Comments and Discussion

COMMENT BY

BEN S. BERNANKE Brunnermeier and Krishnamurthy have provided an insightful analysis of federal credit policies during the pandemic crisis, especially those implemented by the Federal Reserve. Policymakers, responding to an unexpected crisis under great time pressure, have mostly focused on the operational details of their programs. It is very useful to have first-rate financial economists like Brunnermeier and Krishnamurthy think through the rationale and design of credit policies from first principles.

Their paper is actually broader than their title suggests, in that the authors consider a variety of actual and potential interventions besides emergency lending to corporations, including the Federal Reserve's response to the financial market crisis in March 2020 and strategies for supporting smaller firms. In that spirit, I will discuss this paper in the broader context of the full range of recent Federal Reserve financial and credit-market interventions. (I exclude monetary policy actions.) In particular, building on measures taken during the 2007–2009 global financial crisis (GFC), the Federal Reserve in the current episode has gone well beyond classic lender-of-last-resort doctrine by becoming a market maker of last resort and providing a credit-market backstop for nonfinancial borrowers. These responses are appropriate and constructive given the exigencies of the current situation, and I commend Federal Reserve Chair Jay Powell and colleagues for their rapid and proactive response. Still, we have a lot to learn about these new types of interventions, including how well they work and how they may change the roles and the capacity of the Fed and other central banks in the future.

FEDERAL RESERVE NONMONETARY INTERVENTIONS: BEYOND BAGEHOT The Federal Reserve and other central banks have three broad responsibilities: (1) conducting monetary policy to meet macroeconomic objectives, which

in the era of the effective lower bound includes managing not only the short-term policy interest rate but also tools like forward guidance and quantitative easing; (2) regulating and supervising the financial system; and (3) maintaining broad financial stability. Historically, central banks fulfilled this third responsibility largely by serving as a *lender of last resort to the financial system*, in the sense of Bagehot (1873). Banks and similar institutions engage in maturity transformation, borrowing short and lending long, which makes them subject to runs when short-term funding providers lose confidence. Left unchecked, runs may result in asset fire sales, credit contraction, and, possibly, failures of even fundamentally solvent institutions. By standing ready to lend liberally against collateral to solvent institutions—the Bagehot doctrine—central banks can help end panics, or at least buy time for government or the banks themselves to find solutions.

The Federal Reserve was created by the US Congress in 1913, a time when banks dominated credit markets, primarily to serve as a lender of last resort to the banking system. The Fed's normal lending powers were accordingly restricted to banks. In the GFC, the Fed faced a mismatch between its authorities and the needs of the financial system. Some of the most severe liquidity problems occurred at nonbank financial institutions ("shadow banks"), which by the time of the crisis had become a large part of the US credit system. However, by invoking emergency lending powers granted by Section 13(3) of the Federal Reserve Act and by using other authorities, such as the ability to execute currency swaps with foreign central banks, the Fed provided liquidity (directly or indirectly) to a wide range of financial institutions.

Although the pandemic crisis is not centered in the financial system, at least not so far, the severity of the shock and the attendant uncertainty has created financial strains. The Federal Reserve has accordingly replicated most of the GFC playbook to provide liquidity to financial institutions. It has introduced more favorable terms on the discount window, a standing facility that provides loans to banks and thrifts. In addition, it has resurrected the GFC-era Primary Dealer Credit Facility, which lends to major broker-dealers, a facility that encourages banks to provide liquidity to money market mutual funds, and currency swaps that allow fourteen foreign central banks to supply dollars to institutions in their own jurisdictions. All of these programs were used successfully during the GFC. In this current episode, the Fed has also created a facility that lends to banks against small-business loans issued under the Small Business Administration's Paycheck Protection Program (PPP).

However, the Federal Reserve's nonmonetary interventions in the current crisis go beyond the traditional lender-of-last-resort function in two principal ways. These nontraditional interventions also have precedents in the Fed's response to the GFC, but, reflecting the special features of the coronavirus crisis, in scope and scale they have gone substantially beyond the policies of a dozen years ago.

First, in the pandemic crisis the Federal Reserve has actively served as *market maker of last resort*, standing ready to buy securities in key markets when limits on capital, liquidity, or risk tolerance have inhibited normal market making or arbitrage by private actors. Most notably, in March 2020, the economic uncertainty created by the onset of the pandemic led investors to shed longer-term securities, including Treasury securities, in a rush to deleverage and build liquidity. Constrained by capital requirements, risk limits, and other factors, the dealers who normally serve as market makers could not absorb this sudden increase in supply, leading to intense bouts of illiquidity and volatility (Duffie 2020). Serving as market maker of last resort, the Federal Reserve calmed markets by buying large quantities of Treasury securities and securities backed by residential and commercial mortgages. Additionally, the Fed set up a repurchase agreement (repo) facility that allowed foreign official institutions to borrow against their Treasury holdings, thereby making it unnecessary to sell their securities to raise cash.[1]

Market making of last resort could also describe the Federal Reserve's efforts, dating to September 2019, to stabilize repo markets. The spikes in repo rates and the associated funding shortages that began that month should, in theory, have been arbitraged by banks and other liquidity suppliers, but once again capital rules and other constraints prevented that. The Fed engaged in large term-repo operations that provided needed liquidity to that market and led to calmer conditions. Those efforts continue.

Second, with the approval of Congress and financial support from the Treasury, the Federal Reserve has become the *lender of last resort to nonfinancial borrowers*, backstopping key credit markets. Some of the programs in this category were again reprised from the GFC era, notably the Commercial Paper Funding Facility (CPFF) and the Term Asset-Backed Securities Loan Facility (TALF). But other programs were without precedent, at least in the United States—buying corporate bonds and lending directly (on a longer-term basis) to corporations; lending to states, cities,

1. This is known as the FIMA repo facility, for foreign and international monetary authorities.

and counties; and lending (through banks) to medium-size nonfinancial businesses (the Main Street Lending Program).

Like the authors, I interpret this backstopping of private credit markets serving nonfinancial borrowers as a form of after-the-fact insurance. The onset of the pandemic posed very large, and largely undiversifiable, risks for lenders and investors, which—at least initially—appear to have exceeded the risk-bearing capacity of private funding providers. The Federal Reserve's backstopping of these credit markets, with the fiscal support of the Congress and the Treasury, aimed to resuscitate private lending by signaling that the government was prepared to cap creditors' losses and by eliminating "run-like" equilibria in which no one lends for fear that no one else will lend. Because of their signaling aspect, backstop programs of this type may need only to be announced to be successful, with no actual loans required. However, if private lending does not resume, then the backstop program stands ready to provide credit to nonfinancial borrowers.

Table 1, drawn from the Federal Reserve's H.4.1 report as of the day of the conference (June 25, 2020), gives a sense of the relative sizes of the three types of interventions.[2] The top portion of the table shows Fed liquidity injections without Treasury participation, measured as changes from the Fed's holdings from a year earlier. The bottom of the table shows Fed lending programs backed by Treasury capital as authorized by the Coronavirus Aid, Relief, and Economic Security (CARES) Act. In the bottom portion of the table, the left column is net lending by program and the right column shows announced commitments of Treasury capital to each program.

Assigning these programs to my tripartite classification, I interpret the first three lines of the table (Federal Reserve purchases of Treasury bonds and mortgage-backed securities, and repo operations, including FIMA repo operations) as market-making operations of last resort. These interventions are very large, totaling more than $2.5 trillion. The remaining lines in the top of the table—central bank swaps, primary credit (the discount window), the Primary Dealer Credit Facility, and lending to banks to finance PPP loans—I count as traditional lender-of-last-resort activities aimed at providing liquidity to financial institutions. I also count the money market facility in the bottom of the table as a traditional lender-of-last-

2. Updates of the H.4.1 report on which this table is based are available weekly at www.federalreserve.gov. For a regularly updated summary of usage of Federal Reserve lending programs provided by the Yale Program on Financial Stability, see https://som.yale.edu/blog/use-of-federal-reserve-programs-06112020.

Table 1. Federal Reserve Interventions

	Change from June 26, 2019	
US Treasury securities	2,073,175	
Mortgage-backed securities	389,459	
Repurchase agreements	73,129	
Central bank liquidity swaps	276,679	
Primary credit	7,101	
Primary dealer credit facility	3,980	
Paycheck Protection Program	59,374	
	Net lending	*Treasury contribution*
Money market facility	21,389	1,500
Commercial paper facility	4,252	10,000
Corporate credit facilities	8,710	37,500
Main Street facility	0	37,500
Municipal facility	1,200	17,500
Term asset-backed securities facility	0	10,000

Source: H.4.1, June 25, 2020.
Note: Figures are in millions of US dollars.

resort facility, even though it is Treasury backed, because it was intended to forestall what looked to be nascent runs on money market mutual funds. These activities add up to just under $375 billion, with the currency swaps accounting for the bulk.

In contrast, credit-backstop loans to the nonfinancial sector—the remaining items in the table—are small, totaling only about $14 billion. This low usage reflects in part that several of these programs are just in the process of taking applications as I write but also that, as discussed, credit-backstop programs can succeed without actually making loans if they reassure private lenders and thereby restore normal activity in markets.

EVALUATING THE THREE TYPES OF INTERVENTIONS I turn now to a brief assessment and discussion of the Federal Reserve's interventions in the pandemic crisis. I will also relate these interventions more directly to the Brunnermeier and Krishnamurthy paper.

Unlike the GFC, the current crisis did not begin in the financial sector, and—at least so far—financial institutions remain well capitalized and liquid. As can be seen in table 1, traditional lender-of-last-resort activity as reflected in borrowing from the discount window (primary credit) and the Primary Dealer Facility has thus been relatively low. During the GFC, to reduce the stigma of borrowing from the discount window, the Fed

created a facility that auctioned discount window credit (the Term Auction Facility).[3] It is indicative of the lack of concern about the banking system that, in this episode, the Fed has seen no need to reinstate that facility, even though the discount window likely remains at least somewhat stigmatized.

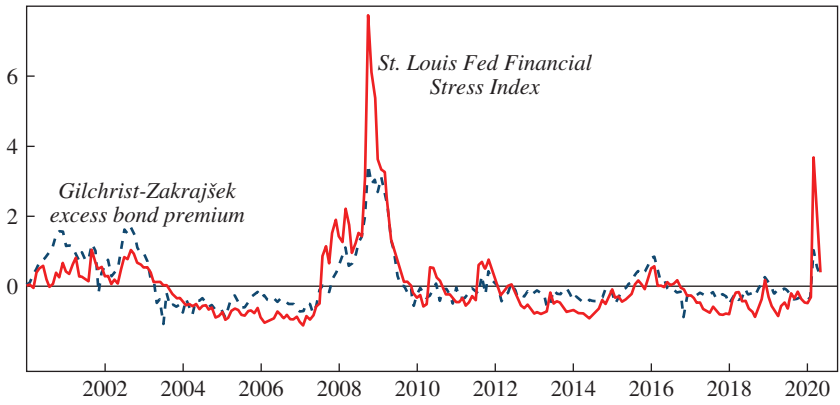
The Federal Reserve's money market facility, which through banks indirectly provides liquidity to money market mutual funds, has recorded some take-up, helping to reduce pressure on the funds and to limit the risk of runs. Quantitatively, though, the Fed's most important traditional lender-of-last-resort operation this time has been its currency swaps with foreign central banks. Globally, many banks both borrow and lend in US dollars, including branches of foreign banking organizations doing business in the United States but also foreign banks operating in dollar markets elsewhere. Early this year many foreign banks faced a shortage of dollars, both because they lost dollar deposits but also because many customers, concerned about their own cash flows, drew down their dollar-denominated credit lines (Cetorelli, Goldberg, and Ravazzolo 2020). As in the GFC, Fed currency swaps provided foreign central banks with dollars to on-lend to their own commercial banks, significantly reducing this pressure and mitigating spillovers into US markets. As Brunnermeier and Krishnamurthy discuss, while traditional lender-of-last-resort activities were central to the response to the GFC, they have been relatively less important in the current crisis.

The Federal Reserve's market-maker-of-last-resort interventions have also succeeded so far. The authors document that the equity risk premium spiked during the deleveraging crisis in March, then normalized following the Fed's aggressive purchases of Treasury bonds and mortgage-backed securities. Since both the origins of the problem and the Fed's interventions were in fixed-income markets rather than the stock market, it is instructive to look at indicators of the behavior of bond markets. Figure 1 shows two such indicators: (1) the Federal Reserve Bank of St. Louis's Financial Stress Index, which aggregates 18 variables but is dominated by interest rates and interest rate spreads, and (2) the Gilchrist-Zakrajšek (GZ) excess bond premium, a measure of the premium that investors demand (with default risk held constant) to hold corporate bonds.[4] These measures also

3. Borrowers from the Term Auction Facility paid what was effectively a market rate rather than the Federal Reserve's discount rate, which may be one reason that it was not stigmatized.

4. The financial stress index is available at https://fred.stlouisfed.org/series/STLFSI2. For a discussion of the GZ excess bond premium, its forecasting properties, and a link to current data see Favara and others (2016).

Figure 1. Financial Market Conditions, 2000–2020



Sources: Favara and others (2016); Federal Reserve Bank of St. Louis.

show a sharp deterioration in financial conditions in March 2020, though not as severe as in late 2008. Conditions improved significantly after the Fed began large-scale securities purchases. However, according to the bond-based indicators in figure 1, the stress had not entirely reversed by May, in mild contrast to Brunnermeier and Krishnamurthy's finding using the equity risk premium.

The credit-market backstops for nonfinancial borrowers are the most novel interventions and get the most attention in the paper. Like the authors, I focus on two potential recipients of Federal Reserve–Treasury credit: large corporations, with access to stock and bond markets, and smaller businesses, without such access.

As the authors point out, the Federal Reserve's announcement of facilities to buy corporate bonds on the secondary market and to make loans directly to corporations substantially improved the functioning of investment-grade bond markets, even before any actual purchases. The authors see the effects of Fed corporate-bond purchases as analogous to the effects of quantitative easing, but because there can be no portfolio balance effects without actual purchases, this comparison seems inappropriate. A closer analogy is to the Outright Monetary Transactions (OMT) program of the European Central Bank (ECB), which was announced after Mario Draghi's "whatever it takes" promise in July 2012. Under the OMT, the ECB stood ready to buy the sovereign debt of troubled members of the eurozone, subject to some conditions. The announcement signaled that

the ECB was willing to intervene to cap losses, and thereby it ruled out bad equilibria in which expectations of default became self-confirming. This signal was sufficient to calm sovereign debt markets—and lowered yields by several percentage points in some cases—without the ECB having to purchase any securities at all. By the same token, the Fed's primary and secondary corporate lending programs did not actually have to extend credit to succeed; it only had to convince private investors that it would lend if necessary.

An interesting question is whether the restoration of normal functioning of corporate credit markets should be the only goal of federal credit policy for large firms. The authors' modeling shows why additional steps may not be necessary. Assuming that the bankruptcy process is operating reasonably well (courts are not too overcrowded and debtor-in-possession, or DIP, financing is available), a Chapter 11 filing allows a troubled firm to reorganize its finances, without damage to its underlying productive capacity. And while bankruptcies do have costs, so does the failure to reorganize a nonviable firm. Accordingly, the authors argue, the best public policy may be to strengthen the bankruptcy process (by ensuring DIP financing is available, for example) and to allow financially stressed large firms to move quickly through Chapter 11.

The authors' basic point is an important one. Early in this crisis, when there was some hope that the pandemic would pass quickly, many saw the goal of policy as "freezing" the economy in its initial state, until safe reopening could occur. Now that the effects of the pandemic seem likely to be longer lasting, policymakers must recognize that not only financial reorganization but also the reallocation of capital and labor from sectors most hurt by the virus to other parts of the economy is likely to become increasingly necessary. That said, I still worry that, without further interventions, too many large firms (from a social perspective) will go bankrupt in the next year or two. First, for most large firms, bankruptcy is not as frictionless as simple models assume. Besides creating direct legal and administrative costs, which will increase if the courts are overwhelmed, bankruptcy may depreciate organizational capital and intangible assets, such as brand names. It also puts into limbo, at least for a time, explicit or implicit contracts with workers, suppliers, and customers (for example, warranties), imposing costs on those counterparties and possibly leading to the breakup of valuable matches. Second, under normal circumstances, the inability to service debt is usually a strong signal about a firm's ability to make profits in the longer run. In the current situation, however, that may or may not be true, depending in large part on the evolution of the

pandemic. And while the pandemic and recession may go on for a while, it is certainly possible that better insight will be available relatively soon about the economy's prospects, and in particular about the long-run viability of some major industries, such as brick-and-mortar retail, leisure and hospitality, and tourism. For these reasons, quick recourse to Chapter 11 may not be the best alternative in many cases.

Policy approaches have been suggested that could reduce inefficient bankruptcies in the near term while still responding to market forces in the longer run. For example, in preliminary work, Stein and others (2020) have argued that the government should finance large corporations in need of support by taking a subordinated position (for example, preferred stock plus warrants) rather than by purchasing senior debt. This approach puts less pressure on firms to reorganize in the short run but gives the taxpayer more upside if the firm ultimately proves viable. Metrick (2020) proposes that the government should subsidize business interruption insurance for businesses hit by the pandemic. These insurance policies would be "stapled" to private loans or bonds and would pay the creditor if the pandemic intensifies, as measured by official government shutdowns or predetermined biomedical indicators. Metrick's proposal separates undiversifiable pandemic risk from ordinary business risk, with the government bearing the costs only of the undiversifiable pandemic risk. Especially if such policies were time limited, they could mitigate pandemic-induced bankruptcies in the short run without protecting firms that are nonviable, due to public health concerns or other reasons, in the longer run.

What about small and medium-size enterprises (SMEs), which typically do not have access to public debt markets? Here I agree with the authors that premature bankruptcy—which in most cases closes firms, rather than reorganizing them—can be very costly. The costs extend beyond the direct losses to the owner/entrepreneur, employees, and customers to encompass the broader reduction in aggregate demand and possibly permanent scarring effects, including the erosion of laid-off workers' skills and efficiency losses from greater market concentration. In contrast to their conclusions about larger firms, the authors recommend that credit to SMEs be subsidized—reflecting credit-market imperfections and externalities. This conclusion seems right to me, and their approach has been apparent in the subsidized PPP, for example.

The Federal Reserve is attempting to support SMEs with its Main Street Lending Program (MSLP), in which banks do the underwriting and the Federal Reserve takes a 95 percent share in the resulting loans. Since most SMEs do not have access to public markets, unlike larger firms benefiting

from the corporate facilities, the simple announcement of the MSLP cannot by itself solve the problem of restoring normal credit flows to this group of borrowers. The program will accordingly be judged in large part by the amount of lending it does.

Will the MSLP work? As I write, the program has just opened, so conclusions are premature. However, the terms of the program have already been eased several times, and concerns remain that the program will not be sufficiently attractive to banks or borrowers. English and Liang (2020) make this case in a recent paper, suggesting amendments that could lead to greater use of the facility, at some increase in expected costs to the Treasury. Their conclusions seem quite consistent with those of the authors: smaller firms without access to public markets need more help, including subsidies or grants.

A funding-for-lending program, such as the ECB's successful targeted long-term refinancing operations, is an alternative that could be run in parallel with the MSLP. In a funding-for-lending program, the Federal Reserve and the Treasury could provide funds at a very low rate to banks to finance marginal loans made to qualifying borrowers. This approach makes the subsidy explicit and eliminates the need for the Fed to impose, effectively, a second set of underwriting standards and loan terms for loans made under the program.

CONCLUSION The pandemic crisis presents new challenges for economic policymakers. The Federal Reserve has responded creatively, going beyond its traditional lender-of-last-resort role (and expanding its GFC tool kit) to serve as a market maker of last resort and as a backstop for credit markets serving nonfinancial borrowers. Though public health policies are by far the most important for the economy and financial system in this episode, the Federal Reserve (alone and in collaboration with the Treasury) is helping the US and global economies weather this storm. Brunnermeier and Krishnamurthy provide a useful framework to help us better understand the rationales for these new policies and how they might be improved.

REFERENCES FOR THE BERNANKE COMMENT

Bagehot, Walter. 1873. *Lombard Street: A Description of the Money Market*. London: Henry S. King.

Cetorelli, Nicola, Linda S. Goldberg, and Fabiola Ravazzolo. 2020. "How Fed Swap Lines Supported the U.S. Corporate Credit Market amid COVID-19 Strains." Blog post, June 12, Liberty Street Economics, Federal Reserve Bank of New York. https://libertystreeteconomics.newyorkfed.org/2020/06/how-fed-swap-lines-supported-the-us-corporate-credit-market-amid-covid-19-strains.html.

Duffie, Darrell. 2020. "Still the World's Safe Haven? Redesigning the U.S. Treasury Market after the COVID-19 Crisis." Working Paper 62. Washington: Hutchins Center on Fiscal and Monetary Policy at Brookings. https://www.brookings.edu/wp-content/uploads/2020/05/WP62_Duffie_v2.pdf.

English, William, and J. Nellie Liang. 2020. "Designing the Main Street Lending Program: Challenges and Options." Working Paper 64. Washington: Hutchins Center on Fiscal and Monetary Policy at Brookings. https://www.brookings.edu/wp-content/uploads/2020/06/WP64_Liang-English_FINAL.pdf.

Favara, Giovanni, Simon Gilchrist, Kurt F. Lewis, and Egon Zakrajšek. 2016. "Updating the Recession Risk and the Excess Bond Premium." FEDS Notes. Washington: Board of Governors of the Federal Reserve System. https://doi.org/10.17016/2380-7172.1836.

Metrick, Andrew. 2020. "Proposal for Dual-Trigger Insurance + Loan (DTIL) Program." Mimeo, Yale University, June 9.

Stein, Jeremy, Sam Hanson, Adi Sunderam, and Eric Zwick. 2020. "An Evaluation of the Fed Treasury Credit Programs." Webinar, Bendheim Center for Finance, Princeton University, May 11. https://bcf.princeton.edu/event-directory/covid19_15/.

GENERAL DISCUSSION Nellie Liang began the discussion by noting that this paper has an interesting insight about the importance of trying to help small and medium-sized enterprises (SMEs) avoid high-cost failures. Liang pointed out that the restructuring costs of an SME failure may not be about the size of the firm but instead whether the firm's owner has pledged all of their personal assets to the business. Liang mentioned the Main Street Lending Program, set up by the Federal Reserve and the Treasury, which lends to firms with lower debt burdens, but measures SMEs by the number of employees of the firm. She asked the authors if they had any thoughts on better indicators to use to identify the firms for which extensions of credit would be most helpful.

Wendy Edelberg brought up the importance of who is taking the losses from bankruptcies of small versus large firms. She noted that losses will have to be taken by someone in both cases. For large firms, the losses could be taken by the equity holders and debt holders. For small firms, Edelberg was surprised that the authors suggested that owners would not be able to absorb any losses.

Raghuram Rajan suggested that any thinking about the costs of bankruptcy must account for the unusual circumstances. He commented that many otherwise viable firms will accumulate a lot of debt because they have temporarily shut down. Given this, Rajan proposed that current debt holders would want to restructure quickly. He asked why Brunnermeier and Krishnamurthy do not believe that debt restructuring and bankruptcy

will not operate more efficiently now than in normal circumstances. If the market did not become more efficient, Rajan wondered whether making out-of-court restructuring faster and easier would be worth a lot more effort.

Şebnem Kalemli-Özcan said that while it is true that not a lot is known about the financing of SMEs in the United States, there is a lot more known about it in Europe. In Europe, the largest form of financing for these firms is bank loans, not corporate bonds. She argued that this fact implies that it is vital to save all SMEs by closing the credit shortfall. She acknowledged that there is still the question of how long support to SMEs should last. The wage bill of SMEs is equal to 13 percent of United States GDP, she noted, so policy must make the decision whether to save them all at a large expense or find a way to separate solvent firms with liquidity problems from insolvent firms.[1] She wondered what the authors' views were on this option.

Janice Eberly brought up the similarities between the issues in this discussion and the earlier discussion about labor reallocation and zombie firms, mentioning the importance of whether this is a short-run or long-run shock and wondering how much flexibility can be built into policy to account for that uncertainty. Eberly suggested that the authors should respond to Ben Bernanke's points about alternative policies to their proposed debtor-in-possession financing facility.

Markus Brunnermeier began his response to the discussion by thanking discussant Ben Bernanke for providing an outline of the classification of the recent Federal Reserve credit policies. Brunnermeier agreed that Federal Reserve policies played a big role in solving the market liquidity problems in March 2020. He and Krishnamurthy think of the Federal Reserve backstop as insurance, decreasing the chance of problems stemming from multiple equilibria.

Brunnermeier pointed out two uncertainties that are important for the analysis. First, because the future path of the economy is uncertain, there is some value to keeping firms alive. Second, the eventual length of the pandemic itself carries uncertainty. Because of these uncertainties, there is a difference in the incentives for equity owners and planners. Equity owners want to avoid the costs of bankruptcy and maintain their call options on their equity. He argued that the desire of equity owners to keep the firm

1. Thomas Drechsel and Şebnem Kalemli-Özcan, "Are Standard Macro Policies Enough to Deal with the Economic Fallout from a Global Pandemic?," policy brief 25, Economics for Inclusive Prosperity, March 2020, https://econfip.org/policy-brief/are-standard-macro-policies-enough-to-deal-with-the-economic-fallout-from-a-global-pandemic/.

alive can distort investment behavior, including worker retention. Instead of keeping their workers, owners may focus their resources on paying off debt and restructuring.

Brunnermeier highlighted that one of the main messages of the paper is that there are two classes of firms, each with a different set of costs to restructuring. For SMEs, these costs are very, very high. However, for larger firms, where management is done by equity holders, Chapter 11 bankruptcy is essentially just replacing one set of equity holders with another set of equity holders. In this second case, the distortions from shortsighted investments are much bigger than the legal costs of bankruptcy.

In regard to Jeremy Stein and others' proposal, Brunnermeier said that it is a very interesting way to maintain flexibility with so much uncertainty about the future.[2] He worried that pricing the warrants in Stein and others' plan would be very challenging. He suggested that taxing firms more heavily later on, effectively making the government an equity owner, would be an easy way to implement the program. It would retain flexibility and also have some future payoff to the government.

Responding to Liang, Brunnermeier acknowledged that, in this paper, size is a proxy for firm type. The important distinction between large firms and SMEs is whether the owner can inject equity into the firm or not. This is what will determine the ease of restructuring. He added that one way to measure this in the data would be to observe the financial resources of the main equity holders to see if they have the wealth to inject equity.

Brunnermeier agreed with Edelberg that who takes the losses is a big question. Citing Chapter 11 bankruptcy and the oil firm example from this paper, he described a process in which a firm filing bankruptcy gets a new name and nothing else in the firm really changes. In this case, the equity holders of the firm would be wiped out and debt would be restructured, but the management would be the same. Brunnermeier said that he and Krishnamurthy found that the cheapest way to get more efficient outcomes for this type of firm is to find ways to reduce the costs of restructuring.

Returning to Kalemli-Özcan's point about Europe, Brunnermeier said that he sees value in learning from Europe, in particular from the European Central Bank's targeted longer-term refinancing operations program, which allows banks to borrow at very low, negative interest rates. He referenced

2. Jeremy Stein, Sam Hanson, Adi Sunderam, and Eric Zwick, "An Evaluation of the Fed Treasury Credit Programs" [webinar], Bendheim Center for Finance, Princeton University, May 11, 2020, https://bcf.princeton.edu/event-directory/covid19_15/.

an earlier proposal that is in the paper for the Federal Reserve to create a similar program to help SMEs get funding and to give banks a strong incentive to participate. Brunnermeier urged that this program should be complemented with use of the countercyclical capital buffer. He said that it is important to have a big enough equity stake as rates would be negative if banks pass along the funding. It is also very easy to issue equity at this time with equity prices being very high. He said that it is important to capitalize on this possibility.

Arvind Krishnamurthy responded to Rajan's comment, saying that a finding of the paper is that the benefits of credit subsidies in today's circumstances are ambiguous. However, he noted that the paper finds that subsidizing and reducing bankruptcy costs is unambiguously beneficial. Krishnamurthy said that if policymakers are deciding where to spend a dollar, he and Brunnermeier believe that the marginal value of the dollar is highest if it is put toward reducing bankruptcy costs. Therefore, he suggested, that would be the place to spend. Krishnamurthy concluded by thanking the commenters and thanking Bernanke for his discussion.