Banking, Credit, and Economic Fluctuations[1]

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ABSTRACT

Credit markets, including the market for bank loans, are characterized by imperfect and asymmetric information. These informational frictions can interact with other economic forces to produce periods of credit-market stress, in which intermediation is unusually costly and households and businesses have difficulty obtaining credit. A high level of credit-market stress, as in a severe financial crisis, may in turn produce a deep and prolonged recession. I present evidence that financial distress and disrupted credit markets were important sources of the Great Depression of the 1930s and the Great Recession of 2007–2009. Changes in the state of credit markets also play a role in "garden-variety" business cycles and in the transmission of monetary policy to the economy.

The central thesis of the research cited by the Prize Committee is that disruptions in credit markets, including the market for bank loans, can have significant macroeconomic effects. Specifically, at times credit markets can become *stressed*, in a sense to be made explicit below. Credit-market stress can serve as both a source and an amplifier of economic

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fluctuations. A very high level of credit-market stress, as in a severe financial crisis, may produce a deep and prolonged recession.

As background, Section I of this lecture briefly reviews the simple analytics of credit markets. It draws on the economics of imperfect and asymmetric information, an area that had been advancing rapidly when I began this line of research in the late 1970s. I explain why the informational frictions that permeate credit markets can lead them to perform poorly at times, with high costs of intermediation and limited access to credit for many borrowers. I then discuss how changes in the balance-sheet strength of both lenders and borrowers, as summarized by net worth and perhaps other indicators, both help determine credit-market outcomes and provide a critical link between those outcomes and broader economic developments.

The rest of the lecture considers applications of these ideas. Section II discusses how the near collapse of credit markets, brought about by bank failures and the financial distress of households and firms, helps explain the depth and persistence of the Great Depression. Section III considers the role of dysfunctional credit markets in the Global Financial Crisis and the Great Recession of 2007–2009. Section IV describes how changes in credit-market performance relate to "garden-variety" business cycles, including the channels through which monetary policy

affects the real economy. Section V concludes. A technical appendix presents a simple model that illustrates how imperfect information may lead to undesirably low levels of credit extension and investment.

THE SIMPLE ANALYTICS OF CREDIT MARKETS

The 2001 Economics Prize in Memory of Alfred Nobel was awarded to George Akerlof, Michael Spence, and Joseph Stiglitz for their work in the economics of imperfect information. Along with other economists, notably including 1972 laureate Kenneth Arrow, these scholars developed theoretical analyses of markets, such as the markets for insurance and medical services, that are characterized by imperfect and asymmetric information between providers and their customers. In particular, their work showed that markets with *asymmetric information*, in which some participants have information not available to others, may clear via rationing or other non-price mechanisms, and that the resulting outcomes are typically socially inefficient, compared with markets with full information. Indeed, under some circumstances, markets characterized by asymmetric information may collapse completely (Akerlof, 1970).

The credit market is a leading example of a market in which imperfect and asymmetric information are central (Townsend, 1979; Stiglitz and Weiss, 1981). Consider a bank that must decide whether to lend to a particular applicant. In most cases the bank will have incomplete knowledge

– and, importantly, less information than the potential borrower – about the borrower's income, assets, and earning prospects, as well as about intangibles like trustworthiness and (in the case of a small-business owner, say) the borrower's business acumen and willingness to work hard. The potential borrower's information advantage exemplifies the concept of asymmetric information.

If borrowers' characteristics were randomly distributed across the population in a manner known to the lender, and if each potential borrower represented a random draw from that fixed population, the bank could overcome much of its information disadvantage by developing a standard loan contract, based on average borrower characteristics, which it would make available to all applicants. However, because potential borrowers are self-selected rather than drawn randomly, this strategy is unlikely to be profitable for the bank. For example, a loan contract based on average borrower characteristics might be most attractive to potential borrowers who know they are especially risky (*adverse selection*), or it might give those who choose to borrow insufficient incentive to work hard (*moral hazard*).

Banks are aware of these informational problems, of course, and much of their value-added lies in overcoming them. Banks and other lenders develop expertise in acquiring and verifying information about borrowers' finances and ability to repay. For example, they hire and train loan officers to weigh the factors relevant to an application; monitor outstanding loans; work with troubled borrowers; and strive to build long-term customer relationships. Banks, knowing that better information reduces the risks of lending, find it profitable to invest in the information capital that these skills and knowledge represent. In addition, banks can limit their risk through techniques such as restricting the borrower's use of borrowed funds through loan covenants and requiring collateral. Importantly, all these measures impose costs, costs that may be pecuniary (the salaries of loan officers) or implicit (the cost to borrowers of covenants that limit the kinds of investments they can make).

Most analyses of lending markets in the literature focus on issues raised by asymmetric information between banks and their borrowers. But it is important to keep in mind that banks and nonbank lenders (henceforth, "banks") are themselves also borrowers, in that they must obtain deposits or other outside funding to finance their own lending to households and firms. Under normal circumstances the risk of a bank defaulting on its debt is low, so not much is lost by ignoring that possibility. In a serious financial crisis, however, fears that a bank may fail can lead its funders to cut off credit or tighten credit terms. A bank that suddenly loses funding must restrict its own lending and may be forced to sell assets rapidly to raise cash, an event known as a *fire sale* (Shleifer and

Vishny, 2011). The ability of banks to raise funds through fire sales is also affected by asymmetric information, in that a bank's superior knowledge about the quality of its assets may make those assets difficult to sell at prices that the bank, based on its own

information, would consider "fair."

Banks' funding problems in a crisis may be exacerbated by the fact that, for reasons explored by Diamond and Dybvig (1983) and Dang, Gorton, and Holmstrom (2020) among others, banks tend to fund illiquid, long-term assets with short-term, liquid liabilities, such as bank deposits or commercial paper. Banks' reliance on short-term financing has benefits in normal times, including the creation of liquidity for their funders and, in most cases, a lower cost of funding for the bank. However, in financially troubled times, the reliance of banks on short-term funding increases the risk of runs or panics, which may lead to fire sales or failures. Moreover, in a panic, banks typically shift their portfolios toward safe, liquid assets (a *flight to quality*). All these outcomes reduce banks' willingness and ability to lend to riskier private borrowers, which can have significant economic costs. From the bank's perspective, reduced lending to private borrowers also carries with it an economic loss, in that the information capital and expertise in which the bank has invested become under-utilized.

So far, we have seen that overcoming the problems of asymmetric information between borrowers and banks, and between banks and their own funders, can impose significant costs, including the costs resulting from periodic financial crises. Since banks and bank funders always have the option of purchasing safe liquid assets (for example, Treasury debt) instead of engaging in risky private lending, ultimately most of the informational, accounting, and other costs of lending will be borne by the borrowers. In Bernanke (1983) I coined the term *cost of credit intermediation*, which I defined as the cost, net of the safe rate of interest, of channeling funds from ultimate savers to ultimate borrowers. The term did not stick, and contemporary research generally refers instead to the *external finance premium*, defined as the all-in cost to a borrower (including the implicit costs of covenants and other restrictions) of obtaining outside funding, less the safe rate of interest. If, in practice, the costs of intermediation ultimately fall largely on the borrower, as I argued above, the two concepts are similar.

External finance premiums differ by borrower, with small businesses typically facing higher costs of external finance than large corporations, for example. However, presumably external finance premiums tend to move together over time, reflecting their common sensitivity to the state of the economy and general financial conditions. In the rest of this lecture, I will refer to "the" external finance premium, analogous to the way

that economists sometimes refer to "the" interest rate, despite the many types of interest rates we observe in practice. I can now define a stressed credit market more precisely as one in which the external finance premium is unusually high. In a stressed credit market, intermediation is especially costly, private credit is expensive and difficult to obtain, and private spending that depends on access to credit accordingly declines.

Many factors determine the evolution of the external finance premium. For example, the ongoing development of automated credit evaluation has likely lowered lending costs and thus the external finance premium faced by households, all else equal. However, for both modeling and empirical purposes, it is useful to have a small set of observable variables that link credit-market conditions and the state of the economy. In my work with coauthors, I have usually chosen the *net worth* of lenders and borrowers, a proxy for overall financial strength, as the principal linking variable. Net worth serves this role nicely because it is both an important determinant of the external finance premium and sensitive to changes in the economy.

That borrowers with higher net worth can get more credit at better terms (face a lower external finance premium) accords with experience. Potential homeowners will find getting a mortgage easier if they can make a large down payment. The founders of a startup company will be more likely to get venture capital financing if they have the resources to retain a large equity share. The straightforward intuition is that borrowers with large stakes ("skin in the game") in the car, home, business, or other asset being financed, have a greater incentive to make the effort necessary for good outcomes (reducing moral hazard) and to avoid excessively risky undertakings (limiting adverse selection). Alternatively, high net worth allows the borrower to post more collateral, which increases the security of the loan and reduces the need for the lender to undertake costly screening and monitoring of the borrower (Kiyotaki and Moore, 1997). In contrast, a low-net-worth borrower effectively owns a smaller share of the financed asset, which may misalign the incentives faced by the lender and the borrower. The technical appendix provides an example of a setting in which the ability of otherwise identical borrowers to obtain credit depends on their net worth.[2]

The benefit of higher net worth in credit markets can be cast in the language of principal and agent (Ross, 1973). The lender (the principal) would like the borrower to take actions that maximize the value of the financed asset, making repayment more likely. The borrower (the agent)

2. The example in the appendix shows that the external finance premium is not necessarily a smooth function of net worth. Instead, the lending market in the example exhibits a discontinuous form of credit rationing, in which all borrowers with net worth above a critical level receive credit on the same terms and those with net worth below the critical level receive no credit. Alternative models can produce a more continuous relation between net worth and credit terms; see, for example Townsend (1979).

may care about the asset's value but also about other factors not observable by the lender. For example, the borrower may dislike making the effort required to maintain the asset or enjoy using the asset in ways that increase its rate of depreciation (driving recklessly in a leased car, for example). With risk-neutral agents, and putting aside some complications, it is not difficult to see that the optimal contract requires a fixed payment by the borrower at an agreed-upon future date, independent of the value of the asset at that date. This contract is efficient because it makes the borrower the residual claimant, with an incentive to internalize the full costs and benefits of their actions. However, if the borrower has insufficient wealth to make the agreed-upon payment in all states of the world, so that the optimal contract is infeasible, then the costs created by asymmetric information resurface. The assumption that the borrower's repayment is limited by their net worth (equivalently, that their consumption must be non-negative) is known as the *limited liability constraint*. From this perspective, high borrower net worth is desirable because it implies that the limited liability constraint binds less frequently, which in turn allows for a more efficient lending contract.

Since banks are also borrowers, their net worth also matters. To a first approximation, bank net worth can be equated with the bank's economic capital, the financial buffer available to absorb losses. Mark Gertler and I (1987) presented a rudimentary general-equilibrium model with banks, in which the adequacy of bank capital, the riskiness of bank investments, and the costs of monitoring banks affect the quantity and terms of bank lending and, consequently, the state of the economy.

When changes in the net worth of ultimate borrowers are incorporated in the model, the

1987 paper also provides an early formalization of financial crises and their macroeconomic effects.[3] In a financial crisis, both banks and borrowers have low net worth, which increases intermediation costs and limits the supply of credit to private borrowers. The situation is exacerbated if banks have a strong comparative advantage in making loans to households and firms, so that declines in bank credit are not easily made up elsewhere; if banks depend heavily on uninsured short-term funding, which is prone to run; and if banks hold assets which, for reasons including asymmetric information between banks and potential buyers of bank assets, are likely to be marked down sharply in a fire sale. The disruptions in credit flows occurring in a financial crisis depress borrowing, spending, and investment as households and firms react to current and expected constraints on credit availability.

In the next two sections, I consider important historical examples that

3. See Gertler and Kiyotaki (2015) for a fully dynamic model of endogenous crises based on similar conceptual underpinnings.

illustrate the effects of severe financial crises on the economy: the Great Depression of the 1930s and the Global Financial Crisis and Great Recession of 2007–2009.

THE GREAT DEPRESSION

Explaining the depth, persistence, and global scope of the Great Depression continues to challenge macroeconomists. Much progress has been made. When I was a graduate student in the late 1970s, the leading explanation of the Depression, at least for the United States, was the monetarist view of Friedman and Schwartz, laid out in their classic monetary history (Friedman and Schwartz, 1963).[4] The central claim of their book was that the rate of money growth is a key determinant of cyclical movements in output, prices, and employment. Consistent with their thesis, Friedman and Schwartz attributed the Great Contraction of 1929–33 in the United States (the downward phase of the Depression) to a sharp decline in the money supply. They argued that this decline was, in turn, largely the product of two factors. First, the catastrophic banking panics of that era – close to 40 percent of the 25,000 U.S. banks in existence in 1929 had failed or merged with other banks by 1933 – led people to convert bank deposits into currency, draining the banking system of reserves. In a fractional-reserve banking system, banks can use a dollar of reserves to back several dollars of deposits, so the net effect of depositor withdrawals was to reduce the money supply (currency plus deposits). Second, Friedman and Schwartz saw the response of the Federal Reserve as perverse, or at least inadequate. In their view, the Fed could have ameliorated the deflationary pressures of the early 1930s through sustained monetary expansion but chose not to.[5] Moreover, they argued, even though responding to banking panics had been a principal motivation for the establishment of the central bank in 1913, the Fed failed to stabilize the banking system, greatly worsening the monetary contraction.[6]

.At points in their book, Friedman and Schwartz mentioned foreign developments that influenced the course of the U.S. Depression. For

4. There were still some dissenters at that time, for example, Temin (1976). In later work, Temin changed his views to accept a larger role for monetary forces, particularly those acting through the gold standard (Temin, 1989).

5. Most scholars of the Depression would also argue that U.S. monetary policy was too tight in the latter part of the 1920s, reflecting the Fed's attempts to tamp down speculation in the stock market. See Hamilton (1987).

6. Why the Federal Reserve System did not do more to support banks, which it could have done through more
aggressive lending to replace banks' lost funding, is controversial. One explanation is that many banks were not
members of the Federal Reserve System and thus not eligible for discount window credit. Banks that were assessed by supervisors as insolvent were also ineligible for Fed loans. Friedman and Schwartz argued that the decentralized structure and weak leadership of the Federal Reserve, particularly after the death of New York Fed governor Benjamin Strong in 1928, also impeded a more active response.

example, they noted that bank failures in Austria and Germany in the spring of 1931, together with Britain's departure from the gold standard later that ye.ar, triggered and intensified U.S. banking panics; they gave a good though brief discussion of the gold standard and its role in transmitting deflation internationally; and they argued against the view that gold outflows limited the Federal Reserve's ability to increase the domestic money supply. But because their principal focus was the United States, their discussion of foreign developments was limited.

In the decades that followed, however, research on the causes of the Depression took a decidedly more international and comparative approach. New work emphasized the global nature of the contraction and contrasted countries' experiences to better distinguish among competing hypotheses. A particularly important step forward was the recognition, alluded to but not developed by Friedman and Schwartz, that structural defects of the post-World-War-I gold standard were a principal cause of the global monetary collapse. Notably, Eichengreen and Sachs (1985) made the important finding, elaborated by Eichengreen (1992) and others, that countries that left or were forced off the gold standard in 1931 or earlier, or never were on the gold standard, recovered more quickly from the Depression than countries that remained on gold well into the 1930s.

What explains this finding? In brief, the initiating event was the reconstruction of the international, gold-based monetary system following World War I. As that reconstruction proceeded, it became clear that existing gold stocks would be insufficient to allow the world to return to the prewar rates of exchange between national currencies and gold. The problem was that, at prewar rates of exchange, and given the available supply of gold, central banks in many countries could not create enough money to be consistent with higher postwar price levels. Full restoration of the prewar gold standard accordingly required either a general deflation (declining price levels) or devaluations of currencies relative to gold. Neither solution was particularly attractive. Sustained deflation was understood to impose significant economic costs, while currency devaluation was seen as shortchanging government bondholders, whose bonds would lose buying power if the gold value of the currency was reduced.

The solution to this dilemma adopted by many countries was to allow central banks to supplement their gold reserves with foreign exchange (for example, British pounds), giving them the elbow room needed to increase domestic money supplies without exceeding legally required ratios of money issuance to central bank reserves. However, this so-called gold exchange system proved unstable. Daunting barriers to global financial stability (such as the onerous reparations demanded of Germany and the refusal of the United States to cancel war debts) and the strained

international relations that were the legacy of the war undercut confidence in the new system. Central banks – fearful that the foreign currencies they held would be devalued relative to gold – competed to convert their foreign exchange holdings into gold, whose value they saw as ensured. This global "scramble for gold," and the associated liquidation of central bank holdings of foreign exchange, resulted in sharp declines in the total reserves of many central banks. Shrinking central bank reserves in turn led to collapsing money supplies and falling prices in countries that remained on the gold standard. Only those countries that chose (or were forced by speculators) to abandon the gold standard at an early stage were able to regain control of their domestic monetary policies, allowing them to avoid global deflationary pressures and thus the worst of the Depression.

The gold standard narrative helped explain the global monetary contraction that began in the late 1920s, as well as why some countries would suffer worse bouts of deflation and depression than others. The narrative also provided new insights about the part played by international politics in triggering the Depression, as well as the roles of the Federal Reserve and the Banque de France, whose restrictive monetary policies resulted in disproportionate accumulations of gold that worsened the global gold scarcity. Overall, the comparative studies gave new support to the Friedman-Schwarz thesis that declines in the money supply were a principal source of the Great Contraction in the United States.

I have laid out the monetarist explanation of the Great Depression in some detail because I find it persuasive in many respects, particularly when placed in an international context. Indeed, I have explored implications of the gold standard hypothesis in my own work. For example, alone and with coauthors I have analyzed in greater detail the factors affecting money supplies in the major countries; expanded the comparative studies of Eichengreen and Sachs to include more countries and additional control variables; and examined the adjustment of wages and employment to deflationary shocks in the United States and other countries. Bernanke (2007) collects my research on the Depression.

Notwithstanding the points in favor of the monetarist explanation, however, early in my research career I investigated a complementary hypothesis, namely, that the near collapse of banking and credit markets in the United States and other countries in the early 1930s was an important additional reason for the depth and persistence of the Depression. I chose to study this possibility for several reasons.

First, I didn't see any justification for Friedman and Schwartz's asymmetric treatment of money and credit. They asserted in their book, for example, that the only significant consequences of bank failures were to reduce the supply of money and to cause bank equity holders to suffer

losses. That they failed even to mention a potential effect of bank failures on the supply of credit is striking. After all, to a first approximation money and credit are, respectively, the liabilities and assets of the banking system. Consequently, as opposite sides of banks' balance sheets, money and credit were affected in similar ways by banking panics and bank failures. Moreover, contemporary sources documented that banking panics, and the fear of panics, significantly affected bank lending.[7] For example, surveys confirmed that the fear of runs made banks lend more cautiously, extending credit only to the safest borrowers and liquidating existing loans when they could. Indeed, the decline in credit was more severe than the decline in money: Banks' loan-to-deposit ratios fell from 0.85 in 1929 to a low of 0.58 in January 1933, even as deposits shrank (Calomiris, 1993). Since branching was not allowed at that time, smaller communities were generally served by a few local banks. The failures of those banks destroyed local information capital and left few or no practical alternatives for many potential borrowers. Moreover, the disposal of assets by failing or troubled banks led to fire sales, which reduced the value and liquidity of collateral assets such as land, added to pressures on other banks, and further reduced credit extension (Ramcharan and Rajan, 2014). Sharply reduced credit availability, as well as the expectation that credit markets would be disrupted for some time, would surely have affected economic activity.

If bank failures affected the Depression-era economy at least in part by constraining the supply of credit, the interpretation of key episodes changes. For example, newly inaugurated President Franklin D. Roosevelt effectively severed the link between the dollar and gold and declared a "bank holiday," which shut down the banking system with the promise that only healthy banks would be allowed to reopen. The bank holiday, together with Congress's approval of a deposit insurance program shortly thereafter, restored public confidence in banks and ended the panics. A period of rapid economic growth followed. What caused that sharp, though short, recovery? From a monetarist perspective, the benefits both of leaving the gold standard and stabilizing the banking system were felt entirely through the resulting increase in the supply of money. But the more-stable banking system, together with the realization that the Federal Reserve could no longer be forced to raise interest rates to stem gold outflows, would also have improved the availability of credit. Distinguishing the two stories, or assessing the weight to give to each, is not straightforward.

The money-credit distinction is also relevant for interpreting the slow recovery during the latter part of the 1930s. Only retrospective estimates

7. Unless otherwise specified, Bernanke (1983) is the source of the historical and empirical statements given below.

of unemployment rates during the Depression are available, and alternative methodologies have produced different results, but there is a consensus that unemployment rates remained in double digits through 1939 (Margo, 1993). The economic recovery was only completed when the country mobilized to fight World War II. Why was the recovery so slow after the initial burst of growth in 1933–34? Monetarists have pointed to the 1937 increase in bank reserve requirements and the associated reduction in the supply of money as a factor that held back the economy (and led to a brief recession in 1937–38). However, increased reserve requirements on banks also reduced credit supply by forcing banks to hold a greater share of their assets as reserves at the central bank.

Indeed, monetarist theory itself supports the view that other factors, such as credit restriction, must have supplemented monetary forces as a source of the slow post-1934 recovery. As Friedman would later write in his influential presidential address to the American Economic Association (Friedman, 1968), the effects of changes in the money supply on real variables such as employment should be temporary, as (for example) workers recognize that changes in nominal wages need not imply similar changes in real wages. That is, monetarists usually argue that money is *neutral* (does not affect real variables like employment) in the medium run, which, if correct, is a strike against the idea that monetary forces depressed the U.S. economy for up to a decade. In contrast, contemporary accounts suggest that the financial rehabilitation of both banks and borrowers after 1933 proceeded slowly. The slow recovery of credit markets after 1933 would have impeded the economic recovery as well (Bernanke, 1983).

Beyond the neglect of credit, another drawback of the monetarist story is that it entirely ignores the extreme financial distress of many households and firms during the period.

Contemporary surveys and news stories give a sense of the depth of the problem. For example, one survey found mortgage default rates ranging from 21 percent to 62 percent in the cities studied. For comparison, the peak mortgage delinquency rate during the recent housing crisis was about 11.5 percent in 2010. In addition, more than half of farm mortgage debt was in default in 1933, and the governments of 37 cities with populations of more than 30,000 and of three states had defaulted by 1934. In the corporate sector, profits plunged, with aggregate after-tax profits negative every year from 1930 to 1933. Corporate credit risk, as measured by credit spreads, default rates, and the valuation of defaulted debt, rose sharply (Calomiris 1993). The spread between Baa and Aaa bond yields, a measure of the relative risk and liquidity of lower- and higher-quality securities, increased from 2.5 percentage points in 1929–30 to about 8 percentage points in mid-1932. As large as it was, that rise in the spread

certainly understated the increase in the relative credit risk of the Baa-rated corporates, because some bonds that were originally rated Baa were downgraded and so not included in these data.[8]

The financial distress of many households and businesses would have been consequential even if it had not affected their economic choices, as it was the proximate cause of the heavy losses experienced by many banks, which in turn led to bank failures and panics. But financial distress certainly changed the behavior of households and nonfinancial firms as well. Knowing that their weakened financial conditions would make credit difficult or impossible to obtain, many households and firms, like banks, became cautious – hoarding liquidity, increasing precautionary saving, and avoiding commitments of funds for consumption or, in the case of

firms, to investment and hiring. Weakened balance sheets and reduced spending by households and firms would have worsened the downturn and – since creditworthiness once damaged takes time to rebuild – prolonged the economic depression, as noted earlier.

Because of data limitations, direct evidence for the 1930s on the link between financial distress and the economic choices of households and firms is not easy to come by; but studies of household and firm behavior in the Great Recession, discussed in the next section, suggest that the effects of distress were likely powerful. Certainly, the plight of Depression-era borrowers was no secret, receiving much public attention. One result was that several government agencies, including the Reconstruction Finance Corporation, the Home Owners' Loan Corporation, and programs authorized by the National Housing Act, among others, were established to provide (or facilitate private provision of) credit to homeowners, farmers, and other groups, taking a role normally played by banks.

Yet another motivation for considering credit-related causes of the Depression is that the existing monetarist analyses, including the international variants, have little to say about the mechanisms through which declines in the money supply supposedly depressed the economy. For the most part, Friedman and Schwartz used a reduced-form, non-theoretical approach: They showed that, in many historical episodes, changes in the money supply typically had at least some independent sources; and that money supply changes were often followed by movements in the economy in the same direction. They inferred from these observations that money was frequently an independent factor affecting the economy, but in most

8. Friedman and Schwartz suggest that some of the increase in bond spreads reflected sales of bonds by banks looking for liquidity. Movements in bond spreads were indeed correlated with banking panics, but that could be explained by restricted credit supply as well as by bank fire sales. Moreover, increased credit spreads arising from fire sales would themselves have impeded the supply of new credit, by raising lenders' required rates of return on new loans. A similar phenomenon occurred during the Global Financial Crisis.

cases, they did not specify the channels through which those effects occurred. Their failure to be more explicit about transmission mechanisms makes it difficult to judge whether the observed changes in the money supply in the 1930s were quantitatively sufficient to explain the depth and persistence of the Depression. In contrast, analyses of credit markets with asymmetric information provide straightforward causal links between credit-market stress and prolonged economic contraction.

Greater clarity about transmission mechanisms, besides filling an important gap in the monetarist argument, could also provide testable hypotheses to help distinguish money-based and credit-based stories. An interesting case in point turns on the question of whether the sharp deflation of the early 1930s, which all agree was closely tied to monetary developments, was largely anticipated by private agents or not. If the deflation was anticipated, then, given the low levels of nominal interest rates, the ex-ante real interest rate would have been high, helping to explain why firms were reluctant to invest and consumers deferred purchases of durable goods and housing. If, on the other hand, the deflation was largely unanticipated, then it may have depressed the economy through what Irving Fisher (1933) called a *debt-deflation* mechanism (see also Mishkin, 1978; Bernanke and Gertler, 1989). Debt deflation occurs when many borrowers have incomes that vary with the price level, but face debt payments fixed in nominal terms. Think of a farmer whose income depends on commodity prices but who must also make regular fixed payments on the farm mortgage. A deflation-induced collapse in commodity prices would reduce the farmer's income and net worth without a comparable reduction in debt service, likely leading to financial distress and possibly bankruptcy.[9] Even those farmers who remained able to service their debts would be forced to reduce spending and increase saving as the unanticipated deflation wreaked havoc with their finances.[10] Debt deflation could also occur even if the deflation were anticipated, if loan contracts signed before the decline in prices were of sufficiently long term and could not be refinanced.

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9. This illustrative example may have had a basis in reality. Hausman, Rhode, and Wieland (2020) argue that financial stress in the agricultural sector was in fact an important source of the downturn.

10. It is important to note that, absent the informational frictions discussed in this lecture, debt deflation would impose little economic cost, since it would be merely a transfer of the collateral (the farm in this example) from the debtor to the bank, implying no change in aggregate wealth. The bank presumably cannot operate the repossessed farm on its own, so it would look for a knowledgeable farmer to sell or lease it to. With well-functioning credit markets, finding a skilled farmer able to purchase or lease the repossessed property should be possible. However, when imperfect information impedes credit flows, as assumed in this lecture, the bank will likely not be able to find a solvent buyer at a time when most farmers are suffering serious financial distress. As a result, the transfer of the farm from the debtor to the bank will cause the farm to lose much of its value, even as the borrower's bankruptcy weakens the bank's balance sheet. The explanation of Shleifer and Vishny (2011) for why fire sales destroy wealth, that transferred assets are worth less in the hands of potential buyers than of sellers, applies here as well.

So, was the deflation of the early 1930s anticipated? Calomiris (1993) summarizes the literature on this question (see also Hamilton, 1987, for similar conclusions). Although there is not full agreement, the evidence overall supports the view that the deflation was largely unanticipated, and, indeed, that forecasters and businesspeople in the early 1930s remained optimistic that recovery and the end of deflation were imminent. Calomiris (1993) summarized the literature as follows: "While there is some continuing disagreement ... over precisely how much of the deflation was anticipated at short time horizons, all parties agree that there was substantial unanticipated deflation even at quarterly frequencies. Furthermore, Evans and Wachtel (1993) argue that over longer-term frequencies most of the deflation was unanticipated... Given that debt contracts often were written with durations greater than several months, the rise in the real value of long-term debt that occurred must have been unanticipated [consistent with the debt-deflation story] (p. 75)."

To summarize, it is difficult to defend the strict monetarist view that declines in the money stock were the only reason for the Depression, although evidence in both Friedman and Schwartz (1963) and the gold standard literature supports the thesis that monetary forces were a contributing factor. However, bank credit is highly correlated with the money stock, so it is difficult to separate the roles of money and credit without taking other considerations into account. An advantage of the credit hypothesis is that it is easy to see how the near collapse of credit markets could have caused a sharp and persistent decline in output and employment. In particular, the credit story shows clearly how the financial distress of households and firms, as well as the runs on banks, could have weakened the economy. In contrast, the monetarist approach has not been clear about transmission mechanisms and has not explained how monetary effects could have been so persistent, given the presumption of medium-term monetary neutrality. Comparison of transmission mechanisms and their implications is a promising way to distinguish the effects of money and credit and in at least one important case – the issue of whether the deflation of the early 1930s was anticipated – the evidence seems more favorable to the credit-based explanation.

Other empirical work also provides support for the credit story. For example, in Bernanke (1983), I showed that bank lending helped forecast industrial production in the downward phase of the Depression even when taking money growth into account. Similarly, in a panel of 24 countries, the historian Harold James and I (1991) found that, controlling for when a country adhered to the gold standard and accounting for features of the banking system, countries experiencing banking crises had sharper declines in output.

While these and related results support the hypothesis that credit-market disruptions were important sources of the Depression, they rely on aggregate time-series data, which may not be adequate to identify the subtle differences between the money and credit views. More-recent work has used cross-sectional, micro-level data and alternative identification methods to better assess the effects on lending of credit disruptions, especially bank failures, during the Depression (Bernanke, 2018). Taken together, these studies provide support for the view that stressed credit markets helped drive declines in output and employment during the Depression.[11]

Calomiris and Mason (2003), using Depression-era state and county-level data, and using predictors of bank distress as instruments for bank failures, found that loan supply explains an important part of the cross-sectional variation in economic activity across geographic areas.

Carlson and Rose (2015), using contemporaneous survey responses, found that businesses and banks saw bank failures as the dominant reason for the contraction of credit during the Depression.

Cohen, Hachem, and Richardson (2016) developed a measure of local lending relationships, finding that the impact of bank suspensions on economic activity was greater in high-relationship areas, consistent with the proposition that banking panics destroy valuable information capital.

Lee and Mezzanotti (2014) showed, using Depression-era city-level data, that industries reliant on external finance were relatively more affected by local bank distress than other firms, suffering greater declines in employment and value added. The authors concluded that the disruption of bank lending had "a sizable impact on the manufacturing sector."

Benmelech, Frydman, and Papanikolaou (2019), exploiting differences across large firms in the timing of their need to raise funds (for example, to replace maturing debt), found that local bank failures affected firms' ability to obtain needed credit, which in turn led to significant declines in employment.

Mitchener and Richardson (2019) provided evidence that fear of panics led banks outside of large cities to withdraw deposits from money center banks, which in turn led the money center banks to make fewer loans to their business customers. This behavior, they estimated, reduced aggregate bank lending by 15 percent between 1929 and 1933.

Overall, the macro and micro evidence taken together supports the view that credit-

market disruptions complemented declines in the money supply as a force initiating and propagating the Great Depression. Future research should try to quantify more precisely the overall contributions of money, credit, and other factors to the phases of the Great Depression.

11. To winnow the list, I have included only post-2000 studies.

THE GLOBAL FINANCIAL CRISIS AND THE GREAT RECESSION

The Global Financial Crisis (GFC) and the Great Recession, like the Great Depression, had enormous consequences for the world economy. The more-recent crisis also resembled the Depression in that it included severe credit-market disruptions. An important difference is that the sources of the Depression remain under debate, with no clear consensus having emerged on the relative importance of monetary and credit-related factors. To the best of my knowledge, however, no one has advanced a plausible alternative to the view that the primary cause of the Great Recession was the chaos in credit markets created by the GFC, which exerted extreme pressure on both lenders and borrowers.[12]

That said, extending the credit-based analysis of the Depression to the more recent episode in not completely straightforward, because the structure of the U.S. and global financial systems changed markedly between 1929 and 2007. In the United States, as in most other advanced economies, Depression-era credit markets were dominated by banks, with some larger companies able to borrow through the corporate bond market as well. By the time of the GFC, in contrast, more than half of private credit intermediation in the United States took place outside commercial banks, mostly through a diverse group of institutions that made up what became known as the *shadow banking system* (Pozsar, Adrian, Ashcraft, and Boesky, 2013). Among the varied shadow banking institutions were consumer-facing firms such as mortgage companies and consumer finance companies; investment banks, which traded and held credit securities on their own account but also provided market-making and other services to institutional clients; money market mutual funds, which funneled liquid funds from institutional and retail investors to both financial and nonfinancial borrowers; asset managers and investors, including hedge funds and bond funds; specialized investment firms dealing in private equity, private loans, venture capital, and real estate; passive investment vehicles, such as the structured investment vehicles created by some large banks;

12. The best alternative explanation would probably be the end of the housing boom of the early 2000s, and the accompanying fall in house prices. The decline in house prices depressed consumption and construction, but *absent the associated financial effects on lenders and households,* which are integral to the credit disruption hypothesis, it cannot account for the severity of the Great Recession. First, the timing is wrong: The Case-Shiller national home price index peaked in mid-2006, but the economy continued to grow near trend on average over the next two years. Sharp declines in real GDP did not occur until the fourth quarter of 2008 and the first quarter of 2009, which corresponded to the most intense period of the financial crisis. Moreover, absent the financial effects of the mortgage crisis, an explanation of the Great Recession based on the drop in housing prices would have to rely entirely on wealth effects. But, although pure wealth effects are symmetric, no consumption boom accompanied the earlier increase in house prices. Nor are standard estimates of wealth effects alone large enough to allow the house price declines to explain the depth and duration of the Great Recession. A different argument is that overly tight monetary policy in the fall of 2008 was responsible for the Great Recession. This claim relies on revised rather than the real-time data available to the Fed and assumes an implausibly large economic effect of small changes in policy. See Kohn (2022) for a discussion.

and more. Many of these institutions worked closely with the traditional banking system as well as with insurance companies and other large investors. More broadly, the financial system in the years before the GFC was considerably more complex, opaque, and internationally connected than it had been eighty years earlier.

Despite the structural changes over the decades, however, the basic functions of the financial system – most importantly, providing liquid media of exchange, sharing risk, and intermediating credit flows – did not change much. That raises the question of why shadow banking rose to such prominence. Shadow banks did sometimes seem nimbler than traditional banks, providing individual and institutional investors with new, often customized investment options and introducing innovative ways to manage risk and liquidity. However, for many firms the main advantage of being a shadow bank was the ability to escape the oversight of federal bank regulators, including the Federal Reserve. Indeed, outside the formal banking system, shadow banks often had little or no effective oversight; or, if they were regulated, it was by agencies, such as the Securities and Exchange Commission, whose focus is protecting individual investors from fraud and deception and preserving market integrity, not ensuring that shadow banks remained solvent. Shadow banks did not have access to some privileges enjoyed by traditional banks, most importantly federal deposit insurance and the ability to borrow short-term through the Federal Reserve's discount window, but most shadow bankers saw these limits as a small price to pay for less onerous regulation. Once the crisis began, however, the fact that the U.S. regulatory system was designed to handle crises in a bank-dominated system, rather than the system as it existed, meant that the crisis-fighting tools of the Federal Reserve and other agencies were mismatched with the most urgent needs. For example, shadow banks' lack of access to the discount window, not a concern in normal times, impeded the Fed's efforts to stop runs outside the traditional banking sector and to act as lender of last resort for the financial system as a whole.[13]

Despite the extensive structural changes in the financial system since the 1930s, the GFC and the ensuing recession can be understood within the same conceptual framework I used in my analysis of the Great Depression. Like the Depression, the GFC was a period of highly stressed credit markets, the result of losses that severely damaged the balance sheets of both lenders and borrowers. In the case of the Depression, the ultimate source of losses was the economic and financial damage caused by World War I; for the GFC, the problem began with a buildup of risk in housing and mortgage markets.

13. For a detailed narrative of the GFC and the policy response, see Bernanke (2015).

Before the more-recent crisis, poorly underwritten and inadequately regulated mortgages, typically extended to borrowers who would not qualify under traditional standards, had surged. Many were so-called private-label mortgages, issued and bundled into complex securities primarily by shadow banks. The increase in the demand for housing created by lax mortgage standards, together with speculative fever, helped induce a multiyear boom in house prices and construction. While it lasted, the boom protected mortgage issuers and investors, since borrowers who could not make their payments could sell their homes, repay in full, and have money left over. When the boom inevitably ended, however, the process went into reverse. Falling house prices implied that the dicey loans were no longer fully collateralized, and the indexing of the interest rates on many mortgages to short-term market rates exerted additional pressure on borrowers when market rates rose. Growing rates of default and foreclosure in turn created losses for financial institutions, whose increasing reluctance to lend further deflated house prices.

Runs on commercial banks were a prominent feature of the Depression. Because of deposit insurance, created by Congress in response to the bank runs of the early 1930s, there were few cases of ordinary depositors running on banks during the GFC. But runs were nevertheless a significant concern for financial institutions and regulators. At the time the crisis began, all the short-term funding of shadow banks and much of the short-term funding of traditional banks was obtained via instruments that were not government-insured and thus "runnable."[14] As providers of uninsured short-term funding to financial firms became concerned about those firms' exposure to risky mortgages, "silent" runs began.[15]

An early and important example was the run on asset-backed commercial paper (ABCP), commercial paper issued by passive investment vehicles that held a range of assets, including mortgages. Beginning in the summer of 2007, after high-profile investment funds that held subprime mortgages (among other assets) suspended withdrawals, investors progressively lost confidence in ABCP, refusing to roll over their commercial paper holdings or renewing them only at short maturities and at high yields. ABCP outstanding declined by 20 percent in August 2007 alone, and by a cumulative 30 percent by the end of the year (Covitz, Liang, and Suarez, forthcoming).

14. Banks rely on money-market instruments, such as commercial paper and repurchase agreements (repos), for a large share of their short-term funding. These instruments are not insured. In addition, federal deposit insurance applied only up to certain limits. Bernanke (2015) provides some discussion.

15. Financial firms could be exposed to mortgage risk directly, that is, because they held mortgages on their balance
sheet, or indirectly, for example, through derivative contracts tied to mortgage values, or through liquidity or credit guarantees to investment vehicles holding mortgages. Complex securitizations, sold in tranches, which could then be re-bundled in new securitizations, made it even more difficult for investors – or the firms themselves – to fully understand their mortgage exposures.

Runs on financial institutions' short-term funding were not confined to the commercial paper market. Gorton and Metrick (2010) have emphasized the damage wrought by what they called the "run on repo." Repurchase contracts (repos) are an important source of funds for many financial firms, including both shadow banks and traditional commercial banks. Although their contractual provisions are complex, repos are effectively very short-term loans, collateralized by securities. As Gorton and Metrick showed, important segments of the repo market began to experience runs as the crisis worsened. Unlike traditional runs, repo runs took several forms.

Besides refusing to roll over repo loans, lenders could protect themselves by shortening maturities, raising required yields, or demanding more and higher-quality collateral. Since borrowing firms had limited liquid assets usable as collateral, fulfilling these demands reduced the amount of funding they could obtain. As the crisis worsened, troubled firms found their access to the repo market increasingly constrained, with the very weakest firms at times unable to borrow even with Treasury securities as collateral.

Unlike in the 1930s, in part reflecting the lessons that policymakers took from the experience of the Depression, during the GFC runs did not result in widespread failures of major financial firms, the most important exception being the investment bank Lehman Brothers in September 2008.[16] However, many firms came close to insolvency and required government assistance to survive. Using emergency powers created during the Depression, the Federal Reserve lent large amounts to shadow banks as well as to traditional banks. Working primarily through the Fed and the Treasury, the government brokered the acquisition of the investment bank Bear Stearns by the commercial bank J.P. Morgan Chase; put the government-sponsored enterprises Fannie Mae and Freddie Mac into conservatorship; saved the massive insurance company AIG from bankruptcy with a loan collateralized by all of the company's insurance subsidiaries; and, eventually, created (with congressional assent) a program to inject capital into many banks, both large and small. The Fed and the Treasury also intervened extensively to protect the functioning of key credit markets, including the markets for commercial paper, mortgages, and asset-backed securities. Despite these efforts, which were far more forceful than the government's response during the Depression, financial firms shed large quantities of private credit assets in fire sales. The combination of fire sales and lenders' inability or reluctance to make loans caused the interest-rate spreads between nearly all types of private credit (not just mortgages) and safe government securities to rise sharply. The

16. Washington Mutual, a large savings and loan, also collapsed in 2008 following a run. Its banking subsidiaries were sold to J.P. Morgan Chase by the Federal Deposit Insurance Corporation.

full stabilization of the banking system occurred only when regulators administered so-called stress tests in the spring of 2009 (Bernanke, 2013). Banks that could not pass these tests were required either to raise sufficient private capital or to accept capital injections from the government. The successful stress tests persuaded the public that the government would ensure the solvency and stability of the banking system, much as Roosevelt's bank holiday had done.

As the financial system teetered on the edge, the flow of credit was further disrupted by borrowers' financial troubles, much as in the Great Depression. Lending to underqualified mortgage borrowers before the crisis contributed to greatly increased delinquencies, defaults, and foreclosures as the economy slowed and the interest rates on adjustable-rate mortgages rose. High foreclosure rates in turn sometimes created whole neighborhoods full of empty and neglected houses, further reducing house values. Some borrowers who were able to keep their homes found themselves "under water," that is, their homes became worth less than the outstanding balance on their mortgages. Actions by the Fed helped push mortgage rates to low levels, but homeowners with low or negative equity were unable to take advantage of lower rates by refinancing their loans. Even homeowners not in immediate danger of falling behind on payments cut discretionary spending and built up their savings if they could. Their hesitancy reflected not only fears about not being able to make mortgage payments but also the reduced availability and higher rates on credit card debt, auto loans, and other forms of consumer credit.

Researchers have documented that the mortgage crisis had severe effects on household

spending and saving during and after the GFC. Among the most comprehensive work is by Atif Mian and Amir Sufi, whose contributions include many academic articles as well as a book aimed at popular audiences (Mian and Sufi, 2014a). To identify the effects of the housing crisis on consumer behavior, Mian and Sufi often used geographical variation in key variables, such as the proportion of mortgages in an area classified as subprime. For example, using county-level data, they provided evidence that weakened household balance sheets explained a significant fraction of aggregate declines in consumption spending and employment (Mian and Sufi, 2014b).

Nonfinancial firms, another important class of borrowers, also experienced financial stress in the crisis. As credit markets dried up, many companies hoarded cash (for example, by drawing down existing credit lines with banks) and put their investment and hiring plans on hold. The Treasury bailed out two large automobile companies (Chrysler and General Motors) that came close to failing. Unlike the pandemic recession a dozen years later, which saw sharp increases in the number of startup firms, in

the GFC and Great Recession business formations declined significantly and remained low.17 Recognizing that the credit needs of nonfinancial firms were not being met, the Federal Reserve took the unprecedented step of extending its lending programs beyond the financial sector, for example, by backstopping the commercial paper market (which serves both financial and nonfinancial firms).

The weakened financial condition of lenders and the impaired creditworthiness of households and firms raised the external finance premium significantly during and after the crisis. One rough measure of the external finance premium, a measure of corporate credit spreads developed by Gilchrist and Zakrajsek (2012), displays an enormous spike around 2008, as does a measure of risk aversion (flight to safety) in financial markets as shown by my paper with Michael Bauer and Eric Milstein (forthcoming). The dislocations in credit markets sharply reduced credit growth. For example, bank credit outstanding relative to gross domestic product (GDP) fell 8.5 percent between the fourth quarter of 2008 and the fourth quarter of 2013, and *even in nominal terms* did not regain its December 2008 level for nearly three years. Hall (2010) found that the increases in financial "frictions" during the GFC, as reflected in higher interest rates and credit spreads, are sufficient to account for the observed decline in output and employment at the beginning of the Great Recession.

There has been some debate about whether the stress experienced by lenders (financial institutions) or that felt by borrowers (homeowners and nonfinancial firms) was the more important source of the recession. My work favors the former, while some researchers, notably including Mian and Sufi, have argued for the latter. My case that the near collapse of the financial system was quantitatively more important as a source of the economic contraction is laid out in Bernanke (2018). In that paper I used dynamic factor models to show that high-frequency indicators of lender stress are significantly better forecasters of output, consumption, employment, and other macro variables than indicators related to mortgage delinquency and housing. Technicalities aside, my argument boils down to timing relationships. Most importantly, although the National Bureau of Economic Research dates the beginning of the recession as December 2007, the Great Recession became "great" only during and after the intensification of the financial crisis in the fall of 2008. For example, in the eight months prior to the Lehman crisis (January 2008 to August 2008) – basically, the first eight months of the recession – the economy lost fewer than 1.2 million jobs in total. In contrast, in the eight months following Lehman (September 2008 to April 2009), nearly 5.4 million jobs were

17. Data are from FRED, Federal Reserve Bank of St. Louis.

lost, with additional sharp declines in subsequent months. Similarly, after growing modestly in the first half of 2008, real GDP fell at an annualized rates of 8.7 percent in the last quarter of 2008 and 4.7 percent in the first quarter of 2009, the sharpest post-World-War-II declines until the pandemic. I don't doubt that the financial problems of households and nonfinancial firms had significant, and probably long-lasting, economic effects. But the extraordinary deterioration of economic conditions after the Lehman episode points to the financial distress of lenders as the relatively more important driver of the downturn.

The debate about whether lender or borrower financial distress was the larger contributor to the Great Recession is relevant to the question of whether government resources were optimally deployed between helping lenders and helping borrowers.[18] However, whatever conclusion one comes to on this issue has no bearing on the broader claim that the Great Recession was initiated primarily by problems in credit markets. It is no doubt true that lender distress is more important in some credit crises and borrower distress in others, but that is a secondary point. For my purposes here, the key conclusion is that disrupted credit markets, the result of the financial stress experienced by both lenders and borrowers, were the principal source of the Great Recession. Moreover, the conclusion that credit-market disruptions helped cause the Great Recession adds credibility to the claim that the even more-severe problems in credit markets in the 1930s were a cause of the Depression.

If credit-market factors initiated the Great Recession, the question remains why the full recovery of the economy was so slow, as it was in the Depression. The unemployment rate, which peaked at 10 percent in October 2009, did not fall below 6 percent until five years later.

Real GDP grew slowly and did not regain its pre-crisis trend, suggesting that some of the output loss associated with the recession was permanent. As in the Depression, credit-market factors, together with other headwinds, may help explain the slow recovery. Even though financial institutions were strengthened by government capital injections and private capital raises, lenders remained exceptionally cautious for some years (especially in mortgage lending) – a reaction to the excessive

18. Parenthetically, I don't think the view held by some that the government prioritized helping lenders over helping borrowers is entirely fair. It is true that the speed at which the financial crisis unfolded required more attention to financial institutions early on. But sustained efforts were made, primarily by the Treasury, to help homeowners facing default and foreclosure. The longer-term results of these programs were disappointing, but the shortfalls were due more to logistical barriers (such as missing paperwork, inadequate capacity on the part of lenders to do millions of workouts or loan modifications in limited time, the difficulty of matching primary and the corresponding second mortgages, the difficulty of extracting individual mortgages from complex securitizations, and lack of borrower cooperation) and to constraints imposed by Congress than to a lack of desire on the part of policymakers to provide help. See Geithner (2014).

risk-taking before the crisis, tougher oversight by regulators, and sluggish demand for credit. That sluggish demand, and an associated increase in personal saving rates, in turn likely reflected in part the slow recovery of the finances of homeowners and other borrowers. As noted earlier, the delinquency rate on single-family mortgages, which had been about 2 percent before the crisis, rose to more than 11 percent in the first quarter of 2010 and declined only slowly over the next decade.[19] Besides the slow normalization of credit markets, reminiscent of the latter part of the Depression, other (non-credit) factors also impeded recovery. These included a sharp drop in private housing starts as the pre-crisis boom unwound; the effects of the zero lower bound on interest rates, which impeded the Fed's efforts to ease monetary policy sufficiently; an inadequate fiscal response which turned to austerity by 2013; and slow growth in the labor force and in labor productivity. Considering these headwinds, the slow recovery from the Great Recession, while intensely disappointing, is perhaps not so surprising.

CREDIT MARKETS AND "GARDEN-VARIETY" BUSINESS CYCLES

Credit-market disruptions not only help explain large economic contractions;, they can also help us better understand less dramatic, "garden-variety" business cycles.

In early work, Gertler and I (1989, 1990) examined the macroeconomic implications of asymmetric information between borrowers and lenders in simple dynamic models. In these models, there is two-way causation between the state of the economy and external finance premiums. For example, if an economic downturn (due, say, to an oil price shock or a decline in productivity) lowers average net worth, the external finance premium faced by the typical borrower will rise, for reasons laid out in Section I. The higher external finance premium in turn depresses aggregate borrowing and investment, propagating the economic downturn. In this setup, endogenous credit-market developments can cause an economic downturn to persist even if the shock that initiated the downturn was purely transitory and external to the financial system. Likewise, an improvement in the economy that increases borrower net worth and thereby lowers the external finance premium will tend to persist, because the improvement in credit availability resulting from a stronger economy in turn encourages borrowing, spending, and investment. The tendency of economic contractions or expansions to be extended by endogenous changes in the net worth of borrowers and, accordingly, in their external finance premium, has been dubbed the *financial accelerator*. The operation of a financial accelerator helps

19. Data are from the FRED, Federal Reserve Bank of St. Louis.

explain why relatively large and persistent fluctuations in the economy can result from relatively small and temporary shocks.[20]

An implication of the financial accelerator model is that borrowers whose external finance premiums are both large and cyclically sensitive will be more affected by changes in the macroeconomic environment than borrowers who face lower and less cyclical premiums. This pattern can explain the flight to quality, the tendency of financial institutions to direct a higher proportion of their lending to safer borrowers during bad economic times. As I have noted, the flight to quality is evident in periods of extreme stress, such as the Depression. Gertler, Simon Gilchrist, and I (1996) studied the flight to quality in more-normal periods. Using post-1958 data drawn from the Quarterly Financial Report of Manufacturing Firms, we found evidence that borrowing by smaller manufacturing firms is more cyclically sensitive than borrowing by larger firms. Since smaller firms presumably have higher and more cyclically sensitive external finance premiums, that finding is consistent with the theory. Our paper includes additional references to empirical work on the cross-sectional implications of models with asymmetric information for borrowing by firms and households.

The economic models developed by Bernanke and Gertler (1989, 1990) were highly simplified. A natural next step was to incorporate a financial accelerator in a reasonably realistic macro model, a task that Gertler, Gilchrist, and I undertook in a 1999 article. We included a financial accelerator mechanism in an otherwise standard new Keynesian model, allowing for cross-sectional differences in the external finance premiums of heterogeneous borrowers. As expected, we found that including a financial accelerator in the model leads to a more persistent response of the simulated economy to shocks. In addition, including credit markets, external finance premiums, and heterogeneous borrowers in the model allowed us to simulate the cyclical behavior of variables not usually included in small models, such as credit spreads and the relative proportions of safe and risky lending. In more recent work, Christiano, Motto, and Rostagno (2014) included cross-sectional risk in a model with a financial accelerator and found that those features were important for matching the behavior of their model with that of the real economy. Today, an increasing share of macroeconomic modeling by researchers inside and outside of central banks allows for endogenous changes in the external finance premium and other financial frictions to help replicate features of the real-world data.

20. In principle, changes in the net worth of lenders can also generate financial accelerator effects. Gertler and I chose to emphasize effects working through the net worth of borrowers, on the grounds that variations in the financial condition of borrowers are probably relatively more important in ordinary business cycles.

The financial accelerator mechanism can also help explain how monetary policy affects the economy. Gertler and I (1995) argued that the estimated effects of monetary policy on the economy seem too large to reflect only the changes in safe interest rates (Treasury rates, for example) induced by monetary actions. We posited that, in addition to affecting the economy by raising or lowering safe interest rates, monetary policy also works by moving the external finance premium in the same direction, which magnifies the economic effects of the policy. We called this proposed mechanism the *credit channel of monetary policy*. Intuitively, the credit channel of monetary policy is an application of the financial accelerator idea in which unexpected changes in monetary policy serve as the initiating shock. A tighter monetary policy, for example, hurts the balance sheets of both borrowers and lenders (reduces net worth) by lowering asset values and expected income flows and increasing loan delinquencies and defaults. From there a financial accelerator effect takes over. The induced increase in the external finance premium reduces credit extension, spending, and investment, slowing the economy by more than would be implied by the increase in the safe interest rate alone.

A small empirical literature has endeavored to test the credit channel hypothesis. For example, Kashyap, Stein, and Wilcox (1993) studied the composition of firms' external finance following changes in the stance of monetary policy. They found that tighter monetary policy induced firms to rely less on bank loans and more on market sources of funds, such as commercial paper, which they argue is consistent with monetary policy working in part through the supply of bank loans. Oliner and Rudebusch (1996) found that, after a monetary tightening, the credit received by small firms declines relative to that received by large firms, forcing small firms to rely more heavily on internal resources to finance capital investments. These findings are consistent with the credit channel hypothesis if, as found by Bernanke, Gertler, and Gilchrist (1996), small firms have relatively higher and more cyclically sensitive external finance premiums. More recently, Gertler and Karadi (2015) analyzed the behavior of asset prices in short windows of time around monetary policy announcements. They found that small movements in the Federal Reserve's policy rate often lead to large changes in credit costs and that, consistent with the credit channel, these changes reflect primarily changes in term premiums and risk premiums, rather than changes in the safe rate of interest. In an international context, a study by the International Monetary Fund found that a tightening of U.S. monetary policy leads to an economically significant decline in cross-border bank lending (Albrizio, Choi, Furceri, and Yoon, 2019). In short, the basic mechanisms at work in severe financial crises appear to have a role to play in less dramatic economic fluctuations as well. Much work remains to develop fully the implications of that insight for economic forecasting and policymaking.

CONCLUSION

The proposition that disruptions in credit markets can damage the economy, independent of purely monetary effects, seems uncontroversial today, especially since the Global Financial Crisis and the Great Recession. That was not always the case. Akerlof (2019), in an essay on the evolution of Keynesian economics, argued that the most serious omission in the framework developed by Keynes's successors – as influential as it became in policy and research – was the failure to pay sufficient attention to financial instability and financial crashes as a source of severe economic downturns. According to Akerlof, this omission – which contrasted with Keynes's own views, as set forth in Chapter 12 of the *General Theory* – was part of an effort to make Keynesianism more acceptable to contemporary economists and policymakers by minimizing the deviation of the model from its classical forebears.

Keynesians, of both the old and new varieties, were not the only school to neglect the role of financial instability. Economists committed to general equilibrium, market-clearing explanations of business cycles, who were wielding increasing influence when I was in graduate school, denied any independent role for credit markets in economic fluctuations. They saw financial markets as a "veil" – an accounting system whose only function was to keep track of contingent contracts among agents. Monetarists defended the centrality of the money supply for explaining fluctuations, for the most part taking account of other financial assets only to the extent that they influenced the demand for money. The development of models in which banking and credit markets could function poorly was left to economists working in finance (Diamond and Dybvig, 1983) and to theorists interested in the implications for markets of imperfect information and principal-agent problems (Townsend, 1979; Stiglitz and Weiss, 1981).

The goal of the research described in this lecture was to bring the new thinking on banking and credit markets into macroeconomics. The Great Depression, a longstanding interest of mine, seemed a natural starting point for making this connection because financial instability was a dominant feature of the period, and the monetarist hypothesis, despite its strengths, did not seem adequate to explain important features of that downturn. In work that followed my 1983 paper, much of it done with Gertler and Gilchrist, I tried to establish stronger theoretical and empirical foundations for integrating microeconomic analyses of banking and credit markets with traditional macroeconomic models.

Although macroeconomic research including credit-related factors became more common in the years after this work appeared, real-world events brought these issues to the fore. Since the Global Financial Crisis and the Great Recession dramatically demonstrated the economic dam-

age that can be wrought by extreme stress in banking and credit markets, research on the effects of financial factors on the behavior of households and firms, the dynamics of business cycles, and the transmission of monetary policy has exploded. Macroeconomic analyses increasingly include financial frictions – that is, factors that raise the costs of lending or trading in financial markets – and are finding that they are relevant in many economic contexts. A particularly interesting new literature has systematically studied the effects of financial crises on economic performance in many countries over long periods, typically finding that credit booms and busts can set off long and deep recessions (Reinhart and Rogoff, 2011; Schularick and Taylor, 2012).

From a policy perspective, this research strongly supports the efforts of policymakers since the Global Financial Crisis to monitor developments in credit markets more closely and to foster greater cooperation among financial regulators. Progress has been made in reducing the risk of financial instability, but shortcomings remain. Shadow banks are still allowed to take risks that traditional banks could not, and oversight of systemwide risks (macroprudential regulation) is not as strong or proactive as it ideally would be. Nevertheless, research on credit-market dysfunction has helped to clarify the issues and identify priorities. Overall, it appears that Akerlof's concerns about the omission of financial instability from macroeconomics may soon be remedied.

Appendix: Net worth, borrowing, and investment

This appendix briefly presents a stripped-down model that motivates an inverse relationship between borrower net worth and the ability to obtain credit. The model illustrates the type of agency problem studied in Bernanke and Gertler (1989, 1990). However, unlike those articles, this appendix does not attempt to embed this partial-equilibrium model of the market for loans in a dynamic, general- equilibrium setting.

In this model, the agency problem is the risk of moral hazard on the part of the borrower. The model assumptions are as follows:

1. There are M risk-neutral agents, $i = 1,\ldots, M$, who have identical preferences but differ in their initial endowments, $1 \geq wi \geq 0$.
2. There are two periods: an investment period and then a consumption period. All agents have access to a technology that allows them to "store" their endowments at a risk-free gross return r, resulting in second-period consumption rwi.
3. N of the M agents, $N << M$, are "entrepreneurs." Entrepreneurs have access to the storage technology but are also able to undertake risky investment projects. The entrepreneurs will be the potential borrowers in this model; the role of non-entrepreneurs is simply to guarantee that, in equilibrium, the opportunity cost of funds is r.
4. Each individual entrepreneur can invest in either a "good" project or a "fair" project (the reasons for the names will be evident shortly). Both types of projects require exactly one unit of endowment as input in the first period. To be viable, the good project also requires the entrepreneur to exert e units of effort, where a unit of effort carries disutility equal to the utility of one unit of consumption. The fair project requires no effort to operate. The choice of project and whether effort has been exerted are known only by the entrepreneur.
5. If undertaken, and with effort exerted, a good project produces R units of the consumption good in the second period with probability p; with probability $1–p$ it produces nothing. The fair project (which requires no effort) produces R units of consumption with probability q, where $q < p$, otherwise it produces nothing. Project outcomes are independent. We assume the expected value of the good project, less the cost of effort, equals or exceeds that of the fair project, that is,

$$(1) \qquad pR - e \geq qR$$

As projects require a unit of the consumption good as input, an entrepreneur with endowment w_i who wishes to undertake a project must borrow

$1 - w_i$ units. The necessary funds are obtained from competitive coalitions of non-entrepreneurs at fixed opportunity cost r. We can think of these coalitions as competitive, risk-neutral financial institutions who intermediate between savers and borrowers.

Following Bernanke and Gertler (1989, 1990), it is convenient to derive the optimal financial contract as follows. Assume that the entrepreneur initially turns over their endowment wi to the intermediary. The intermediary adds the $1 - w_{ii}$ units needed to fund the project. The intermediary then observes whether the project succeeds or fails. If it succeeds, the intermediary retains the output R and pays the entrepreneur C_s units of the consumption good. If the project is unsuccessful, the intermediary pays the entrepreneur C_u units of consumption. Note that these payments will in general be functions of the entrepreneur's initial endowment; for notational simplicity I suppress that dependence below. These contingent payments cannot depend on which type of project the entrepreneur undertakes or on whether effort is exerted, since these are observed only by the entrepreneur.

Let $C_p^*=pC_s+(1-p)\,C_u$ be the expected payout in consumption units to the entrepreneur if they undertake the good project and, analogously, be the expected payout if the fair project is undertaken. The intermediary's maximation problem is:

(2) $\max\{pR-r(1-w_i)-C_p^*\}$

Subject to

(3) $C_p^*-e\geq rw_i$

(4) $C_p^*\geq C_q^*+e$

(5) $C_s,C_u\geq o$

In (2), the expression in curly brackets is the intermediary's expected profit in terms of consumption goods, net of the opportunity cost of fully funding the borrower's project. Equation (3) is a participation constraint; it must hold to induce the entrepreneur to invest in the good project and exert effort rather store endowment.

Equations (2) and (3) are conditional on the entrepreneur choosing the entrepreneur chooses the good project. That is ensured by the incentive compatibility constraint, equation (4), which requires that the expected payment for choosing the good project be greater or equal to the expected

payment for the fair project plus the effort cost. (Assume the entrepreneur picks the good project if otherwise indifferent.) Equation (5) adds the assumption that agents' consumption cannot be negative in either state.

With risk-neutrality and independent projects, the zero-profit condition will hold borrower by borrower. Imposing zero profits yields

(6) $C_p^* = pR - r(1 - w_i)$

Equation (6) shows that the higher the entrepreneur's initial endowment, the higher the expected payment the intermediary will be able to offer.

Straightforward manipulation of the incentive-compatibility constraint, equation (4), using the definitions of and , yields

(7) $(p - q)(C_s - C_u) \geq e$

where $(p - q) > 0$. Holding constant at the value given by (6), and noting that Cu does not otherwise appear in (2) or (3), the difference between the left and right sides of inequality (7) is maximized by setting $Cu = 0$, its lowest possible value. Intuitively, since the good project succeeds more often that the fair project, the intermediary maximizes the borrower's incentive to undertake the good project by making the maximum possible payment when the project succeeds and the lowest possible payment (zero, by (5)), when the project fails.

If $C_u = 0$ then $C_p^* = pC_s$ Using (6), we can now write an expression relating Cs to the potential borrower's endowment:

(8) $pC_s = pR - r(1 - w_i)$

Equation (8) tells us that the higher the borrower's endowment, the more they receive when their project is successful. The question is whether the payment received for success is sufficiently large to induce the entrepreneur to undertake the good project and exert effort. Inserting (8) into the incentive-compatibility constraint (7) and rearranging yields

(9) $pR - r(1 - w_i) \geq \left[\frac{p}{p-q}\right] e$

The inequality (9), the condition needed for the entrepreneur to undertake the good project and exert effort, must be satisfied for a loan to be made. Entrepreneurs whose endowments *wi* satisfy (9) will receive loans; those with smaller endowments will not. For example, suppose $R = 16$, $p = .5$, $q = .25$, $e = 3$, and $r = 4$. Inserting these values into (9), we find that the condition is satisfied only for entrepreneurs whose endowment *wi* equals or exceeds 0.5. Entrepreneurs with smaller endowments will not get loans or be able to invest.

This example carries two lessons. First, to induce the entrepreneur to take the good project, the expected payment from the good project, net of the effort requirement, must exceed that of the fair project. But the expected payment to an entrepreneur with low endowment is constrained by the intermediary's zero-profit condition. Accordingly, for the low-endowment entrepreneur, the lender is thus not able to pay enough for successful outcomes to meet the incentive constraint. In short, getting a loan requires that the potential borrower have sufficient net worth.

Second, the incentive constraint could be met, even for a low-endowment entrepreneur, if it were possible for the payment in the unsuccessful state to be sufficiently negative (see equation 7). But that solution is ruled out by the non-negativity requirement for the entrepreneur's consumption. We conclude that, when a potential borrower is financially weak, the limited liability condition makes infeasible incentive arrangements that could otherwise attain the first best.

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