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What Assets Should Banks Be Allowed to Hold?

Institutions that finance long-term assets with demand deposits serve a useful role but should be limited to small holdings of publicly traded securities

V. V. Chari and Christopher Phelan*

University of Minnesota and Federal Reserve Bank of Minneapolis

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Abstract
Banks are vulnerable to self-fulfilling panics because their liabilities (such as demand deposits and certificates of deposit) are short term and unconditional, and their assets (such as mortgages and business loans) are long term and illiquid. To prevent wider financial fallout from such panics, governments have strong incentive to bail out bank debt holders. Paradoxically, expectations of such bailouts can lead financial systems to rely excessively—from a societal perspective—on short-term debt to fund long-term assets. Fragile banking systems thus impose external costs, and regulation may therefore be socially desirable.

In light of this fragility and cost, we examine two of the major theoretical *benefits* from the reliance of the banking system on short-term debt: (1) *maturity transformation* and (2) *efficient monitoring* of bank managers. We argue that while both justifications may be compelling, they point us to financial regulations very different from the ones currently in place. These theoretical justifications suggest that the assets funded by banks should not have close substitutes in publicly traded markets, as is currently the case.

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Introduction

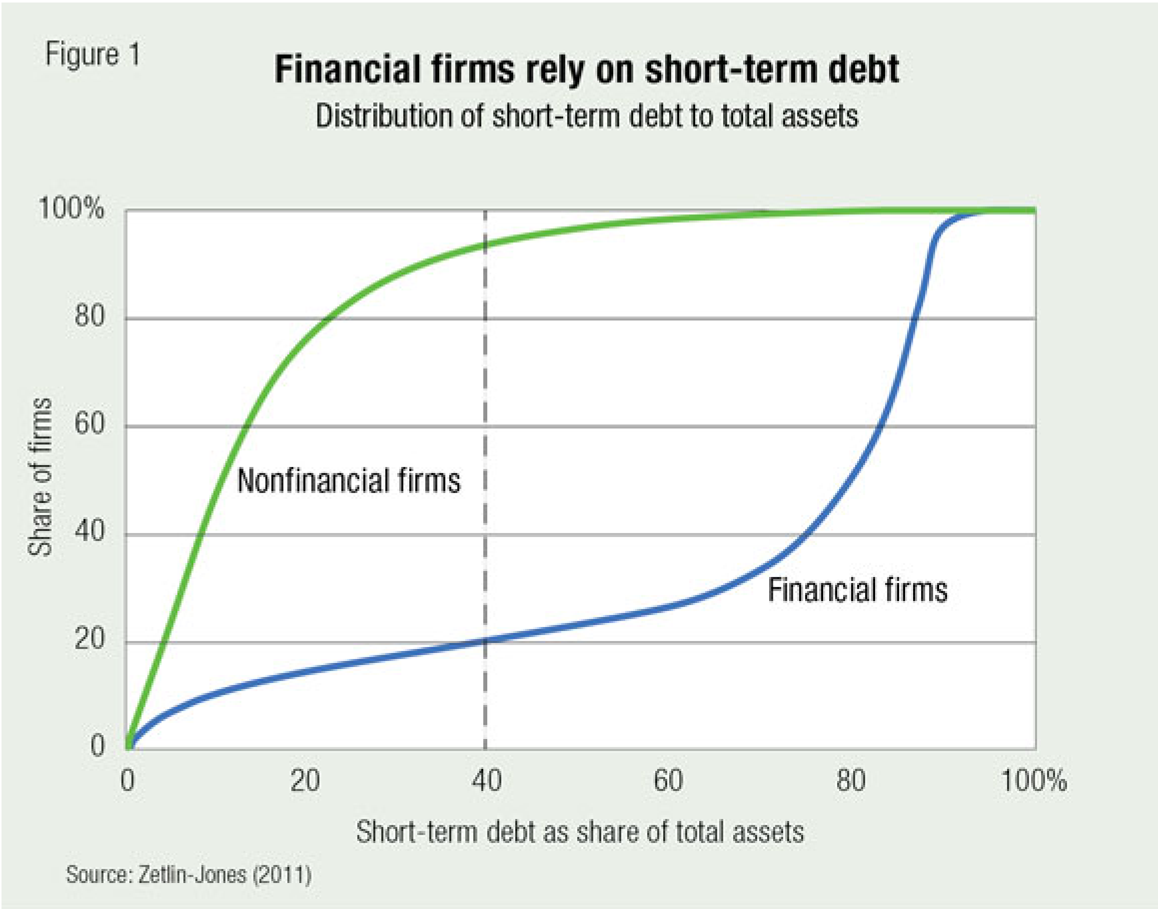
The enormous direct and indirect costs of rescuing banks and related financial institutions during the financial crisis of 2007-08 generated widespread policy debate on future banking regulation, resulting in part in the Dodd-Frank Act of 2010. Largely absent from these discussions was a careful reexamination of the services that banks provide and whether they are sufficient justification for the inherent financial fragilities of banks and the societal costs of this fragility.

The inherent fragility of banks

In what sense are banks and similar financial institutions fragile? Answering this question requires understanding the balance sheets of financial institutions more generally. The assets of financial institutions are, by and large, financial assets, and claims on them are primarily financial liabilities. They hold few tangible assets such as land, buildings or machinery. Their financial assets consist mainly of promises to deliver dollars at future dates (and perhaps then only under certain circumstances). Among such assets are stocks, bonds and the notes on mortgages and business and consumer loans, as well as an array of more exotic financial instruments such as derivatives. Likewise, their financial liabilities consist mostly of a variety of obligations to deliver dollars at particular dates, under certain circumstances.

Some types of financial institutions, particularly banks, have liabilities that are mostly short term and unconditional. For example, banks issue demand deposits, which promise to pay a fixed amount of money whenever a depositor demands a withdrawal. Likewise, banks issue certificates of deposit (CDs), which promise to pay a fixed amount of money at a particular (usually very near-term) date. Typically, banks rely on the rolling over of CDs, when they mature, into new CDs. In this sense, a failure to roll over a short-term CD can be thought of as equivalent to a withdrawal from a deposit account.

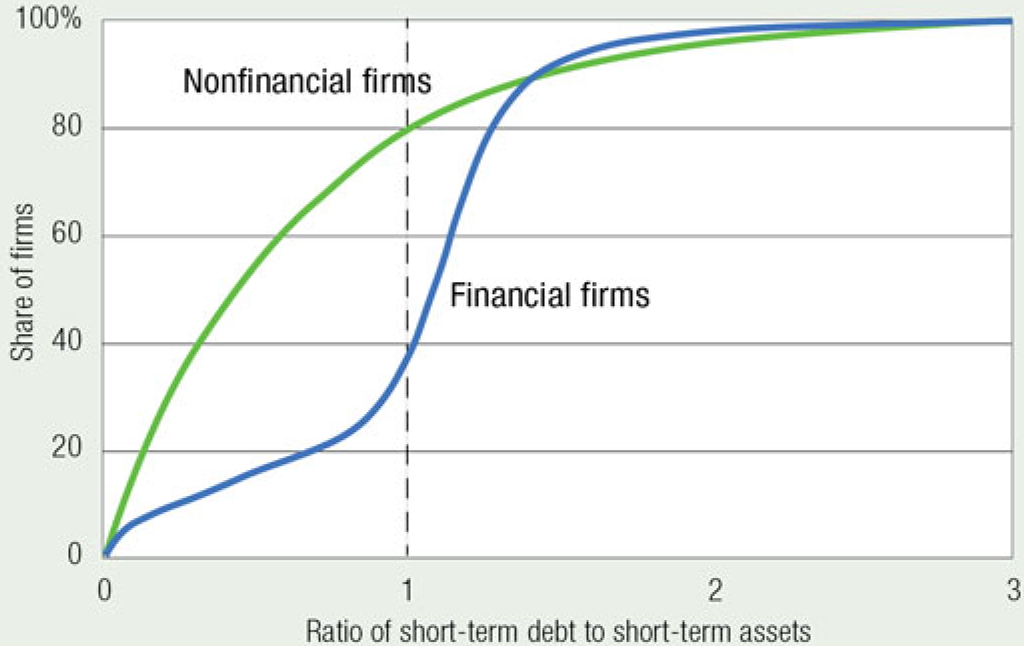
In Figure 1, we display the distribution of firms—financial and nonfinancial—by their ratio of short-term debt to total assets, for all publicly traded companies. This figure shows that financial firms typically have much higher levels of short-term debt relative to total assets than nonfinancial firms. For example, 80 percent of financial firms have a ratio of short-term debt to total assets greater than 40 percent, while only 10 percent of nonfinancial firms do (see vertical dashed line).



In Figure 2, we display the distribution of firms by their ratio of short-term debt to short-term assets, again for all publicly traded financial and nonfinancial firms. Firms that have ratios greater than 1 are using short-term debt to finance holdings of long-term assets. The figure shows that nonfinancial firms are far less likely than financial firms to use short-term debt to finance their holdings of long-term assets—less than 20 percent of nonfinancial firms depend on short-term debt, while roughly 60 percent of financial firms do so.

Figure 2 **Financial firms more likely to finance long-term assets with short-term debt**

Distribution of short-term debt to short-term assets



Source: Zetlin-Jones (2011)

The bulk of these financial firms with high levels of short-term debt are legally structured as banks. From an economic standpoint, the financial firms we focus on in this policy paper are those with high levels of short-term debt, and for convenience we'll refer to them all as *banks*.

This reliance on short-term debt makes banks fragile in the sense that they are particularly vulnerable to the risks of insolvency and the possibility of confidence crises. Since bank assets are usually much longer term than their liabilities and since the value of these assets fluctuates, a bank's net worth (its assets less its liabilities) also fluctuates a great deal.

Furthermore, a bank's assets are typically illiquid. A bank cannot easily and quickly sell its portfolio of small business loans, home equity loans or jumbo mortgages, for instance, to satisfy an unexpected surge of withdrawals from demand deposit accounts. The illiquidity of banks' assets and the demandable structure of their liabilities thus expose banks to crises of confidence. Since a bank typically will not be able to meet the demands of all depositors within a short period of time should they all choose to withdraw, banks are vulnerable to self-fulfilling panics in which depositors withdraw their funds simply because they believe other depositors will do so.

This panic is an entirely rational response even if the bank is solvent (though illiquid). If a depositor suspects that other depositors will withdraw their funds in the near future, it is rational for that depositor to rush to the bank and withdraw his or her deposits before other depositors can do so. But since this logic holds for all depositors, banks are subject to self-fulfilling panics in which the belief in a run causes the run.

In the midst of such self-fulfilling panics, governments have a strong incentive to intervene to bail out debt holders of banks in order to prevent the entire financial system from failing. Paradoxically, expectations of such bailouts can increase the incidence and depth of financial crises because once depositors believe that their deposits will be protected by general tax revenues in the event of potential systemic failure, they have less incentive to monitor the risk-taking proclivities of bank managers.

Bank managers, in turn, have increased incentive to take on risk, knowing their failures are implicitly insured—taxpayers (not banks themselves) bear the full consequences of this risk-taking. Given that the banking system rationally chooses to take on risk, the possibility of insolvency of the banking system increases, and the need for bailouts rises.

In this way, expectations of bailouts can lead financial systems to rely excessively—from a societal perspective—on short-term debt to fund long-term assets. Fragile banking systems thus impose external costs, and regulation may therefore be socially desirable.

The benefits of banks

Why then do we allow banks—financial institutions that fund long-term assets with short-term debt—to operate? One answer is historical: The very ubiquity of banks throughout history suggests that they serve a valuable function. But the world has much changed since the invention of banks. In particular, the range of economic activities that can be funded through publicly traded assets has expanded enormously. For instance, in the not-too-distant past, publicly traded mortgage-backed securities did not exist. In light of these changing circumstances, it is worth examining how long-term assets should be funded and the role banks should play in funding such assets.

Given that we have already discussed the weaknesses or *costs* of such financial institutions, we'll now use economic theory to examine the possible social *benefits* of having a financial system in which illiquid assets with volatile values are funded by demand deposits and short-term debt. This cost-benefit analysis allows us to ask how modern economic theory can be used to design better regulatory systems for banks. This issue is clearly of pressing importance given the central role that banks are argued to have played during the recent financial crisis. This issue is also of central importance given the importance of banks to financial systems throughout the world.

We examine the role of banks and the role of regulation by considering, in turn, two of the major theoretical justifications for the reliance of the banking system on short-term debt:

- Demand deposits allow banks to engage in socially useful *maturity transformation*.
- Demand deposits allow for *efficient monitoring* of bank managers.

We argue that while both justifications may be compelling, they point us to financial regulations very different from the ones currently in place. Specifically, they suggest that while it may be important to have institutions that finance long-term assets with short-term debt, the assets that are so funded should not have close substitutes in publicly traded markets.

Our logic is as follows: The economic case for regulating such institutions at all is due to the external *costs* they impose. But any such regulation should also, to the extent possible, preserve the *benefits* that economic theory suggests they convey. We argue that these benefits exist only when these institutions hold assets which do not have close substitutes that are traded in public markets. Indeed, our analysis suggests that bank assets having close publicly traded substitutes *destroys* the possible social benefit of banks under the maturity transformation view and *reveals* the social benefit to be zero (or small) under the efficient monitoring view. Thus, institutions that issue short-term debt should be allowed to hold only a limited amount of publicly traded assets.

Theoretical justifications of banking

We now provide closer consideration of the two primary theoretical justifications for a banking system that relies on short-term debt. We first describe and then assess the *maturity transformation* rationale, and then we turn to the notion that demand deposits permit *efficient monitoring* of bank managers, again starting with a description followed by our assessment.

Maturity transformation

Banks are often said to perform a miracle of financial alchemy referred to as *maturity transformation.* They are thought to hold long-term assets that yield a high rate of return and finance these assets with short-term claims (such as deposits) that pay a higher rate of return than what those depositors could earn if they invested directly in short-term assets (such as very short-term bonds).

Such a form of financial alchemy implies that those who roll over their short-term claims until the maturity of the long-term asset will necessarily receive a lower rate of return than if they had directly held the long-term asset. In effect, maturity transformation is a redistribution of resources from those who roll over their short-term claims to those who redeem such short-term claims early. Why would this financial alchemy be socially desirable?

Diamond and Dybvig (1983) developed a model in which such maturity transformation is desirable and possible. Furthermore, they showed that the arrangement that delivers such maturity transformation resembles banks in the sense that (at least conceptually) households get access to their funds whenever they want to, so that the liabilities of banks resemble demand deposits, while the assets of banks are long term and illiquid. (See Appendix A-1 for a simplified technical description of the model.) The basic idea in their model is that the redistribution of resources associated with maturity transformation is desirable because such redistribution allows for insurance. If people are not sure whether they will need resources *only* at the maturity of long-term assets *or* at a date prior to maturity, they may wish to insure themselves by accepting a lower return at maturity in exchange for a higher return should they instead desire their funds sooner.

An assessment of the maturity transformation view

While Diamond and Dybvig's model provides important insights into the possibility of maturity transformation, the mechanism rests on an increasingly implausible feature of the model: *nonbank* financial institutions do not *also* hold assets such as the mortgages and mortgage-backed securities typically held by banks as part of their transformation role [a point originally made by Jacklin (1987)]. Put simply, if it is possible for households to hold the long-term assets of banks outside the banking system, the ability of banks to perform maturity transformation is destroyed, along with the social benefit from doing so. (For technical discussion of this point, see Appendix A-2.)

As we show in Appendix A-2, if people can hold long-maturity assets outside the banking system, they have strong incentives to do so. If they happen to not need funds prior to maturity, they can obtain higher returns than under maturity transformation since they are not subsidizing those who need their funds sooner. If they happen to need their funds sooner, they can simply sell their holdings of these long-term assets to customers of the banking system who do not need their funds until maturity. Further, these customers will be willing to sell to them. Recall that such bank customers were promised relatively low returns for funds held long term inside the banking system and relatively high returns if they needed their funds earlier. But for these customers, the event they were insuring against—that they would need their funds early—did not occur. After they know this, they have strong incentives to trade with those outside the banking system in order to achieve higher returns. Analysis of the Diamond-Dybvig model under this alternative assumption—that the assets typically held by banks are also traded in public markets—demonstrates that banks cannot provide the social benefit associated with maturity transformation.

Recent data on holdings of U.S. financial institutions show that, indeed, market trading of such assets is increasingly common.

Figure 3 shows mortgages and mortgage-backed securities held by bank and bank-like entities in the United States relative to their stock of financial assets (typically known as bank credit). Note that such assets constitute almost 50 percent of bank financial assets over the past decade.

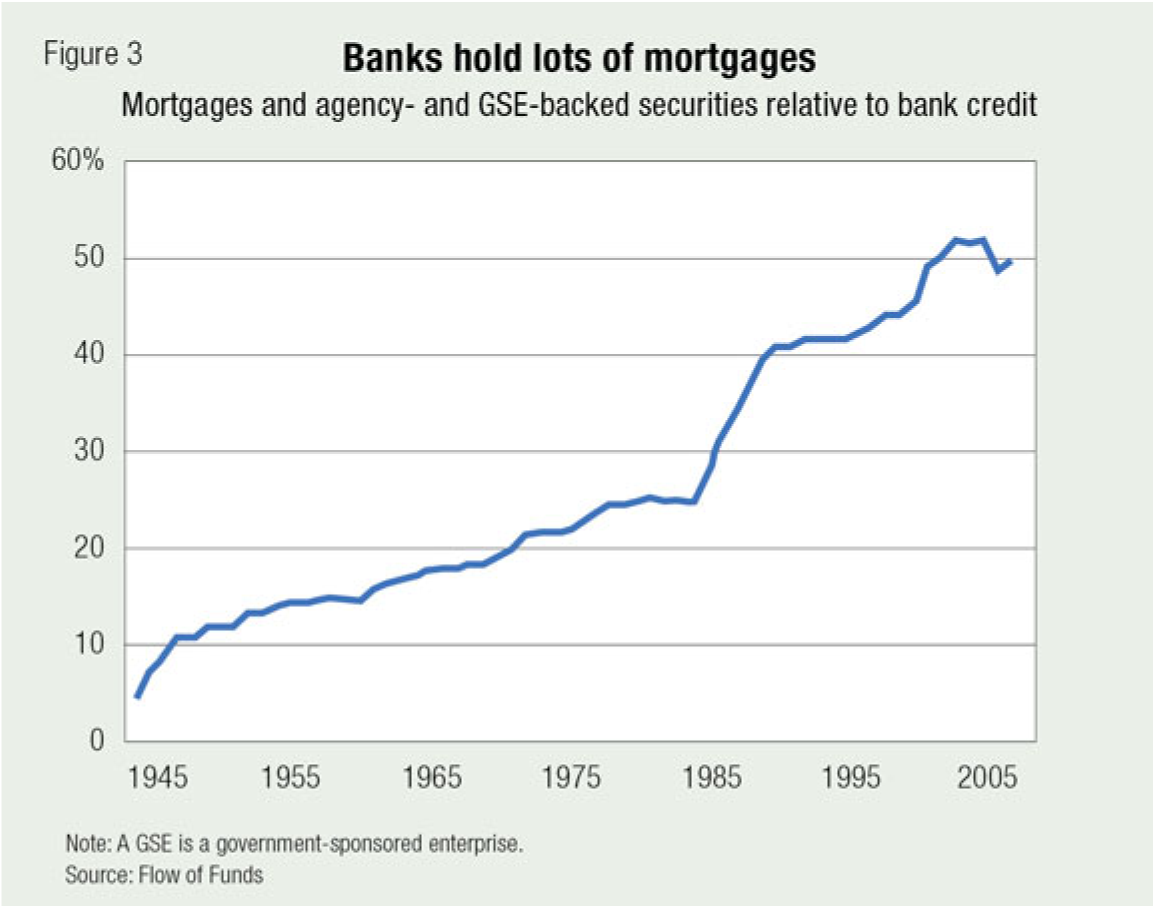
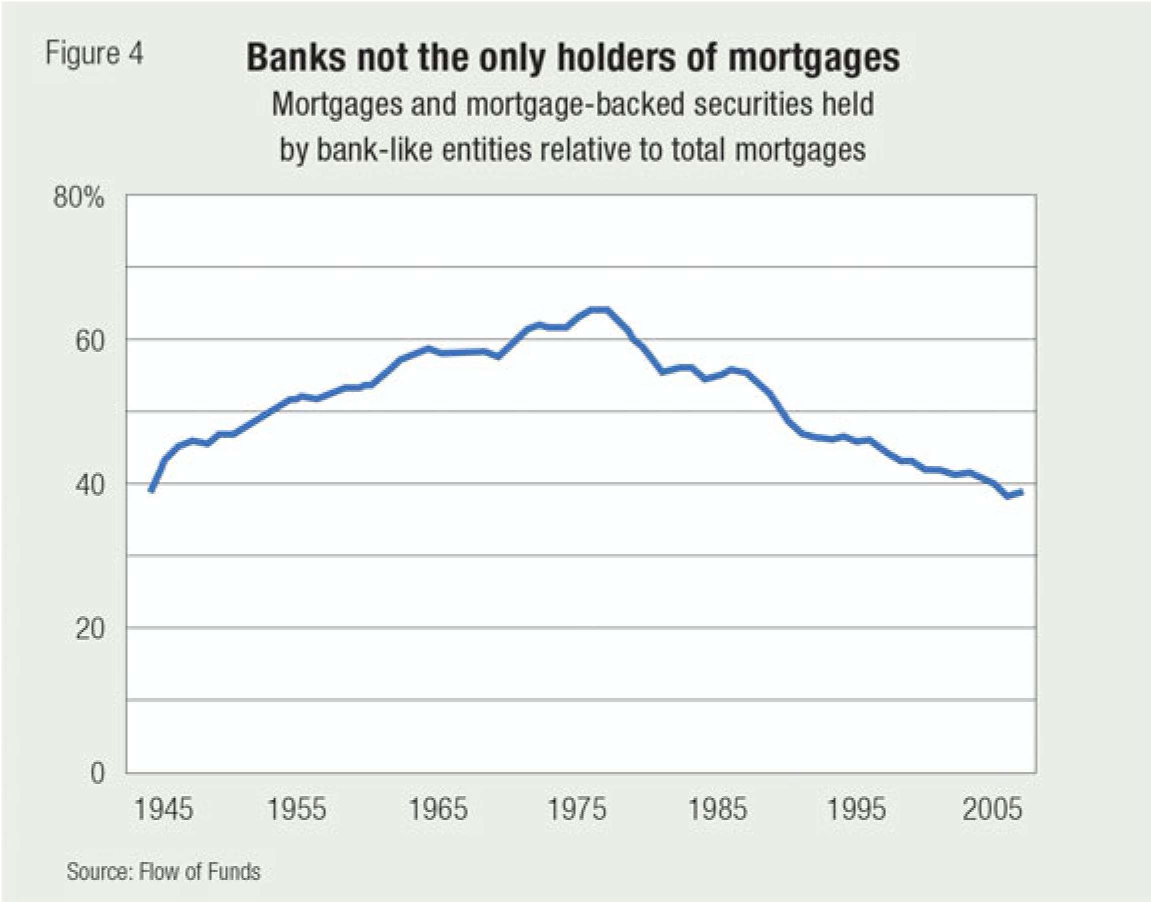
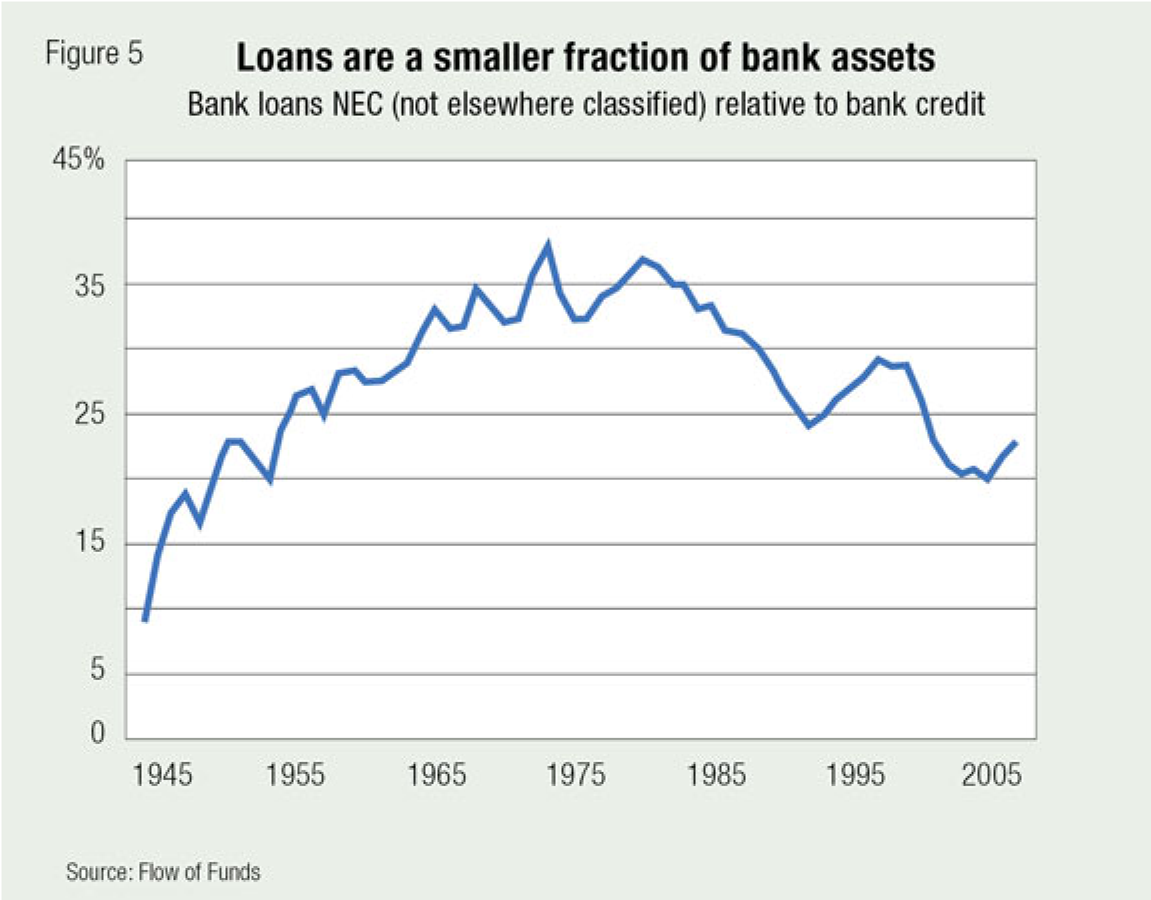


Figure 4 shows the total outstanding stock of mortgages and mortgage-backed securities held by banks and bank-like entities relative to the total stock of mortgages. Note that these banks and bank-like entities hold only about 40 percent of the total outstanding stock of mortgages over the past decade, and that share has declined steadily since the late 1970s. That is, institutions that are very different from banks now hold a very significant and rising share of the total outstanding stock of mortgages. Such institutions do not fund their assets with short-term debt.



In this sense, the ability of banks to achieve maturity transformation is severely limited by the holdings of close substitutes by other institutions. Figure 5 shows bank loans for commercial and industrial purposes relative to the stock of financial assets (again, typically known as bank credit) held by banks. Such bank loans may well not have close publicly traded substitutes. But they also make up only one-quarter of bank assets. This perspective suggests that if we view maturity transformation as the principal reason for the existence of banks, the United States could do very well with a banking sector just a quarter the size it now is.



Efficient monitoring

Over the past 25 years, a theoretical literature has emerged arguing that short-term debt and the associated possible runs on financial institutions may in fact be an efficient way of allowing markets to incorporate information that investors have about returns on financial assets. [See Chari and Jagannathan (1988), Calomiris and Kahn (1991), Diamond and Rajan (2001) and Zetlin-Jones (2011).]

The basic idea is that some investors often have access to information about the returns on financial assets and that this information is valuable to other investors and financial markets as a whole. Efficient arrangements will then have to provide such investors with incentives to obtain and act on this information, and those incentives may require market mechanisms that provide higher returns to those investors compared with others. These differential returns can be efficiently provided through "bank runs" in which early withdrawers ("sophisticated" investors who have relevant information through their close monitoring of managers) get higher returns than late ("uninformed") withdrawers. [See Appendix A-3 for a simplified technical discussion, using the Calomiris-Kahn model (1991).]

One way of implementing the efficient arrangement outlined above is to think of assets being provided and being funded by demand deposits. The demand deposits allow all investors to withdraw their assets at will. In normal times (when sophisticated investors receive favorable signals about the bank's returns), all investors wait to withdraw their assets at maturity and receive the same return. In crisis times (when sophisticated investors get unfavorable signals), large withdrawals occur. Those who choose to withdraw early receive a higher rate of return than those who wait until maturity. The observation that investors who withdraw early get a higher return resembles a bank run and therefore creates a crisis for the bank.

An assessment of the efficient monitoring view

The efficient monitoring view of the social usefulness of banks rests crucially on the idea that it is difficult to set up alternative methods of compensating sophisticated investors and/or efficient managers. But, in fact, this assumption may be unrealistic. For example, one could easily imagine various kinds of equity claims as well as combinations of equity and debt that could provide sophisticated investors with appropriate incentives to monitor the activities of managers. One could also imagine compensation contracts for managers that are tied to the market valuation of their assets. Such mechanisms are widely used in firms whose claims are traded in public markets.

On the one hand, to the extent that close substitutes to the assets held by banks are traded in public markets, the marginal value of having banks fund these projects as well is likely to be small since these assets would likely be funded by public markets even if banks did not exist. On the other hand, the costs of banks—in the form of crises and their associated bailouts (as well as the changes in bank risk-taking behavior induced by the expectation of bailouts)—are clearly quite large.

In this sense, under *both* the efficient monitoring and the maturity transformation views, banks provide significant social value *only* when the assets they hold do not have close substitutes that are traded in public markets. Bank assets having close publicly traded substitutes *destroys* the possible social benefit of banks under the maturity transformation view and *reveals* the social benefit to be zero (or small) under the efficient monitoring view.

Finally, the efficient monitoring view also poses a severe challenge to those who view bailouts as necessary for the proper functioning of financial markets. Note that under the efficient monitoring view, crises do occasionally occur, and, at the time of the crisis, if governments were particularly concerned about the well-being of unsophisticated investors, bailouts of all investors would be considered desirable. But if such bailouts are anticipated, sophisticated investors have no incentive to monitor banks when such monitoring is costly. Absent such monitoring, either valuable projects will not be undertaken or, given the expectations of large transfers from the government, inefficient projects will be undertaken.

Implications for policy

To answer the question “Do we need banks?” we first need to answer the question “What are banks?” Guided by the data, we have chosen to think of banks as institutions that hold long-term, illiquid, volatile assets and issue large amounts of short-term debt to finance these assets. Given the possibility of bank crises, this institutional arrangement seems puzzling on the face of it. Nevertheless, we need to take seriously the observation that such institutions have been a durable part of the economic landscape for many centuries and, arguably, have played a significant role in the industrial revolutions the world has been fortunate enough to experience.

Both the maturity transformation and the efficient monitoring views suggest that it may desirable to fund long-term assets that have no close substitutes in publicly traded markets with short-term debt. Both views also suggest that the social value of funding long-term assets that have close publicly traded substitutes with short-term debt is small. Given the costs imposed by crises and attendant bailouts, both views suggest that it may be desirable to allow these institutions to issue short-term debt *only* if their assets do not have close publicly traded substitutes. Otherwise their benefits are either zero or negligible.

These implications suggest policies that are dramatically different from those undertaken by most bank supervisors or various forms of international regulation under the Basel agreements. Current supervisory systems encourage banks to hold assets with close substitutes for publicly traded assets by giving such assets lower risk ratings and by requiring less equity capital to back up these assets. These supervisory systems encourage the banking system to hold publicly traded assets that are risky in the full knowledge that if the returns on these assets are poor, governments will step in to bail out short-term debt holders.

The framework for regulatory policy implied by our analysis would lead to a banking system that is radically different from the one we currently have. Institutions that issue large amounts of short-term debt relative to their assets would be regulated and required to hold relatively little of their assets in publicly traded securities.

This new system would not eliminate all crises. Indeed, we have argued that bank runs may well be an essential ingredient of an efficient economic system. In all likelihood, however, the crises of this new system would be much smaller and less costly than those we have experienced in the recent past. One reason: The volume of assets backed by short-term debt would be dramatically smaller under our proposed system than under the current system.

The economic theories explored in this paper suggest we do need banks. These theories also point us to constructive ways in which we can reform the financial system to make it more efficient and to minimize the spillover costs imposed on the broader economy by crises that affect particular financial institutions.

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Appendix A-1

Maturity transformation in the Diamond-Dybvig model

In their stylized model, Diamond and Dybvig (1983) suppose that a large group of risk-averse households lives for three periods (dates $t = \{0,1,2\}$). At date t=0, each household has one apple. If this apple is planted at date t=0 (that is, invested) and left untouched for two periods, it becomes R>1 apples in period t=2. However, if the apple is “uprooted” in t=1, it remains one apple.

Households can be one of two types: patient or impatient. A patient type cares only about the total quantity of apples it eats over periods t=1 and t=2. Assume that this household’s payoff is $u(c(1)+c(2))$, where $c(1)$ is consumption at period t=1 and $c(2)$ is consumption at period t=2.

An impatient type is identical except that it cares only about the total quantity of apples it eats in period t=1. (So this household’s payoff is $u(c(1))$.) Importantly, while at date t=0 all households know what fraction of the households will be patient (let this fraction be denoted p), no one knows which households will be patient or impatient. That is, each household sees itself as being in the patient group of households with probability p and being in the impatient group of households with probability $1-p$.

Since the two-period return dominates the one-period return ($R > 1$), if all households were known to be patient (instead of only fraction p of them), the efficient social arrangement for this model society would be for all apples to be untouched until period t=2. Further, households wouldn’t need to interact with each other in any way. Each could, on its own, “plant” its own supply of apples and harvest at period t=2.

But, if $p < 1$ (or fraction $1-p$ of the households are impatient), households can all benefit by interacting with each other. If a household cannot interact with other households, it will plant its apple and then eat one apple at t=1 if it is impatient and eat R apples at t=2 if it is patient.

Instead, suppose that households get together in large groups and agree that impatient households will eat $c(1)$ and patient households will eat $c(2)$. The only constraint such a group would face (assuming exactly p fraction will be patient) is that the group can afford the consumption plan $(c(1),c(2))$, or

$$(1-p)\ c(1) + p\ c(2)/R = 1.$$

If households were risk neutral, they would all agree to set $c(1) = 0$ and $c(2) = R/p$. This maximizes expected consumption (which, by definition, is all a risk-neutral household cares about) because none of the apples are harvested early. However, if households are infinitely risk averse (or care only about the minimum of $c(1)$ and $c(2)$), they will set $c(1) = c(2)$, which along with equation (1) solves for

$$c(1) = c(2) = R/(p + (1-p)R).$$

So, for instance, if R=2 and p = 3/4, then each household is promised 1.6 apples regardless of whether it is patient or impatient. In period 1, when the identities of the one-quarter of impatient households is determined, the group harvests 40 percent of the apples it planted (since 1.6 × (1/4) = .4). Then the remaining 60 percent of the apples are held to maturity, yielding exactly enough apples so that the remaining three-quarters of the households also consumes 1.6 apples (since 1.6 × (3/4) = .6 x 2). Note that for an infinitely risk-averse household, this arrangement (eating 1.6 apples regardless of whether the household is impatient or patient) is preferable to what it could have achieved on its own (eating one apple if impatient and two apples if patient). In fact, infinite risk aversion is not necessary. This arrangement is preferable to what a household could have achieved on its own as long as households are sufficiently (but not necessarily infinitely) risk averse.

Bank runs in the Diamond-Dybvig model

Like actual banks, the banks in this model can have runs. Suppose that when households ask for consumption in periods t=1 or t=2, they are randomly ordered, as if in a queue, and further, government policy requires that these "banks" deliver the promised $c(1)$ to any household that demands it as long as the household still has the resources (apples in the ground) to do so. Then two things can happen. First, if all the patient households believe the other patient households will ask for their consumption at t=2, they will be willing to go along and ask for their consumption at t=2 as well. Then the arrangement works exactly as described above: One-quarter of the households (the impatient ones) demand their apples at t=1.

But suppose instead that each patient household believes the other patient households will ask for their consumption at t=1. Then each patient household will foresee that there won't be any apples left at t=2. If all patient as well as impatient households ask for their apples at t=1, once the first 1/1.6 = 5/8 of the group demands their 1.6 apples, there will be none left. Any patient household that waits until t=2 to demand its apples will get none. But a patient household that asks for its apples at t=1 will get 1.6 apples with probability 5/8 (the probability of being sufficiently close to the front of the line that apples will still be left when the household gets served). It's better to get a 5/8 chance of some apples than a zero chance, so a patient household believing the other patient households will run on the bank will run as well.

Diamond and Dybvig argue that such logic justifies deposit insurance such as that provided by the Federal Deposit Insurance Corp. The rationale: If an outside entity ensures that each patient household will receive its 1.6 apples in period t=2 regardless of the behavior of the other households, such households have no incentive to demand early payment.

Appendix A-2

Infeasibility of maturity transformation when assets are publicly traded

Suppose that the households discussed in Appendix A-1 are allowed to buy and sell "apples in the ground" in period t=1. [Our argument builds on that in Jacklin (1987), Wallace (1988) and Farhi, Golosov and Tsyvinski (2009).]

Next, suppose that a group of households gets together and agrees to the $c(1) = c(2) = 1.6$ apples arrangement outlined above. (Call this group the bank and its customers.) Consider a household that is not a customer of the bank which plants its apple in the ground. If the household turns out to be patient, it lets its investment mature to period t=2 and eats two apples ($c(2)$=2). If the household turns out to impatient, rather than eating one apple at t=1, it sells the right to eat two apples at t=2 to a patient customer of the bank. Here, the patient customer withdraws at t=1 (and thus gets 1.6 apples from the bank) and gives these apples to the impatient noncustomer in return for its claim to two apples at t=2. The patient bank customer clearly prefers this arrangement to eating 1.6 apples at t=2. Further, as long as the noncustomer is not infinitely risk averse, it too is strictly better off by not being a bank customer, eating 1.6 apples if it is impatient and two apples if it is impatient. Note, then, that if the bank exists, all households will wish to exit it. This logic implies that when a market exists for selling apples in the ground, the only allocation that can be implemented is one in which impatient households eat one apple at t=1 and patient households eat two apples at t=2. Maturity transformation cannot be implemented.

Appendix A-3

Efficient monitoring in the Calomiris-Kahn model

Here we explain this basic idea using the Calomiris-Kahn (1991) model. In their model, the authors imagine a world where investing is fraught with moral hazard. For simplicity, assume that there are only three people, all of them risk neutral: A banker who has no apples, but does have access to a project (a loan opportunity), and two investors, each of whom has one apple. The first investor will be labeled the "sophisticated" investor and the second the normal investor. Further assume that the project needs two apples to start up.

The project yields $Y1$ or $Y2$ apples ($Y1<Y2$) in the following manner: First, with probability π the project becomes a good project (and with probability $(1-\pi)$ it becomes a bad project). Good projects yield $Y2$ with probability pg, and bad projects yield $Y2$ with probability $pb < pg$. So before it is known whether a project is good or bad, it yields $Y2$ with probability $\pi\ pg + (1-\pi)\ pb$.

What makes the project perilous is that (1) only the banker can see whether $Y1$ or $Y2$ actually occurs and (2) the banker can abscond with a portion of the resulting apples. In particular, after $Y = Y1$ or $Y2$ is realized, the banker can abscond with $A \times Y$ apples (where $A<1$) and the other $(1-\mathrm{A}) \times Y$ apples are simply destroyed. The fact that only the banker can see whether the good outcome $Y2$ or the bad outcome $Y1$ occurred implies that the payment from the banker to the investors can't depend on which outcome occurs. Call these payments PS and PN (for sophisticated and normal). To keep the banker from absconding if the outcome is Y, it is necessary that $Y - PS - PN$

>= $A \times Y$, or that the payoff to the banker if the bad outcome occurs is better than the banker's outcome from absconding. (Note that if $Y1 - PS - PN >= A \times Y1$, then $Y2 - PS - PN > A \times Y2$, since $Y2 > Y1$ and $A < 1$, or, in words, if the banker doesn't want to abscond when the project outcome is bad, then the banker also doesn't want to abscond when the project outcome is good.) Finally, assume each of the investors can simply store his apple in a riskless asset that returns S apples.

Suppose that $Y2 = 4$, $Y1 = 2$, $A = 1/10$, $\pi = .9$, $pg = .9$ and $pb = .1$. That is, the project yields four apples (from an investment of two apples) 82 percent of the time (since $.9 \times .9 + .1 \times .1 = .82$). Otherwise, the project simply returns the invested two apples. Given these numbers, investing in the project is socially useful. The expected outcome if two apples are invested in the risky project is $.82 \times 4 + .18 \times 2 = 3.64$ apples, while if the investors put their apples in the safe asset, the two apples become three apples.

But that it is socially useful does not imply investment in the project. Given the ability of the banker to abscond, the best the investors can do given these assumptions is to assume that the banker will abscond when $Y = Y1$ and set $PS + PN$ to the highest amount such that the banker won't abscond when $Y = Y2$, which implies $PS + PN = Y2 \times (1-1/10) = 3.6$. But since they receive this payment with only 82 percent probability, they receive, in expectation, $3.6 \times .82 = 2.952$ apples in return for their investment of two apples. But the investors can, on their own, transform their original two apples into three apples with no chance of the banker absconding. For these example numbers, the investors won't invest in the risky project (again, even though it dominates the safe investment in terms of expected return).

But now suppose that the sophisticated investor has another option. In particular, suppose that after it is determined whether the project is good or bad, but before the outcome of the project is realized, the sophisticated investor can, privately and at a cost $c > 0$, research the bank's investment. That is, if the sophisticated investor chooses to pay this cost, he gets to privately see whether the project is good or bad. Further, after seeing whether the project is good or bad, the sophisticated investor can call for the liquidation of the bank. If the investor does so, the bad outcome $Y1$ is ensured, but the banker can't abscond.

For these assumptions, investment is now possible. Now let the sophisticated investor research and call for liquidation if he sees the project as being bad. This changes the outcomes as follows. Before, there were two possible outcomes: (1) the good outcome occurred (with probability .82), allowing the investors to collect 3.6 apples, and (2) the bad outcome occurred and the banker absconded (with probability .18), giving the investors zero apples. Now, with the possibility of liquidation, there are three possible outcomes: (1) the project is liquidated (with probability .1), allowing the investors to collect 2 apples, (2) the good outcome occurs (with probability .81), allowing the investors to collect 3.6 apples and (3) the bad outcome occurs (with probability .09), giving the investors zero apples. This implies that the investors will, in expectation, collect 3.116 apples for their two-apple investment (which is greater than the three apples they can together receive if they invest in the safe asset).

What is left to be determined is how many apples each investor gets under liquidation and the good outcome. Since the expected return on the risky project (to the investors) is 3.116 apples, while both investing in the safe asset yields a total of three apples, as long as $c < .116$, there is always a way to split the apples collected such that the sophisticated investor finds it worthwhile to invest in the risky project and pay the research cost (rather than invest in the safe project or invest in the risky project but not research) and the normal investor finds it worthwhile to invest in the risky project as well, but not necessarily by a rule that splits these apples evenly.

That is, suppose that $c = .1$, the investors split the 3.6 apples in the good outcome evenly and, under liquidation, the investors split the two apples available given liquidation evenly. Then the expected payoff to the sophisticated investor is $(.81 \times 1.8 + .1 \times 1 + .09 \times 0) - .1 = 1.458$. He would prefer the safe asset. But suppose the sophisticated investor gets more than an even split in liquidation. In particular, suppose the sophisticated investor receives 1.5 apples if he calls for liquidation and the normal investor receives .5 apples. Then the expected payoff to the sophisticated investor is $(.81 \times 1.8 + .1 \times 1.5 + .09 \times 0) - .1 = 1.508$, and the payoff to the normal investor is $(.81 \times 1.8 + .1 \times .5 + .09 \times 0) = 1.508$. Since the payoff for each is over 1.5, each will be willing to invest in the risky asset.