-0.477***	-0.628***	-0.617***	-0.508***
	(0.093)	(0.138)	(0.145)	(0.151)	(0.133)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
First stage F	8.14	10.35	9.81	9.41	8.47
R^2 (within)					
Observations	560	522	484	446	408

Notes: This table shows state-dependent instrumented variable local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\widehat{\Delta_5 c_{i,t} \times B_i}\right) + \beta_{3,h}\hat{B}_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure, instrumented by 3 indicator variables for English, French, or German legal origin (Nordic legal origin is the base category). The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t-5$. Panel B additionally controls for the rule of law index (Kaufmann and Kraay, 2023) and its interaction with business credit fluctuations $\Delta_5 c_{i,t}$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. Since the legal origin instruments are time-invariant, we cannot identify the base coefficient $\beta_{3,h}$ for bankruptcy efficiency alongside country fixed effects. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA12 – Change in Log Real GDP and Efficiency of Liquidating Nonviable Firms

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Efficiency reorganizing viable firm	0.127	0.443**	0.656**	0.734**	0.802***
	(0.074)	(0.149)	(0.229)	(0.243)	(0.223)
Δ_5 Business credit/GDP $\times$ Efficiency liquidating nonviable firm	0.067	-0.141	-0.176	-0.167	-0.181
	(0.064)	(0.160)	(0.248)	(0.341)	(0.474)
Δ_5 Business credit/GDP	-0.201***	-0.316***	-0.470***	-0.539***	-0.576**
	(0.037)	(0.042)	(0.057)	(0.124)	(0.248)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.15	0.18	0.21	0.25
Observations	553	516	479	442	405

Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B^V_{i,t}\right) + \beta_{3,h}\left(\Delta_5 c_{i,t} \times B^N_{i,t}\right) + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t. $B^V_{i,t}$ is the efficiency of resolving a viable firm, defined as the value preserved in bankruptcy (net of costs) relative to the full value from continuing operation. $B^N_{i,t}$ is the efficiency of liquidating a nonviable firm, defined as the realized liquidation value (net of bankruptcy costs) relative to the total liquidation value. Both measures are taken by Djankov et al. (2008a) for 2006 and are time invariant. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA13 – Change in Log Real GDP after Nontradable and Tradable Credit Booms

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Nontradable Credit/GDP $\times$ Bankruptcy efficiency	0.401	0.933*	1.436**	2.393***	2.138***
	(0.237)	(0.502)	(0.572)	(0.506)	(0.462)
Δ_5 Nontradable credit/GDP	-0.379**	-0.821**	-1.199**	-1.908***	-1.655***
	(0.172)	(0.367)	(0.440)	(0.418)	(0.382)
Δ_5 Tradable Credit/GDP $\times$ Bankruptcy efficiency	-0.439*	-1.034	-1.361	-2.877***	-2.472**
	(0.228)	(0.577)	(0.831)	(0.825)	(0.797)
Δ_5 Tradable credit/GDP	0.300	0.751	1.026	2.282***	1.967**
	(0.183)	(0.477)	(0.698)	(0.671)	(0.658)
Bankruptcy efficiency	-0.408	0.628	2.423	1.774	3.113
	(1.003)	(1.896)	(2.257)	(2.198)	(3.072)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.07	0.09	0.10	0.16	0.24
Observations	321	321	321	321	321

Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c^N_{i,t} + \beta_{2,h}\Delta_5 c^T_{i,t} + \beta_{3,h}\left(\Delta_5 c^N_{i,t} \times B_{i,t}\right) + \beta_{4,h}\left(\Delta_5 c^T_{i,t} \times B_{i,t}\right) + \beta_{5,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c^N_{i,t}$ ($\Delta_5 c^T_{i,t}$) denotes the change of debt of the nontradable (tradable) business sector relative to GDP in country i from year $t-5$ to year t. $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA14 – Bankruptcy Efficiency and Nontradable Credit Share

	(1) Nontradable share	(2) Share change	(3) Share change
Bankruptcy efficiency	0.205**	0.021	-0.002
	(0.071)	(0.024)	(0.033)
Δ_3 Business credit/GDP $\times$ Bankruptcy efficiency		0.097	
		(0.096)	
Δ_3 Business credit/GDP		-0.059	
		(0.055)	
Δ_3 Business loans/GDP $\times$ Bankruptcy efficiency			-0.098
			(0.127)
Δ_3 Business loans/GDP			0.098
			(0.111)
Country FE	Yes	Yes	Yes
R^2 (within)	0.038	0.003	0.003
Observations	721	339	670

Notes: This table shows estimates of panel regressions with different dependent variables. The outcome variable for the first three columns is the share of bank debt of the nontradable business sector relative to total business debt as measured by Müller and Verner (2023). The outcome variable in columns (2) and (3) is the change in this share between $t-3$ and t. Column (2) measures business credit using BIS data, which include both loans and bonds. Column (3) measures business credit using business loans from Müller and Verner (2023). All regressions control for country fixed effects. The sample in column (1) and (3) covers annual data from an unbalanced panel of 64 countries over the period 2003 to 2014. The sample in column (2) covers 34 countries over the period 2003 to 2014. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA15 – Change in Log Real GDP after Business Credit Expansions and Contractions

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.014	0.033	0.397***	0.606**	0.706***
	(0.054)	(0.076)	(0.109)	(0.202)	(0.227)
$\Delta^+ \times \Delta_5$ Business credit/GDP $\times$ Bankruptcy efficiency	0.223**	0.450***	0.194	-0.058	-0.178
	(0.076)	(0.139)	(0.154)	(0.213)	(0.217)
Δ_5 Business credit/GDP	-0.015	0.021	-0.261***	-0.428**	-0.500**
	(0.034)	(0.050)	(0.083)	(0.141)	(0.185)
$\Delta^+ \times \Delta_5$ Business credit/GDP	-0.211***	-0.488***	-0.291**	-0.088	0.035
	(0.061)	(0.132)	(0.131)	(0.156)	(0.166)
$\Delta^+ \times$ Bankruptcy efficiency	-0.286	0.206	0.144	0.589	-0.322
	(0.509)	(0.997)	(1.106)	(1.003)	(1.671)
Bankruptcy efficiency	-2.273***	-3.634*	-1.246	0.014	0.786
	(0.761)	(1.912)	(3.013)	(4.447)	(4.847)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.20	0.21	0.23	0.25	0.29
Observations	560	522	484	446	408

Notes: This table shows results from state-dependent local projections with sign dependence following Ben Zeev, Ramey, and Zubairy (2023): $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \Delta^+ \left[\beta^+_{1,h}\Delta_5 c_{i,t} + \beta^+_{2,h}(\Delta_5 c_{i,t} \times B_{i,t})\, \beta^+_{3,h} B_{i,t} + \boldsymbol{\gamma}^+_h \boldsymbol{x}_{i,t}\right] + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The indicator variable Δ^+ takes value 1 if $\Delta_5 c_{i,t} > 0$, i.e., marking a credit boom. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

IA2 Proofs and Theoretical Extensions

IA2.1 Proof of Proposition 1

The firm's optimally chosen face value of debt $b^*(\beta, \beta_f, \xi)$ in (4) subject to (5) and (6) satisfies the first-order condition:[22]

$$\left.\frac{\partial\left(q_b(b,\beta,\xi)\cdot b\right)}{\partial b}\right|_{b=b^*\left(\beta,\beta_f,\xi\right)} = \beta_f \int_{b^*\left(\beta,\beta_f,\xi\right)}^{\bar{z}_j} \phi\left(z_j\right) dz_j = \beta_f\left(1-\Phi\left(b^*\left(\beta,\beta_f,\xi\right)\right)\right). \tag{IA1}$$

From (7) for the price schedule $q_b(b,\beta,\xi)$, we know that, for $b \in (\underline{z}, \bar{z})$,

$$q_b(b,\beta,\xi)\cdot b = \beta\left(b\left(1-\Phi(b)\right) + (1-\xi)\Phi(b)z^{\text{liq}} + \xi\int_{\underline{z}}^{b} z_j\phi(z_j)dz_j\right), \tag{IA2}$$

and

$$\frac{\partial(q_b(b,\beta,\xi)\cdot b)}{\partial b} = \beta\left(1-\Phi(b)-(1-\xi)\left(b-z^{\text{liq}}\right)\phi(b)\right). \tag{IA3}$$

Together, the optimal face value of debt $b^*(\beta,\beta_f,\xi)$ satisfies:

$$\beta\left(1-\Phi(b^*(\beta,\beta_f,\xi))-(1-\xi)\left(b^*(\beta,\beta_f,\xi)-z^{\text{liq}}\right)\phi(b^*(\beta,\beta_f,\xi))\right) = \beta_f\left(1-\Phi(b^*(\beta,\beta_f,\xi))\right). \tag{IA4}$$

Note that z_j is drawn from a uniform distribution with a measure 1 support $[\underline{z}, \bar{z}]$ and $z^{\text{liq}} = \underline{z}$, then (IA4) becomes:

$$\beta_f(\bar{z}-b^*(\beta,\beta_f,\xi)) = \beta(\bar{z}-b^*(\beta,\beta_f,\xi)-(1-\xi)(b^*(\beta,\beta_f,\xi)-\underline{z})),$$

which means that:

$$b^*(\beta,\beta_f,\xi) = \bar{z} - \frac{1-\xi}{2-\xi-\frac{\beta_f}{\beta}} = \underline{z} + \frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}. \tag{IA5}$$

Because $\xi \in (0,1)$ and $\beta_f < \beta$, we know that $0 < \frac{1-\xi}{2-\xi-\frac{\beta_f}{\beta}} < 1$, which means that $b^*(\beta,\beta_f,\xi) \in (\underline{z}, \bar{z})$. This means that the optimal face value of debt is interior to the interval $(\underline{z}, \bar{z})$, and there is a positive measure of firms both going bankrupt and not going bankrupt in the second period.

We still have to verify that the firm is willing to invest ($V_f > 0$):

$$V_f > 0 \iff \beta_f\mathbb{E}[\text{div}_2] + \beta\mathbb{E}\left[\mathbb{I}_{\{b^*(\beta,\beta_f,\xi)\le z_j\}}\cdot b^*(\beta,\beta_f,\xi) + \mathbb{I}_{\{b^*(\beta,\beta_f,\xi)>z_j\}}\cdot\left((1-\xi)z^{\text{liq}}+\xi z_j\right)\right] \ge I, \tag{IA6}$$

[22](IA1) uses the fact that the optimal face value of debt $b^*\left(\beta,\beta_f,\xi\right) \in \left(\underline{z}, \bar{z}\right)$, which we verify below.

where we replace div_1 using (5) and replace $q_b(b, \beta, \xi)$ using (7). (IA6) is equivalent to:

$$\beta_f \int_{b^*}^{\bar{z}} (z_j - b^*)\phi(z_j)dz_j + \beta \left(b^*(1 - \Phi(b^*)) + (1-\xi)\Phi(b^*)z^{\text{liq}} + \xi \int_{\underline{z}}^{b^*} z_j \phi(z_j) dz_j \right) > I,$$

$$\iff \frac{\beta_f}{2}(\bar{z} - b^*)^2 + \beta \left(b^*(\bar{z} - b^*) + (1-\xi)(b^* - \underline{z})\underline{z} + \frac{\xi}{2}\left((b^*)^2 - (\underline{z})^2\right) \right) > I,$$

$$\iff \frac{\beta_f}{2}\left(\frac{1-\xi}{2 - \xi - \frac{\beta_f}{\beta}} \right)^2 + \beta \left(\left(1 - \frac{\xi}{2}\right) \frac{1 - \frac{\beta_f}{\beta}}{2 - \xi - \frac{\beta_f}{\beta}} \frac{1-\xi}{2 - \xi - \frac{\beta_f}{\beta}} + \frac{\xi}{2} \frac{1 - \frac{\beta_f}{\beta}}{2 - \xi - \frac{\beta_f}{\beta}} + \underline{z} \right) > I,$$

$$\iff \frac{\beta}{2} \left(\frac{1 - \xi\frac{\beta_f}{\beta}}{2 - \xi - \frac{\beta_f}{\beta}} \right) + \beta\underline{z} > I,$$

where we condense the notation of $b^*(\beta, \beta_f, \xi)$ to b^* for simplicity. Hence by Assumption 1, the firm is willing to invest.

For the first part of Proposition 1, we take the derivative of $b^*(\beta, \beta_f, \xi)$ in (IA5) with respect to ξ:

$$\frac{\partial b^*(\beta, \beta_f, \xi)}{\partial \xi} = \frac{1 - \frac{\beta_f}{\beta}}{\left(2 - \xi - \frac{\beta_f}{\beta}\right)^2} > 0,$$

where we use the fact that $\beta_f < \beta$.

For the second part, using the formula for output in (8) and the fact z_j that is drawn from a uniform distribution with a measure 1 support $[\underline{z}, \bar{z}]$, we know that, for $b \in (\underline{z}, \bar{z})$,

$$Y(b, \xi) = \underline{z} + \frac{1}{2} - \frac{1-\xi}{2}(b - \underline{z})^2.$$

Together with (10), the impact of the credit boom in the first period on aggregate output in the second period is given by:

$$\varepsilon(\beta, \beta_f, \xi) = \frac{\partial Y(b^*(\beta, \beta_f, \xi), \xi)}{\partial b} = -(1-\xi)\left(\frac{1 - \frac{\beta_f}{\beta}}{2 - \xi - \frac{\beta_f}{\beta}} \right) < 0.$$

Finally, note that

$$\frac{\partial \varepsilon(\beta, \beta_f, \xi)}{\partial \xi} = \frac{\left(1 - \frac{\beta_f}{\beta}\right)\left(2 - \xi - \frac{\beta_f}{\beta}\right) - (1-\xi)\left(1 - \frac{\beta_f}{\beta}\right)}{\left(2 - \xi - \frac{\beta_f}{\beta}\right)^2} = \left[\frac{1 - \frac{\beta_f}{\beta}}{2 - \xi - \frac{\beta_f}{\beta}} \right]^2 > 0.$$

IA2.2 The Impact of Credit Booms Driven By Creditors' Beliefs

Here, we show that the results in Proposition 1 are robust to credit booms driven by creditors' beliefs. That is, higher bankruptcy efficiency still dampens the negative impact of credit booms when the booms are driven by shocks to creditors' beliefs (rather than by shocks to the discount rate), as modeled in Dávila and Walther (2023). Specifically, consider the environment in Section 5, but creditors' and firms' discount rates are fixed at a value $\beta > \beta_f$. Firms still have rational expectations, believing that z_j is drawn from the uniform distribution $[\underline{z}, \bar{z}]$. Creditors instead have irrational expectations, believing that z_j is drawn from the uniform distribution $[\underline{z} + \Delta, \bar{z} + \Delta]$, where Δ captures shocks to creditors' beliefs. For example, when $\Delta > 0$, creditors are overly optimistic about the potential cash flows from firms' investment opportunities, leading to a belief-driven increase in credit supply. We will keep $z^{\text{liq}} = \underline{z}$, and both firms and creditors believe so.

In this case, the price schedule $q_b(b, \xi, \Delta)$ is given by a variant of (7), where rational expectations are replaced with creditors' subjective expectations. That is, (IA2) becomes as follows. For $b \in (\underline{z} + \Delta, \bar{z} + \Delta)$,

$$q_b(b, \xi, \Delta) \cdot b = \beta \left(b\left(1 - \Phi(b - \Delta)\right) + (1 - \xi)\Phi(b - \Delta)z^{\text{liq}} + \xi \int_{\underline{z}}^{(b-\Delta)} (z_j + \Delta)\phi(z_j)dz_j \right), \quad \text{(IA7)}$$

where β is eliminated as an argument because it is fixed (similarly, we drop β_f as an argument below). Each firm optimally chooses the face value of debt $b^*(\Delta, \xi)$ in (4) subject to (5) and (6) and the price schedule $q_b(b, \xi, \Delta)$ here.

Here, credit booms are driven by shocks to creditors' belief Δ. A one-unit increase in total business credit results from a $1/\frac{\partial b^*(\Delta,\xi)}{\partial \Delta}$ increase in unit increase in Δ. The impact of a one unit increase in total business credit on subsequent macroeconomic outcomes (e.g., aggregate output/GDP $Y^*(\Delta, \xi) \equiv Y(b^*(\Delta, \xi), \xi)$), is then given by:

$$\varepsilon(\Delta, \xi) = \frac{\frac{\partial Y^*(\Delta,\xi)}{\partial \Delta}}{\frac{\partial b^*(\Delta,\xi)}{\partial \Delta}} = \frac{\partial Y(b^*(\Delta, \xi), \xi)}{\partial b}, \quad \text{(IA8)}$$

Now, we show that Proposition 1 is robust to credit booms driven by creditors' beliefs.

Proposition IA1. *Consider credit booms driven by creditors' beliefs. Under Assumption 1, there exists a $\bar{\Delta} > 0$ such that, for all $|\Delta| < \bar{\Delta}$,*

1. A more efficient bankruptcy system (a higher ξ) is associated with a larger credit market: $\frac{\partial b^*(\Delta,\xi)}{\partial \xi} > 0$.

2. The impact of credit booms on macroeconomic outcomes is negative: $\varepsilon(\Delta, \xi) < 0$. Furthermore, a more efficient bankruptcy system (a higher ξ) dampens the negative impact of credit booms on macroeconomic outcomes: $\frac{\partial \varepsilon(\Delta,\xi)}{\partial \xi} > 0$.

Proof of Proposition IA1

The firm's optimally chosen face value of debt $b^*(\Delta, \xi)$ in (4) subject to (5) and (6) satisfies the first-order condition:[23]

$$\left.\frac{\partial(q_b(b,\xi,\Delta)\cdot b)}{\partial b}\right|_{b=b^*(\Delta,\xi)} = \beta_f \int_{b^*(\Delta,\xi)}^{\bar{z}_j} \phi(z_j)dz_j = \beta_f\left(1-\Phi(b^*(\Delta,\xi))\right).$$

From the price schedule (IA7), we know that, for $b \in (\underline{z}+\Delta, \bar{z}+\Delta)$,

$$\frac{\partial(q_b(b,\xi,\Delta)\cdot b)}{\partial b} = \beta\left(1-\Phi(b-\Delta)-(1-\xi)\left(b-z^{\text{liq}}\right)\phi(b-\Delta)\right).$$

Combining everything and using the fact that $\Phi(\cdot)$ and $\phi(\cdot)$ are based on a uniform distribution with support $[\underline{z}, \bar{z}]$ and that $z^{\text{liq}} = \underline{z}$, the optimal face value of debt $b^*(\Delta, \xi)$ solves:[24]

$$\beta_f(\bar{z}-b^*(\Delta,\xi)) = \beta(\bar{z}+\Delta-b^*(\Delta,\xi)-(1-\xi)(b^*(\Delta,\xi)-\underline{z})),$$

which means that

$$b^*(\Delta,\xi) = \bar{z} - \frac{1-\xi-\Delta}{2-\xi-\frac{\beta_f}{\beta}} = \underline{z} + \frac{1-\frac{\beta_f}{\beta}+\Delta}{2-\xi-\frac{\beta_f}{\beta}}$$

is continuous in Δ and ξ. The condition such that the firm is willing to invest becomes:

$$\begin{aligned}
&\frac{\beta_f}{2}(\bar{z}-b^*)^2+\beta\left(b^*(\bar{z}-b^*)+(1-\xi)(b^*-\underline{z})\underline{z}+\frac{\xi}{2}\left((b^*)^2-(\underline{z})^2\right)\right)\geq I,\\
\iff\ &\frac{\beta_f}{2}\left(\frac{1-\xi-\Delta}{2-\xi-\frac{\beta_f}{\beta}}\right)^2+\beta\left(\left(1-\frac{\xi}{2}\right)\frac{1-\frac{\beta_f}{\beta}+\Delta}{2-\xi-\frac{\beta_f}{\beta}}\frac{1-\xi-\Delta}{2-\xi-\frac{\beta_f}{\beta}}+\frac{\xi}{2}\frac{1-\frac{\beta_f}{\beta}+\Delta}{2-\xi-\frac{\beta_f}{\beta}}+\underline{z}\right)\geq I,\\
\iff\ &\frac{\beta}{2}\frac{1}{2-\xi-\frac{\beta_f}{\beta}}\left((1-\xi-\Delta)(1+\Delta)+\xi\left(1-\frac{\beta_f}{\beta}+\Delta\right)\right)+\beta\underline{z}\geq I,\\
\iff\ &\frac{\beta}{2}\left(\frac{1-\xi\frac{\beta_f}{\beta}-\Delta^2}{2-\xi-\frac{\beta_f}{\beta}}\right)+\beta\underline{z}\geq I,
\end{aligned}\qquad \text{(IA9)}$$

where we condense the notation of $b^*(\Delta, \xi)$ to b^* for simplicity. If $\Delta = 0$, the condition becomes the restriction (IA6) in the proof of Proposition 1. That is, under Assumption 1, (IA9) holds with a strict inequality when $\Delta = 0$. Further note that from the left hand side of the above condition and $b^*(\Delta, \xi)$ being continuous in Δ, we know there exists a $\bar{\Delta} \in (0, 1-\frac{\beta_f}{\beta})$ such that for all $|\Delta| < \bar{\Delta}$, (IA9) holds under Assumption 1 and $b^*(\Delta, \xi) \in (\underline{z}, \bar{z}) \cap (\underline{z}+\Delta, \bar{z}+\Delta)$.

[23] Here we use the fact that the optimal face value of debt $b^*(\Delta, \xi) \in (\underline{z}, \bar{z})$, which is true because $b^*(0, \xi) \in (\underline{z}, \bar{z})$ as in Proposition 1, b^* is continuous in Δ as shown below, and we pick $\bar{\Delta} > 0$ small enough.

[24] Here we use the fact that the optimal face value of debt $b^*(\Delta, \xi) \in (\underline{z}+\Delta, \bar{z}+\Delta)$, which is true because $b^*(0, \xi) \in (\underline{z}, \bar{z})$ as in Proposition 1, b^* is continuous in Δ as shown below, and we pick $\bar{\Delta} > 0$ small enough.

For the first result of Proposition IA1, take the derivative of $b^*(\Delta, \xi)$ with respect to ξ:

$$\frac{\partial b^*(\Delta, \xi)}{\partial \xi} = \frac{1 - \frac{\beta_f}{\beta} + \Delta}{\left(2 - \xi - \frac{\beta_f}{\beta}\right)^2} > 0,$$

where we used the fact that $|\Delta| < \bar{\Delta} < 1 - \frac{\beta_f}{\beta}$. For the second part, using the formula for output in (8) and the fact that z_j is drawn from a uniform distribution with a measure 1 support $[\underline{z}, \bar{z}]$, we know that, for $b \in (\underline{z}, \bar{z})$,

$$Y(b, \xi) = \underline{z} + \frac{1}{2} - \frac{1 - \xi}{2} (b - \underline{z})^2 .$$

Together with (IA8), the impact of credit boom in the first period on aggregate output in the second period is given by:

$$\varepsilon(\Delta, \xi) = \frac{\partial Y\left(b^*\left(\Delta, \xi\right), \xi\right)}{\partial b} = -(1 - \xi) \left(\frac{1 - \frac{\beta_f}{\beta} + \Delta}{2 - \xi - \frac{\beta_f}{\beta}}\right) < 0.$$

Finally, note that

$$\frac{\partial \varepsilon(\Delta, \xi)}{\partial \xi} = \left(1 - \frac{\beta_f}{\beta} + \Delta\right) \frac{1 - \frac{\beta_f}{\beta}}{\left(2 - \xi - \frac{\beta_f}{\beta}\right)^2} > 0,$$

where we again used the fact that $|\Delta| < \bar{\Delta} < 1 - \frac{\beta_f}{\beta}$.

IA2.3 The Impact of Credit Booms Driven by Firms' Beliefs

Here, we show that the results in Proposition 1 are robust to credit booms driven by firms' beliefs. That is, higher bankruptcy efficiency still dampens the negative impact of credit booms when the booms are driven by shocks to firms' beliefs (rather than by shocks to the discount rate). Specifically, consider the environment in Section 5, but creditors and firms' discount rates are fixed at a value $\beta > \beta_f$. Creditors still have rational expectations, believing that z_j is drawn from the uniform distribution $[\underline{z}, \bar{z}]$. Firms instead have biased expectations, believing that z_j is drawn from the uniform distribution $[\underline{z} + \Delta, \bar{z} + \Delta]$, where Δ captures shocks to firms' beliefs. For example, when $\Delta > 0$, firms are overly optimistic about the potential cash flows from their investment opportunities, leading to a belief-driven increase in credit demand. We will keep $z^{\text{liq}} = \underline{z}$, and both firms and creditors believe so.

In this case, the price schedule $q_b(b, \xi)$ is still determined by (7), where β is eliminated as an argument because it is fixed (similarly, we drop β_f as an argument below). Each firm optimally chooses the face value of debt $b^*(\Delta, \xi)$ in (4) subject to (5) and (6) and the price schedule $q_b(b, \xi)$, with rational expectations replaced with firms' subjective expectations.

Here, credit booms are driven by shocks to firms' beliefs Δ. A one-unit increase in total business credit results from a $1/\frac{\partial b^*(\Delta,\xi)}{\partial \Delta}$ increase in Δ. The impact of a one unit increase in total business credit on subsequent macroeconomic outcomes (e.g., aggregate output/GDP $Y^*\left(\Delta, \xi\right) \equiv Y\left(b^*\left(\Delta, \xi\right), \xi\right)$), is then given by:

$$\varepsilon(\Delta,\xi)=\frac{\frac{\partial Y^*(\Delta,\xi)}{\partial\Delta}}{\frac{\partial b^*(\Delta,\xi)}{\partial\Delta}}=\frac{\partial Y\left(b^*\left(\Delta,\xi\right),\xi\right)}{\partial b}, \tag{IA10}$$

Now, we show that Proposition 1 is robust to credit booms driven by firms' beliefs.

Proposition IA2. *Consider credit booms driven by firms' beliefs. Under Assumption 1, there exists a* $\bar{\Delta}>0$ *such that, for all* $|\Delta|<\bar{\Delta}$*,*

1. A more efficient bankruptcy system (a higher ξ*) is associated with a larger credit market:* $\frac{\partial b^*(\Delta,\xi)}{\partial\xi}>0$.

2. The impact of credit boom on macroeconomic outcomes is negative: $\varepsilon(\Delta,\xi)<0$*. Furthermore, a more efficient bankruptcy system (a higher* ξ*) dampens the negative impact of a credit boom on macroeconomic outcomes:* $\frac{\partial\varepsilon(\Delta,\xi)}{\partial\xi}>0$.

Proof of Proposition IA2

The firm's optimally chosen face value of debt $b^*(\Delta,\xi)$ in (4) subject to (5) and (6) satisfies the First-order Condition:[25]

$$\left.\frac{\partial(q_b(b,\xi,\Delta)\cdot b)}{\partial b}\right|_{b=b^*(\Delta,\xi)}=\beta_f\int_{(b^*(\Delta,\xi)-\Delta)}^{\bar{z}_j}\phi(z_j)dz_j=\beta_f\left(1-\Phi(b^*(\Delta,\xi)-\Delta)\right).$$

From the price schedule (IA2), we know that, for $b\in(\underline{z},\bar{z})$,

$$\frac{\partial(q_b(b,\beta,\xi)\cdot b)}{\partial b}=\beta\left(1-\Phi(b)-(1-\xi)\left(b-z^{\text{liq}}\right)\phi(b)\right).$$

Combining everything and using the fact that $\Phi(\cdot)$ and $\phi(\cdot)$ are based on a uniform distribution with support $[\underline{z},\bar{z}]$ and that $z^{\text{liq}}=\underline{z}$, the optimal face value of debt $b^*(\Delta,\xi)$ solves:[26]

$$\beta_f(\bar{z}+\Delta-b^*(\Delta,\xi))=\beta(\bar{z}-b^*(\Delta,\xi)-(1-\xi)(b^*(\Delta,\xi)-\underline{z})),$$

which means that

$$b^*(\Delta,\xi)=\bar{z}-\frac{1-\xi+\frac{\beta_f}{\beta}\Delta}{2-\xi-\frac{\beta_f}{\beta}}=\underline{z}+\frac{1-\frac{\beta_f}{\beta}(1+\Delta)}{2-\xi-\frac{\beta_f}{\beta}}.$$

[25] Here we use the fact that the optimal face of debt $b^*\left(\Delta,\xi\right)\in\left(\underline{z}+\Delta,\bar{z}+\Delta\right)$, which is true because $b^*\left(0,\xi\right)\in\left(\underline{z},\bar{z}\right)$ as in Proposition 1, b^* is continuous in Δ as shown below, and we pick $\bar{\Delta}>0$ small enough.

[26] Here we use the fact that the optimal face of debt $b^*\left(\Delta,\xi\right)\in\left(\underline{z},\bar{z}\right)$, which is true because $b^*\left(0,\xi\right)\in\left(\underline{z},\bar{z}\right)$ as in Proposition 1, b^* is continuous in Δ as shown below, and we pick $\bar{\Delta}>0$ small enough.

continuous in Δ and ξ. The condition such that the firm is willing to invest becomes:

$$\beta_f \int_{b^*}^{\bar{z}+\Delta} (z_j - b^*)\phi(z_j)dz_j + \beta \left(b^*(1-\Phi_f(b^*)) + (1-\xi)\Phi_f(b^*)z^{\text{liq}} + \xi \int_{\underline{z}+\Delta}^{b^*} z_j\phi(z_j)dz_j \right) \geq I,$$

$$\iff \frac{\beta_f}{2}(\bar{z}+\Delta-b^*)^2 + \beta\left(b^*(\bar{z}+\Delta-b^*) + (1-\xi)(b^*-\underline{z}-\Delta)\underline{z}\right) + \beta\left(\frac{\xi}{2}\left((b^*)^2 - (\underline{z}+\Delta)^2\right)\right) \geq I,$$

where we condense the notation of $b^*(\delta,\xi)$ to b^* for simplicity. This condition reduces to:

$$\iff \frac{\beta_f}{2}\left(\frac{\Delta(2-\xi)+1-\xi}{2-\xi-\frac{\beta_f}{\beta}}\right)^2 + \beta\left(\frac{(\Delta(2-\xi)+1-\xi)\left(1-\frac{\beta_f}{\beta}(1+\Delta)\right)}{\left(2-\xi-\frac{\beta_f}{\beta}\right)^2}\right)$$
$$+\beta\frac{\xi}{2}\left(\frac{1-\frac{\beta_f}{\beta}(1+\Delta)}{2-\xi-\frac{\beta_f}{\beta}}\right)^2 + \beta\left(-\frac{\xi}{2}\Delta^2+\underline{z}\right) \geq I. \quad \text{(IA11)}$$

If $\Delta = 0$, the condition becomes the restriction (IA6) in the proof of Proposition 1. That is, under Assumption 1, (IA11) holds with a strict inequality when $\Delta = 0$. Further note that the LHS of the above condition and $b^*(\Delta,\xi)$ is continuous in Δ, we know there exists a $\bar{\Delta} \in (0, \frac{\beta}{\beta_f}-1)$ such that for all $|\Delta| < \bar{\Delta}$, (IA11) holds under Assumption 1 and $b^*(\Delta,\xi) \in (\underline{z},\bar{z}) \cap (\underline{z}+\Delta, \bar{z}+\Delta)$.

For the first result of Proposition IA2, take the derivative of $b^*(\Delta,\xi)$ with respect to ξ:

$$\frac{\partial b^*(\Delta,\xi)}{\partial \xi} = \frac{1-\frac{\beta_f}{\beta}(1+\Delta)}{(2-\xi-\frac{\beta_f}{\beta})^2} > 0.$$

where we used the fact that $|\Delta| < \bar{\Delta} < \frac{\beta}{\beta_f} - 1$.

For the second part, using the formula for output (8) and the fact z_j is drawn from a uniform distribution with a measure 1 support $[\underline{z},\bar{z}]$, we know that, for $b \in (\underline{z},\bar{z})$,

$$Y(b,\xi) = \underline{z} + \frac{1}{2} - \frac{1-\xi}{2}(b-\underline{z})^2.$$

Together with (IA10), the impact of credit boom in the first period on aggregate output in the second period is given by:

$$\varepsilon(\Delta,\xi) = \frac{\partial Y(b^*(\Delta,\xi),\xi)}{\partial b} = -(1-\xi)\frac{(1-\frac{\beta_f}{\beta}(1+\Delta))}{2-\xi-\frac{\beta_f}{\beta}} < 0.$$

We can then prove the second part of Proposition IA2:

$$\frac{\partial \varepsilon(\Delta,\xi)}{\partial \xi} = \left(1-\frac{\beta_f}{\beta}(1+\Delta)\right)\frac{(1-\frac{\beta_f}{\beta})}{\left(2-\xi-\frac{\beta_f}{\beta}\right)^2} > 0.$$

where we again used the fact that $|\Delta| < \bar{\Delta} < \frac{\beta}{\beta_f} - 1$.

IA2.4 The Impact of Credit Booms Driven by Fundamentals

Here, we show that the second part of Proposition 1 can be different if we consider credit booms driven by rational expectations of firms' fundamentals. In particular, we consider credit booms driven by an increase in firms' productivity. The impact of such a fundamental-driven credit boom on macroeconomic outcomes (e.g., aggregate output) is now positive. However, we find opposite predictions of the impact of bankruptcy efficiency. A more efficient bankruptcy system now dampens the positive impact of a credit boom on macroeconomic outcomes.

Formally, each firm j's risky cash flow z_j is now drawn i.i.d. from the uniform distribution $[\underline{z}+\Delta, \bar{z}+\Delta]$, where Δ captures shocks to firms' future productivity. Both creditors and firms have rational expectations. Their discount rates are fixed at a value $\beta > \beta_f$. We will keep $z^{\text{liq}} = \underline{z}$.

In this case, the price schedule $q_b(b, \xi, \Delta)$ given by (IA2) becomes as follows. For $b \in (\underline{z} + \Delta, \bar{z} + \Delta)$,

$$q_b(b, \xi, \Delta) \cdot b = \beta \left(b \left(1 - \Phi(b - \Delta)\right) + (1 - \xi)\Phi(b - \Delta) z^{\text{liq}} + \xi \int_{\underline{z}}^{(b-\Delta)} (z_j + \Delta)\phi(z_j) dz_j \right), \quad \text{(IA12)}$$

where β is eliminated as an argument because it is fixed (similarly, we drop β_f as an argument below).

Each firm optimally chooses face value of debt $b^*(\Delta, \xi)$ in (4) subject to (5) and (6) and the price schedule $q_b(b, \xi, \Delta)$ here. Different from previous cases, aggregate output now directly depends on the productivity shock Δ, because it shifts the true distribution of z_j. That is, for $b \in [\underline{z} + \Delta, \bar{z} + \Delta]$, (8) becomes

$$Y(\Delta, b, \xi) = \int_{\underline{z}}^{\bar{z}} (z_j + \Delta)\, \phi(z_j)\, dz_j - \underbrace{(1 - \xi) \int_{\underline{z}}^{(b-\Delta)} \left(z_j + \Delta - z^{\text{liq}}\right) \phi(z_j)\, dz_j}_{\text{output loss from inefficient liquidation}}. \quad \text{(IA13)}$$

Define aggregate output/GDP $Y^*(\Delta, \xi) \equiv Y(\Delta, b^*(\Delta, \xi), \xi)$ based on the optimally chosen face value of debt $b^*(\Delta, \xi)$. We can see that the impact of productivity shock Δ on aggregate output is given by

$$\frac{\partial Y^*(\Delta, \xi)}{\partial \Delta} = \underbrace{\frac{\partial Y(\Delta, b^*(\Delta, \xi), \xi)}{\partial \Delta}}_{\text{direct productivity effect}} + \underbrace{\frac{\partial Y(\Delta, b^*(\Delta, \xi), \xi)}{\partial b} \cdot \frac{\partial b^*(\Delta, \xi)}{\partial \Delta}}_{\text{effect through credit changes}}.$$

Here, credit booms are driven by fundamental shocks to firms' productivity Δ. A one unit increase in total business credit, $b^*(\Delta, \xi)$, results from a $1/\frac{\partial b^*(\Delta,\xi)}{\partial \Delta}$ unit increase in Δ. The impact of a one unit increase in total business credit on subsequent macroeconomic outcomes is then given by:

$$\varepsilon(\Delta,\xi)=\frac{\frac{\partial Y^*(\Delta,\xi)}{\partial\Delta}}{\frac{\partial b^*(\Delta,\xi)}{\partial\Delta}}=\underbrace{\frac{\partial Y(\Delta,b^*(\Delta,\xi),\xi)}{\partial\Delta}\cdot\left(\frac{\partial b^*(\Delta,\xi)}{\partial\Delta}\right)^{-1}}_{\text{direct productivity effect, }>0}+\underbrace{\frac{\partial Y(\Delta,b^*(\Delta,\xi),\xi)}{\partial b}}_{\text{effect through credit changes, }<0}, \tag{IA14}$$

In fact, as proved below, the net impact of fundamental-driven credit boom $\varepsilon(\Delta,\xi)>0$ is positive, as the direct productivity effect dominates. In this case, Proposition 1 is overturned, as a more efficient bankruptcy system now dampens the positive impact of a credit boom on macroeconomic outcomes.

Proposition IA3. *Consider credit booms driven by fundamentals. Under Assumption 1, there exists a $\bar{\Delta}>0$ such that, for all $|\Delta|<\bar{\Delta}$,*

1. A more efficient bankruptcy system (a higher ξ) is associated with a larger credit market: $\frac{\partial b^*(\Delta,\xi)}{\partial\xi}>0$.

2. The impact of a fundamental credit boom on macroeconomic outcomes is now positive: $\varepsilon(\Delta,\xi)>0$. Furthermore, a more efficient bankruptcy system (a higher ξ) dampens the positive impact of a credit boom on macroeconomic outcomes: $\frac{\partial\varepsilon(\Delta,\xi)}{\partial\xi}<0$.

Proof of Proposition IA3

The firm's optimally chosen face value of debt $b^*(\Delta,\xi)$ in (4) subject to (5) and (6) satisfies the first-order condition:[27]

$$\left.\frac{\partial(q_b(b,\xi,\Delta)\cdot b)}{\partial b}\right|_{b=b^*(\Delta,\xi)}=\beta_f\int_{(b^*(\Delta,\xi)-\Delta)}^{\bar{z}_j}\phi(z_j)dz_j=\beta_f\left(1-\Phi(b^*(\Delta,\xi)-\Delta)\right). \tag{IA15}$$

From the price schedule (IA12), we know that, for $b\in(\underline{z}+\Delta,\bar{z}+\Delta)$,

$$\frac{\partial(q_b(b,\xi,\Delta)\cdot b)}{\partial b}=\beta\left(1-\Phi(b-\Delta)-(1-\xi)\left(b-z^{\text{liq}}\right)\phi(b-\Delta)\right).$$

Combining everything and using that z_j is drawn from a uniform distribution with support $[\underline{z}+\Delta,\bar{z}+\Delta]$ and that $z^{\text{liq}}=\underline{z}$, the optimal face value of debt $b^*(\Delta,\xi)$ solves:[28]

$$\beta_f(\bar{z}+\Delta-b^*(\Delta,\xi))=\beta(\bar{z}+\Delta-b^*(\Delta,\xi)-(1-\xi)(b^*(\Delta,\xi)-\underline{z})),$$

[27](IA15) uses the fact that the optimal face value of debt $b^*(\Delta,\xi)\in(\underline{z}+\Delta,\bar{z}+\Delta)$, which is true because $b^*(0,\xi)\in(\underline{z},\bar{z})$ as in Proposition 1, b^* is continuous in Δ as shown below, and we pick $\bar{\Delta}>0$ small enough.

[28]Here we use the fact that the optimal face value of debt $b^*(\Delta,\xi)\in(\underline{z}+\Delta,\bar{z}+\Delta)$, which is true because $b^*(0,\xi)\in(\underline{z},\bar{z})$ as in Proposition 1, b^* is continuous in Δ as shown below, and we pick $\bar{\Delta}>0$ small enough.

which means that

$$b^*(\Delta,\xi) = \bar{z} - \frac{1-\xi-\Delta\left(1-\frac{\beta_f}{\beta}\right)}{2-\xi-\frac{\beta_f}{\beta}} = \underline{z} + \frac{(1-\frac{\beta_f}{\beta})(1+\Delta)}{2-\xi-\frac{\beta_f}{\beta}} \tag{IA16}$$

is continuous in Δ and ξ. The condition such that the firm is willing to invest reduces to:

$$\frac{\beta}{2}\left(\frac{(1+\Delta)(1-\frac{\beta_f}{\beta}\xi+(1-\xi)^2\Delta)}{2-\xi-\frac{\beta_f}{\beta}}\right) + \beta\left(\frac{\xi}{2}\Delta+\underline{z}\right) \geq I. \tag{IA17}$$

If $\Delta = 0$, the condition becomes the restriction (IA6) in the proof of Proposition 1. That is, under Assumption 1, (IA17) holds with a strict inequality when $\Delta = 0$. Further note that from the left hand side of the above condition and $b^*(\Delta,\xi)$ being continuous in Δ, we know there exists a $\bar{\Delta}_1 \in (0,1)$ such that for all $|\Delta| < \bar{\Delta}_1$, (IA17) holds under Assumption 1 and $b^*(\Delta,\xi) \in (\underline{z}+\Delta, \bar{z}+\Delta)$.

For the first part of Proposition IA3, we take the derivative of $b^*(\Delta,\xi)$ in (IA16) with respect to ξ:

$$\frac{\partial b^*(\Delta,\xi)}{\partial \xi} = \frac{\left(1-\frac{\beta_f}{\beta}\right)(1+\Delta)}{\left(2-\xi-\frac{\beta_f}{\beta}\right)^2} > 0,$$

where we used the fact that $|\Delta| < \bar{\Delta}_1 < 1$.

For the second part, by using the output formula in (IA13) and the fact z_j that is drawn from a uniform distribution with a measure 1 support $[\underline{z}+\Delta, \bar{z}+\Delta]$, we know that, for $b \in (\underline{z}+\Delta, \bar{z}+\Delta)$,

$$Y(\Delta,b,\xi) = \underline{z} + \frac{1}{2} + \Delta + \frac{(1-\xi)}{2}\Delta^2 - \frac{1-\xi}{2}(b-\underline{z})^2.$$

To apply (IA14), we note that

$$\frac{\partial b^*(\Delta,\xi)}{\partial \Delta} = \frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}} > 0,$$

$$\frac{\partial Y(\Delta,b^*(\Delta,\xi),\xi)}{\partial b} = -(1-\xi)\left[\frac{(1-\frac{\beta_f}{\beta})(1+\Delta)}{2-\xi-\frac{\beta_f}{\beta}}\right] < 0,$$

$$\frac{\partial Y(\Delta,b^*(\Delta,\xi),\xi)}{\partial \Delta} = 1+(1-\xi)\Delta > 0,$$

where we used the fact that $|\Delta| < \bar{\Delta}_1 < 1$. As a result,

$$\varepsilon(\Delta,\xi) = \underbrace{\frac{\left(2-\xi-\frac{\beta_f}{\beta}\right)}{1-\frac{\beta_f}{\beta}} - (1-\xi)\frac{\left(1-\frac{\beta_f}{\beta}\right)}{2-\xi-\frac{\beta_f}{\beta}}}_{a_1} + \underbrace{\Delta\left[\frac{(1-\xi)\left(2-\xi-\frac{\beta_f}{\beta}\right)}{1-\frac{\beta_f}{\beta}} - (1-\xi)\frac{\left(1-\frac{\beta_f}{\beta}\right)}{2-\xi-\frac{\beta_f}{\beta}}\right]}_{a_2},$$

where $\varepsilon(\Delta, \xi)$ is a linear function on Δ. We now show that the intercept a_1 is positive:

$$
\begin{aligned}
a_1 > 0 \iff & \left(2-\xi-\frac{\beta_f}{\beta}\right)^2 > (1-\xi)\left(1-\frac{\beta_f}{\beta}\right)^2, \\
\iff & \left(1-\frac{\beta_f}{\beta}\right)^2 + 2\left(1-\frac{\beta_f}{\beta}\right)(1-\xi) + (1-\xi)^2 > (1-\xi)\left(1-\frac{\beta_f}{\beta}\right)^2, \\
\iff & \xi\left(1-\frac{\beta_f}{\beta}\right)^2 + 2\left(1-\frac{\beta_f}{\beta}\right)(1-\xi) + (1-\xi)^2 > 0.
\end{aligned}
$$

As a result, there exists $\bar{\Delta}_2 \in \left(0, \bar{\Delta}_1\right)$ such that for all $|\Delta| < \bar{\Delta}_2$, $\varepsilon(\Delta, \xi) > 0$.

For the last part of Proposition IA3,

$$
\frac{\partial \varepsilon(\Delta, \xi)}{\partial \xi} = \underbrace{\left[\frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\right]^2 - \frac{1}{1-\frac{\beta_f}{\beta}}}_{a_3} + \Delta \underbrace{\left[\left(\frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\right)^2 - \frac{3-2\xi-\frac{\beta_f}{\beta}}{1-\frac{\beta_f}{\beta}}\right]}_{a_4}.
$$

This derivative is also a linear function of Δ. We now show that the intercept a_3 is negative:

$$
a_3 < 0 \iff \left(1-\frac{\beta_f}{\beta}\right)^3 < \left(2-\xi-\frac{\beta_f}{\beta}\right)^2,
$$

which is true because $\frac{\beta_f}{\beta}, \xi \in (0,1)$. As a result, there exists $\bar{\Delta} \in \left(0, \bar{\Delta}_2\right)$ such that for all $|\Delta| < \bar{\Delta}$, $\frac{\partial \varepsilon(\Delta, \xi)}{\partial \xi} < 0$. Together, we know that, for all $|\Delta| < \bar{\Delta}$, Proposition IA3 holds.

IA2.5 Generalizing the Cash Flow Distribution of the Risky Project.

Here, we show that Proposition 1 extends to settings where the cash flow of the risky project z_j is drawn from a general class of distributions, not limited to the uniform distribution case examined in the main analysis. Specifically, consider the environment in Section 5, but we relax the assumption that the stochastic cash flow is drawn from a uniform distribution.

Assumption IA1. *The cash flow of the risky project of each firm j, z_j, is drawn from a i.i.d. distribution with support $[\underline{z}, \bar{z}]$, where $\underline{z} \geq 0$. Define $f(z_j) = (z_j - \underline{z}) \frac{\phi(z_j)}{1-\Phi(z_j)}$, where $\phi(z_j)$ and $\Phi(z_j)$ are probability density function and cumulative distribution function. We assume that $\phi(z_j)$ is strictly positive and bounded in $z_j \in [\underline{z}, \bar{z}]$ and $f(z_j)$ strictly increases in $z_j \in [\underline{z}, \bar{z})$.*

Assumption IA1 holds under commonly studied distributions, such as the case of uniform distributions and the case of distributions with monotone hazard rates ($\frac{\phi(z_j)}{1-\Phi(z_j)}$ increases in $z_j \in [\underline{z}, \bar{z}]$). We also generalize Assumption 1, which guarantees that the firm prefers investing to not investing.

Assumption IA2. *The investment cost is such that:*

$$
\begin{aligned}
I < {} & \beta_f \mathbb{E}\left[(z_j - b^*(\beta, \beta_f, \xi)) \cdot \mathbb{I}_{\{b^*(\beta,\beta_f,\xi) \le z_j\}}\right] \\
& + \beta \mathbb{E}\left[b^*(\beta, \beta_f, \xi) \cdot \mathbb{I}_{\{b^*(\beta,\beta_f,\xi) \le z_j\}} + ((1-\xi)\underline{z} + \xi z_j) \cdot \mathbb{I}_{\{b^*(\beta,\beta_f,\xi) > z_j\}}\right]
\end{aligned}
$$

where $b^*(\beta, \beta_f, \xi)$ is firm's optimally chosen face value of debt.

We can show that Proposition 1 extends to this setting with a general class of distributions.

Proposition IA4. *Under Assumptions IA1 and IA2,*

1. A more efficient bankruptcy system (a higher ξ) is associated with a larger credit market: $\frac{\partial b^*\left(\beta,\beta_f,\xi\right)}{\partial \xi} > 0$.

2. Nonfundamental credit booms have negative effects on macroeconomic outcomes: $\varepsilon\left(\beta, \beta_f, \xi\right) < 0$. Furthermore, a more efficient bankruptcy system (a higher ξ) dampens the negative impact of nonfundamental credit booms on macroeconomic outcomes: $\frac{\partial \varepsilon\left(\beta,\beta_f,\xi\right)}{\partial \xi} > 0$.

Proof of Proposition IA4

The firm's optimally chosen face value of debt $b^*(\beta, \beta_f, \xi)$ satisfies the first-order condition:[29]

$$
\left.\frac{\partial\left(q_b(b, \beta, \xi) \cdot b\right)}{\partial b}\right|_{b=b^*\left(\beta,\beta_f,\xi\right)} = \beta_f\left(1 - \Phi\left(b^*(\beta, \beta_f, \xi)\right)\right). \tag{IA18}
$$

From (7) for the price schedule $q_b(b, \beta, \xi)$, we know that, for $b \in (\underline{z}, \bar{z})$,

$$
q_b(b, \beta, \xi) \cdot b = \beta\left(b\left(1 - \Phi(b)\right) + (1-\xi)\Phi(b) z^{\text{liq}} + \xi \int_{\underline{z}}^{b} z_j \phi(z_j) dz_j\right), \tag{IA19}
$$

and

$$
\frac{\partial(q_b(b, \beta, \xi) \cdot b)}{\partial b} = \beta\left(1 - \Phi(b) - (1-\xi)\left(b - z^{\text{liq}}\right)\phi(b)\right).
$$

Together, the optimal face value of debt $b^*(\beta, \beta_f, \xi)$ satisfies:

$$
\beta\left(1 - \Phi(b^*(\beta, \beta_f, \xi)) - (1-\xi)\left(b^*(\beta, \beta_f, \xi) - z^{\text{liq}}\right)\phi(b^*(\beta, \beta_f, \xi))\right) = \beta_f\left(1 - \Phi(b^*(\beta, \beta_f, \xi))\right), \tag{IA20}
$$

[29](IA18) uses the fact that the optimal face value of debt $b^*\left(\beta, \beta_f, \xi\right) \in \left(\underline{z}, \bar{z}\right)$, which we verify below.

which can be rewritten as

$$f\left(b^{*}(\beta,\beta_f,\xi)\right)=\left(b^{*}(\beta,\beta_f,\xi)-\underline{z}\right)\frac{\phi\left(b^{*}(\beta,\beta_f,\xi)\right)}{1-\Phi\left(b^{*}(\beta,\beta_f,\xi)\right)}=\frac{\beta-\beta_f}{\beta\left(1-\xi\right)}, \tag{IA21}$$

where $f\left(z\right)\equiv\left(z-\underline{z}\right)\frac{\phi(z)}{1-\Phi(z)}$. From Assumption IA1, we know that $f\left(\underline{z}\right)=0$, $f\left(z_j\right)$ strictly increases in $z_j\in\left[\underline{z},\bar{z}\right)$, $\lim_{z_j\to\bar{z}}f\left(\bar{z}\right)=+\infty$. We know that there exists a unique $b^{*}(\beta,\beta_f,\xi)\in\left(\underline{z},\bar{z}\right)$ that solves (IA20), which pins down $b^{*}(\beta,\beta_f,\xi)$. Moreover, $b^{*}(\beta,\beta_f,\xi)$ strictly increases in $\beta>\beta_f$ and ξ. The fact that the firm is willing to invest ($V_f>0$) then follows directly from Assumption IA2. From (IA20), we know that

$$\frac{\partial b^{*}\left(\beta,\beta_f,\xi\right)}{\partial\xi}=\frac{\left(b^{*}(\beta,\beta_f,\xi)-\underline{z}\right)}{\left(1-\xi\right)\frac{\phi'\left(b^{*}(\beta,\beta_f,\xi)\right)}{\phi\left(b^{*}(\beta,\beta_f,\xi)\right)}\left(b^{*}(\beta,\beta_f,\xi)-\underline{z}\right)+2-\frac{\beta_f}{\beta}-\xi}.$$

Because $b^{*}(\beta,\beta_f,\xi)$ strictly increases in ξ, we know that $\frac{\partial b^{*}\left(\beta,\beta_f,\xi\right)}{\partial\xi}>0$ and

$$\left(1-\xi\right)\frac{\phi'\left(b^{*}(\beta,\beta_f,\xi)\right)}{\phi\left(b^{*}(\beta,\beta_f,\xi)\right)}\left(b^{*}(\beta,\beta_f,\xi)-\underline{z}\right)+2-\frac{\beta_f}{\beta}-\xi>0. \tag{IA22}$$

This finishes the proof of part 1 of Proposition IA4.

To prove Part 2 of Proposition IA4. Using the formula for output in (8), we know that, for $b\in\left(\underline{z},\bar{z}\right)$,

$$\begin{aligned}
\frac{\partial Y\left(b,\xi\right)}{\partial b}&=-\left(1-\xi\right)\left(b-\underline{z}\right)\phi\left(b\right)\\
\frac{\partial^2 Y\left(b,\xi\right)}{\partial b\partial\xi}&=\left(b-\underline{z}\right)\phi\left(b\right)\\
\frac{\partial^2 Y\left(b,\xi\right)}{\partial b^2}&=-\left(1-\xi\right)\phi\left(b\right)-\left(1-\xi\right)\left(b-\underline{z}\right)\phi'\left(b\right).
\end{aligned}$$

Because $b^{*}(\beta,\beta_f,\xi)\in\left(\underline{z},\bar{z}\right)$, we know that $\frac{\partial Y\left(b^{*}\left(\beta,\beta_f,\xi\right),\xi\right)}{\partial b}<0$. Moreover, together with (11),

$$\begin{aligned}
\frac{\partial\varepsilon\left(\beta,\beta_f,\xi\right)}{\partial\xi}&=\frac{\partial^2 Y\left(b^{*}\left(\beta,\beta_f,\xi\right),\xi\right)}{\partial b\partial\xi}+\frac{\partial^2 Y\left(b^{*}\left(\beta,\beta_f,\xi\right),\xi\right)}{\partial b^2}\frac{\partial b^{*}\left(\beta,\beta_f,\xi\right)}{\partial\xi}\\
&=\frac{\left(1-\frac{\beta_f}{\beta}\right)\left(b^{*}\left(\beta,\beta_f,\xi\right)-\underline{z}\right)\phi\left(b^{*}\left(\beta,\beta_f,\xi\right)\right)}{\left(1-\xi\right)\frac{\phi'\left(b^{*}\left(\beta,\beta_f,\xi\right)\right)}{\phi\left(b^{*}\left(\beta,\beta_f,\xi\right)\right)}\left(b^{*}\left(\beta,\beta_f,\xi\right)-\underline{z}\right)+2-\frac{\beta_f}{\beta}-\xi}>0,
\end{aligned}$$

where we use the fact that ϕ is strictly positive on $\left[\underline{z},\bar{z}\right]$ and (IA22).

IA2.6 Allowing $z^{\text{liq}} \in (\underline{z}, \bar{z})$ and the Possibility of Inefficient Continuing Operation.

In the main analysis, we set the value from liquidation $z^{\text{liq}} = \underline{z}$ to be the lowest realization of cash flow if the firm continues to operate. This assumption is in line with empirical evidence (Ramey and Shapiro, 2001; Kermani and Ma, 2023), but rules out the possibility of inefficient continuation. Here, we relax this assumption and consider the case that $z^{\text{liq}} \in (\underline{z}, \bar{z})$, which allows for the possibility of inefficient continuation. In this extension, the bankruptcy efficiency ξ captures the probability that the bankruptcy system correctly decides between liquidation and continuation. That is, following default, with probability $\xi \in (0,1)$, the project's cash flow is given by $\max\left\{z_j, z^{\text{liq}}\right\}$. With probability $1-\xi$, the project's cash flow is given by $\min\left\{z_j, z^{\text{liq}}\right\}$.[30]

In this case, the firm's optimally chosen face value of debt $b^*(\beta, \beta_f, \xi)$ is still given by (IA1). The debt price schedule is determined by the free entry of creditors to the lending market. Similar to (7) and (IA2), we know that, for $b \in (\underline{z}, \bar{z})$:

$$
\begin{aligned}
q(\beta,\beta_f,\xi)\cdot b &= \beta\mathbb{E}\left[\mathbb{I}_{b\le z_j} b + \mathbb{I}_{b>z_j}\left((1-\xi)\min\{z_j, z^{\text{liq}}\} + \xi\max\{z_j, z^{\text{liq}}\}\right)\right] \\
&= \beta\left(b\left(1-\Phi(b)\right) + (1-\xi)\int_{\underline{z}}^{b}\min\{z_j, z^{\text{liq}}\}\phi(z_j)dz_j + \xi\int_{\underline{z}}^{b}\max\{z_j, z^{\text{liq}}\}\phi(z_j)dz_j\right).
\end{aligned} \tag{IA23}
$$

Now we show that the main result Proposition 1 remains to be true under a generalization of Assumption 1.

Assumption IA3. *The investment cost I is such that:*

$$
I < \frac{\beta}{2}\left(\frac{1-\xi\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\right)(\bar{z}-z^{liq})^2 + \beta z^{liq}(\bar{z}-z^{liq}) + \beta\left(\frac{1-\xi}{2}\left((z^{liq})^2-(\underline{z})^2\right) + \xi(z^{liq}-\underline{z})z^{liq}\right).
$$

Proposition IA5. *Consider the model described above. Under Assumption IA3:*

1. A more efficient bankruptcy system (a higher ξ) is associated with a larger credit market: $\frac{\partial b^*(\beta,\beta_f,\xi)}{\partial\xi} > 0$.

2. Nonfundamental credit booms have negative effects on macroeconomic outcomes: $\varepsilon(\beta,\beta_f,\xi) < 0$. Furthermore, a more efficient bankruptcy system (a higher ξ) dampens the negative impact of nonfundamental credit booms on macroeconomic outcomes: $\frac{\partial\varepsilon(\beta,\beta_f,\xi)}{\partial\xi} > 0$.

[30] When $z^{\text{liq}} = \underline{z}$, because $\max\left\{z_j, z^{\text{liq}}\right\} = z_j$, then bankruptcy efficiency ξ defined here is the same as the probability of continuing operating as defined in the main analysis.

Proof of Proposition IA5

For $b \in (z^{\text{liq}}, \bar{z})$, $\min\{b, z^{\text{liq}}\} = z^{\text{liq}}$ and $\max\{b, z^{\text{liq}}\}$. Hence, from (IA23):

$$\frac{\partial(q_b(b,\beta,\xi)\cdot b)}{\partial b} = \beta\left(1-\Phi(b)-(1-\xi)\left(b-z^{\text{liq}}\right)\phi(b)\right). \tag{IA24}$$

Since (IA24) is equivalent to (IA3), the optimal value of debt $b^*(\beta,\beta_f,\xi)$ satisfies:

$$b^*(z^{\text{liq}},\xi) = \bar{z} - \frac{1-\xi}{2-\xi-\frac{\beta_f}{\beta}}(\bar{z}-z^{\text{liq}}) = \underline{z} + \frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}} - \frac{1-\xi}{2-\xi-\frac{\beta_f}{\beta}}(\underline{z}-z^{\text{liq}}), \tag{IA25}$$

which can be rewritten as:

$$b^*(\beta,\beta_f,\xi) = z^{\text{liq}} + \frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}(\bar{z}-z^{\text{liq}}). \tag{IA26}$$

Because $\xi \in (0,1)$ and $\beta_f < \beta$, we know that $\frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}} < 1$. Combined with the fact that $\bar{z} > z^{\text{liq}}$, we verify that $b^*(\beta,\beta_f,\xi) \in (z^{\text{liq}},\bar{z})$. The condition such that the firm is willing to invest becomes:

$$\begin{aligned}
&\beta_f\int_{b^*}^{\bar{z}}(z_j-b^*)\phi(z_j)dz_j + \beta\Bigg(b\left(1-\Phi(b)\right)+(1-\xi)\left(\int_{\underline{z}}^{z^{\text{liq}}} z_j\phi(z_j)dz_j + \int_{z^{\text{liq}}}^{b} z^{\text{liq}}\phi(z_j)dz_j\right)\\
&\qquad +\xi\left(\int_{\underline{z}}^{z^{\text{liq}}} z^{\text{liq}}\phi(z_j)dz_j + \int_{z^{\text{liq}}}^{b} z_j\phi(z_j)dz_j\right)\Bigg) \geq I,\\
\iff\ & \frac{\beta_f}{2}(\bar{z}-b^*)^2 + \beta\Bigg(b^*(\bar{z}-b^*)+(1-\xi)(b^*-z^{\text{liq}})z^{\text{liq}} + \frac{\xi}{2}\left((b^*)^2-(z^{\text{liq}})^2\right)\\
&\qquad + \frac{1-\xi}{2}\left((z^{\text{liq}})^2-(\underline{z})^2\right)+\xi(z^{\text{liq}}-\underline{z})z^{\text{liq}}\Bigg) \geq I,\\
\iff\ & \frac{\beta_f}{2}\left(\frac{1-\xi}{2-\xi-\frac{\beta_f}{\beta}}\right)^2(\bar{z}-z^{\text{liq}})^2\\
&\qquad +\beta\left(\left(1-\frac{\xi}{2}\right)\frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\frac{1-\xi}{2-\xi-\frac{\beta_f}{\beta}} + \frac{\xi}{2}\frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\right)(\bar{z}-z^{\text{liq}})^2\\
&\qquad +\beta\underline{z}(\bar{z}-z^{\text{liq}}) + \beta\left(\frac{1-\xi}{2}\left((z^{\text{liq}})^2-(\underline{z})^2\right)+\xi(z^{\text{liq}}-\underline{z})z^{\text{liq}}\right) \geq I,\\
\iff\ & \frac{\beta}{2}\left(\frac{1-\xi\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\right)(\bar{z}-z^{\text{liq}})^2 + \beta z^{\text{liq}}(\bar{z}-z^{\text{liq}})\\
&\qquad +\beta\left(\frac{1-\xi}{2}\left((z^{\text{liq}})^2-(\underline{z})^2\right)+\xi(z^{\text{liq}}-\underline{z})z^{\text{liq}}\right) \geq I,
\end{aligned} \tag{IA27}$$

where we condense the notation of $b^*(\beta, \beta_f, \xi)$ to b^* for simplicity. Hence by Assumption IA3, the firm is willing to invest. [31]

For the first part of Proposition IA5, take the derivative of $b^*(\beta, \beta_f, \xi)$ with respect to ξ:

$$\frac{\partial b^*(\beta, \beta_f, \xi)}{\partial \xi} = \frac{1 - \frac{\beta_f}{\beta}}{\left(2 - \xi - \frac{\beta_f}{\beta}\right)^2}(\bar{z} - z^{\text{liq}}) > 0.$$

For the second part, the formula for output in (8) now needs to be supplemented by a term that captures the gain in output that occurs when liquidation is efficient ($z^{\text{liq}} > z_j$):

$$\begin{aligned} Y(b, \xi) &= \mathbb{E}[z_j] - (1 - \xi) \int_{z^{\text{liq}}}^{b} \left(z_j - z^{\text{liq}}\right) \phi(z_j)\, dz_j + \xi \int_{\underline{z}}^{z^{\text{liq}}} \left(z^{\text{liq}} - z_j\right) \phi(z_j)\, dz_j, \\ &= \underline{z} + \frac{1}{2} - \frac{1 - \xi}{2}(b - z^{\text{liq}})^2 + \frac{\xi}{2}(z^{\text{liq}} - \underline{z})^2. \end{aligned}$$

Define aggregate output/GDP $Y^*(\beta, \beta_f, \xi) \equiv Y(b^*(\beta, \beta_f, \xi), \xi)$ based on the optimally chosen face value of debt $b^*(\beta, \beta_f, \xi)$. The impact of a nonfundamental credit boom is still given by (IA8), which means:

$$\varepsilon(\beta, \beta_f, \xi) = \frac{\partial Y(b^*(\beta, \beta_f, \xi), \xi)}{\partial b} = -(1 - \xi) \left(\frac{1 - \frac{\beta_f}{\beta}}{2 - \xi - \frac{\beta_f}{\beta}}\right) (\bar{z} - z^{\text{liq}}) < 0.$$

Finally, note that

$$\frac{\partial \varepsilon(\beta, \beta_f, \xi)}{\partial \xi} = \left[\frac{1 - \frac{\beta_f}{\beta}}{2 - \xi - \frac{\beta_f}{\beta}}\right]^2 (\bar{z} - z^{\text{liq}}) > 0.$$

[31] If $z^{\text{liq}} = \underline{z}$, Assumption IA3 becomes Assumption IA1 in the main text.