

Are Higher Capital Requirements Worth It?

Curbs on bank leverage are intended to prevent bailouts but can slow economic growth. The challenge is to obtain precise estimates of the impact so policymakers can weigh the tradeoff.

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BY PABLO D'ERASMO

When trillions of dollars in loans and other assets went bad in the financial crisis, banks across the globe were unprepared to absorb the losses. The bank failures and government assistance that followed led policymakers in the U.S. and worldwide to tighten regulations for financial institutions. At the center of these new regulations are higher capital requirements. The idea is that a well-capitalized bank will be able to handle major write-downs of its assets without defaulting on its creditors and depositors.¹ By inducing banks to internalize their losses in this way, regulators seek to prevent banks from straining federal deposit insurance funds and especially to prevent government bailouts.

Their overarching objective, however, is to foster a more stable financial system. The nature of commercial banking is inherently unstable, as banks fund their long-term lending mostly with short-term debt in the form of insured deposits or by borrowing from other banks or from investors by issuing bank bonds. This high degree of leverage in the financial industry means that, if confidence in the financial system is shaken, as happened in 2008, even banks that are not exposed to catastrophic losses are vulnerable to panic-selling of assets to meet worried depositors' and creditors' sudden demand for liquidity. Requiring banks to hold a larger portion of their liabilities in the form of equity is intended to reduce the risk that they will be forced to sell off their assets at fire-sale prices and trigger the sort of contagion that threatened the global financial system in 2008.²

Not only the financial sector but also the whole economy benefits from confidence in the banking system, since financial turmoil often precedes deep recessions. Such crises are very costly. During the Great Recession, U.S. GDP dropped more than 5 percent from

its previous peak, 8.8 million jobs were lost, and the federal government spent \$250 billion to stabilize banks and \$82 billion to stabilize the U.S. auto industry.

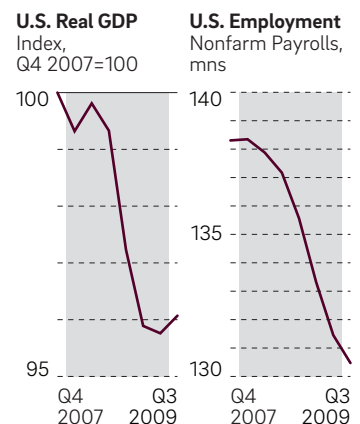
Are the new capital requirements sufficient to prevent another crisis? At what cost? The relative benefits and costs of

See ["Raising the Floor Under Capital."](#)

higher capital requirements are the subject of ongoing debate. It is still not clear how changes in

capital regulation affect the likelihood of a new crisis, the dynamics of the banking industry, or business cycle fluctuations in credit—the grease for the engine of commerce. Banks' role in credit intermediation between investors and depositors helps the economy expand over the long term. And to the extent that larger banks are better able to increase their capital, higher minimums will reduce competition in the banking industry, which can result in less efficient intermediation in the form of higher borrowing costs. Moreover, precisely measuring the cost of a crisis is not so simple, because the size of a contraction will generally depend on the size of the very expansion that led to the crisis in the first place. Therefore, measuring whether imposing higher capital requirements would have avoided a crisis requires understanding how the economy would have behaved with and without the higher minimums throughout the entire boom and bust cycle and not just during the decline.³

FIGURE 1
Great Recession's Impact



Jobs Lost
8.8 mn

U.S. Government Spending to Stabilize Select Industries
Banking: \$250 bn
Automotive: \$82 bn

Sources: U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics.

Regardless, as I will show, higher capital requirements have the potential to reduce bank risk-taking and competition in the financial sector while increasing borrowing costs, which might also translate into higher risk-taking by borrowers. The challenge for policymakers, therefore, is to balance financial stability with efficiency. And the challenge for economists is to more precisely estimate the degree to which the effects of regulation will dampen lending and economic growth so that policymakers can weigh that tradeoff. Since the Great Recession, economists have been seeking better ways to measure the economic effects of higher capital requirements to gain a firmer understanding of what amount of bank capital is optimal.

Optimal for Whom?

To maximize its profits, a bank would not typically choose the level of capital preferred by regulators, who take into account more than just the individual bank's profits. So it is helpful to ask what level of capital a bank would choose absent capital regulation. At the most basic level, the bank will balance the costs of funding its loans and other investments with debt (deposits, CDs, or bonds) versus the cost of funding its activities by raising equity. In this sense, the tradeoffs are similar to those of any type of firm that faces limited liability, and traditional theories of optimal capital structure provide some guidance. On the one hand, a better-capitalized bank faces lower costs of financial distress and might be able to maintain a positive charter value.⁴ On the other hand, debt financing has two advantages over equity financing: One, it offers banks tax benefits, as interest payments can be deducted and, two, it may cost the bank more to raise equity by selling shares than by borrowing funds.⁵

Other factors unique to banks help explain why they tend to use debt funding more than nonfinancial firms do. Unlike the debt of nonfinancial firms, bank debt is used as money and, thus, is important in facilitating exchange. Think about writing checks on your deposit account. Producing liabilities to support exchange is as much a part of the business of banking as making loans. Importantly, deposit insurance reduces banks' cost of funding their activities with deposits and tends to make those costs relatively insensitive to bank risk.⁶ That is, as long as customers know that their accounts are federally insured, they will not monitor their bank as closely as they otherwise might for signs of higher bank risk-taking, allowing riskier banks to avoid having to attract depositors by paying higher interest rates.

What level of capital do regulators prefer? The failure of an individual bank is not necessarily a problem for its depositors or investors, since depositors' losses can be covered by deposit insurance, and its bondholders are compensated via market prices that reflect default risk. However, the failure of a bank can have important negative implications for other banks and other sectors of the economy—a contagion effect.⁷

See **"Raising the Floor Under Capital."**

Unlike banks, regulators take into account these negative effects, or externalities, that a bank's actions may have on other banks, firms, and individuals in the economy.

While a bank thinks only about its own potential cost of financial distress, a regulator takes into account the cost of financial

distress to all banks. According to this logic, the regulator would like banks to choose loan portfolios that are less risky and to hold more capital than banks would prefer. So, regulators set minimum capital ratios above the level of capital that an unregulated bank would choose on its own.

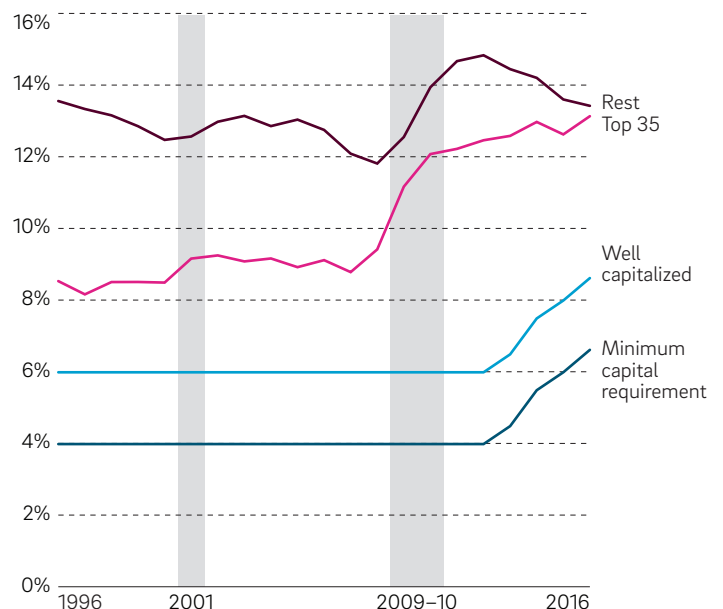
Given these conflicting interests of banks and regulators, what levels of capital do banks currently hold? The average tier 1 capital ratio (mostly common equity) at the end of 2016 was 13.20 percent of risk-weighted assets; in the 1996–2016 period, the average risk-weighted tier 1 capital ratio was 10.09 percent—well above the minimum required.⁸ It is important to note that actual capital ratios far exceed what the regulations define as *well capitalized* (2 percentage points higher than the minimum), suggesting that banks have a precautionary motive.⁹ A bank that was adequately capitalized but not well capitalized would not be subject to regulatory scrutiny but would be unable to engage in certain activities, for example, taking brokered deposits or partaking in international activities. Although from the bank's perspective it would rather not incur the cost of maintaining large amounts of capital, in practice, banks tend to hold a buffer above the minimum required.¹⁰ That way they avoid inadvertently letting their capital slip to a level that would trigger closer regulatory scrutiny and restrictions on their activities.

Within these averages, the capital levels that large and small banks choose are quite different. The level of capital ratios for commercial banks is inversely related to bank size, as measured by assets. Average asset-weighted ratios vary substantially among banks, and there is a lot of cross-sectional dispersion. For the top 35 banks in terms of assets, the average for 1996–2016 was 8.81 percent, versus 12.90 percent for all other banks (Figure 2).¹¹ This inverse relationship between capital levels and bank size can be seen both before and after the crisis (Figure 3).

FIGURE 2

Actual Ratios Exceed Requirements

Average risk-weighted capital ratios, by bank size, 1996–2016.



Source: Federal Reserve Call Reports.

Economy Affected via Three Main Channels

Determining optimal capital settings is relevant not just to the profitability of banks or the stability of the financial industry but to the whole economy’s ability to grow. In my research with Dean Corbae, we show that tighter capital regulations force banks to change their balance sheet composition, which alters the quantity and quality of credit directed to the overall economy through three main channels:

One, reduced lending: A bank can increase its capital ratio either by raising new equity or by slowing the growth of its assets by making fewer loans. If banks in general take the latter route, it can result in less lending economywide and higher prevailing loan interest rates, since banks would seek to offset the reduction in profitability from having smaller loan portfolios by increasing their net interest margin—the difference they pocket between how much interest they pay out to their depositors and other funders and how much they charge their borrowers. The higher loan rates would discourage borrowing, thereby curbing spending and investment and ultimately economic growth.

Two, risk-taking: The standard argument is that by increasing capital ratios, bank risk-taking is reduced.¹² The intuition is simple. Since higher capital ratios imply greater losses for equity holders in the event of default, they reduce shareholders’ incentive to take on risk. However, imposing higher capital ratios might also increase bank risk-taking. Increasing capital requirements could reduce the continuation value of a bank, that is, its stream of future profits.¹³ The bank is forced to allocate more funds toward less risky assets that generally carry lower expected returns. In addition, since there is limited liability, the bank’s individual owners share in the high profits when risky portfolio choices pay off but lose only their own investments when the

bank suffers large asset losses. The reduction in its charter value induces the bank to take on more risk.¹⁴ These offsetting effects imply that the overall effect can be ambiguous.¹⁵

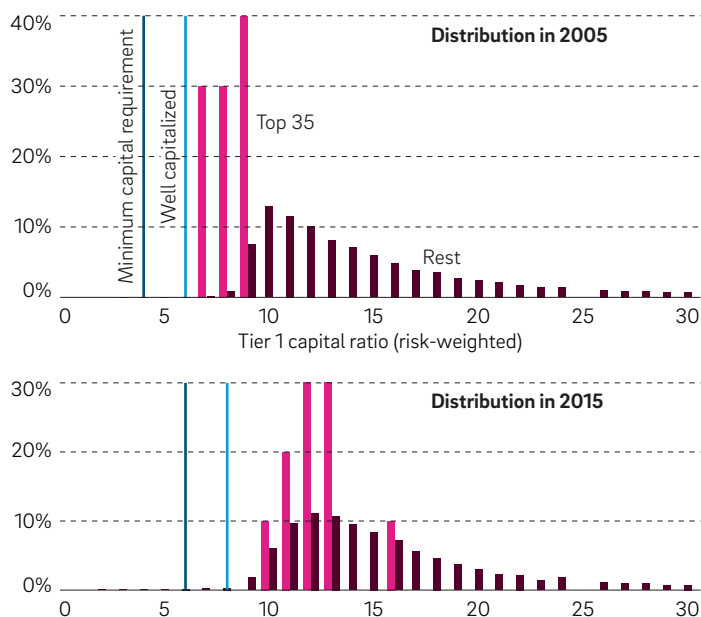
If we look more broadly, increasing commercial banks’ need for capital introduces a competitive advantage for bank-like institutions such as those in the shadow banking sector, which operates outside the purview of regulators and therefore is not subject to capital requirements, shifting financial activities from regulated banks to unregulated firms.¹⁶ This shift might increase risk-taking in the economy as a whole even while reducing risk-taking by banks.

Three, competitive effects: Regulation can increase or decrease the industry’s level of competition, which can be measured, for example, as the share of loans extended by the biggest banks or the industry’s asset concentration. Higher capital requirements can affect regulated banks differently depending on their size. In the short run, higher capital requirements might result in a less concentrated banking industry by reducing the largest banks’ share of the loan market, thereby benefiting smaller banks. As I described previously, large banks typically hold smaller cushions above the required capital level, so a higher capital requirement will force them to reduce their loan portfolios—especially given that, following the collapse of the asset-backed securities market in the financial crisis, banks now have considerably fewer opportunities to make loans with the intention of selling them to securitizers. In the long run, however, higher capital requirements may reduce competition by acting as an entry barrier for new banks. Higher capital requirements may also make banking less profitable by shifting the composition of banks’ balance sheets toward safer assets, thereby reducing the value of creating a bank. If more potential competitors are prevented from forming, higher capital requirements might protect existing banks by giving them more market power to raise loan rates, account fees, and other costs for their customers, thereby curbing overall economic growth.

FIGURE 3

Actual Ratios Vary Substantially by Bank Size

Average risk-weighted tier 1 capital distribution, top 35 vs. rest.



Source: Federal Reserve Call Reports.

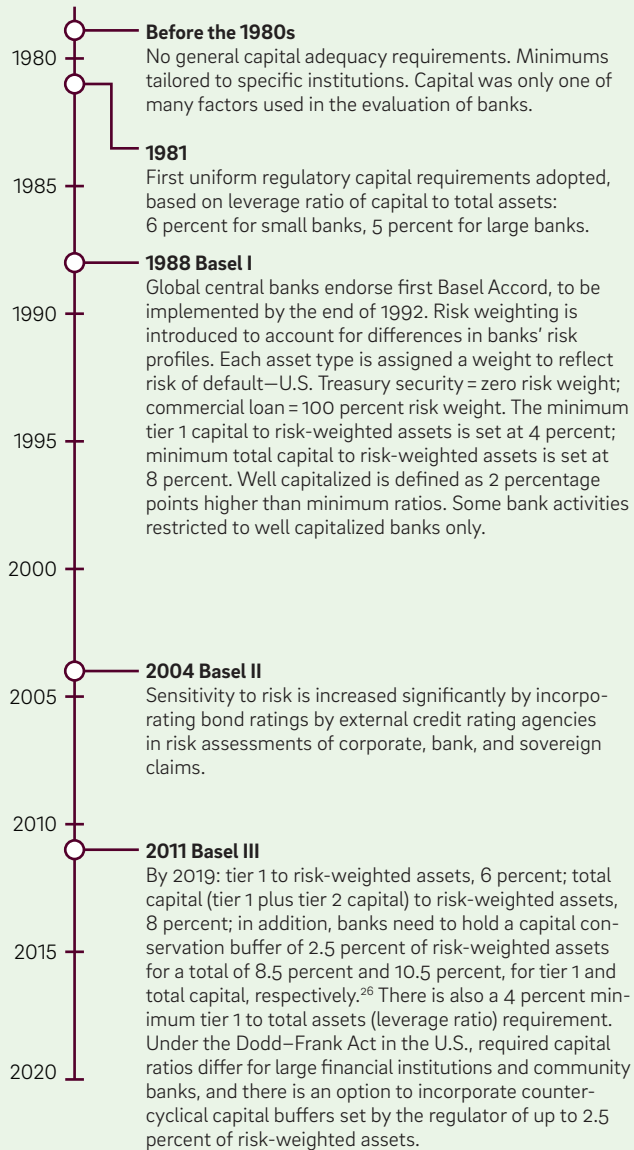
Estimated Costs and Benefits

How can we quantify all these effects? Concerns about what implications higher capital requirements may have for the financial industry and for households and firms in general have motivated economists to seek more precise ways to measure the impact. As with any shift in regulatory policy, when policymakers are armed with realistic estimates, they are in a better position to weigh the cost of a change against the benefit. Unfortunately, not all the estimates that researchers have generated so far can be easily compared. For example, some of the studies I discuss next estimate the rise in banks’ loan rates, while others estimate the effect on the level or growth rate of the gross domestic product. Taken together, though, these disparate estimates offer a general sense of how sizeable the impact is likely to be. I will also describe a new approach I helped develop that seeks to quantify the effect of higher capital levels using a more realistic model of the banking landscape.

Raising the Floor Under Capital

As banks' reliance on capital has fluctuated, regulators in developed countries have responded by repeatedly raising minimums. These efforts have been coordinated by the Basel Committee on Banking Supervision at the Bank for International Settlements in Basel, Switzerland, with the understanding that national central banks and other regulatory authorities would write the specific rules and time-tables for implementation in their countries. In the United States, Basel III has been largely implemented through the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010. The Bank for International Settlements discusses the evolution of global banking regulations at <http://www.bis.org/about/chronology.htm>.

Required Ratios



Tier 1 capital = common equity + preferred noncumulative stock + minority interests in consolidated subsidiaries.

Tier 2 capital = tier 1 capital + allowances for loan losses + perpetual preferred stock + subordinated debt + various hybrid capital instruments.

Banks' Funding Costs

One way to gauge the impact of raising capital requirements is to measure the change in what it costs banks to fund their lending and other activities using traditional finance models of capital structure. According to Franco Modigliani and Merton Miller's celebrated theorem, a firm's debt-equity mix does not affect its cost of capital as long as the mix does not affect its risk-taking and debt and equity are taxed identically.¹⁷ Ignoring taxes for a moment, Modigliani and Miller show that a rise in required capital—that is, a shift toward equity funding and away from debt funding—will have no effect on banks' cost of capital. Even though equity investors require a higher return than debtholders do to compensate them for the higher risk of stock returns, the decrease in banks' leverage reduces the return that their stockholders require as risk compensation, leaving banks' weighted average cost of capital unaffected. If one then takes into account that banks can deduct the interest and principal payments they make to their debtholders but not the dividends to their stockholders, the rise in banks' weighted average cost of funds is due solely to debt's more favorable tax treatment.

Using this approach, Anil Kashyap, Jeremy Stein, and Samuel Hanson found that a 10 percentage point increase in required capital ratios had a modest long-run impact on loan rates, in the range of 25 to 45 basis points.¹⁸ To get a sense of the modest nature of this impact, banks' average loan interest margin—the difference between the interest rates they charge on loans and the interest they pay on deposits—since 1990 has been 4.42 percent.¹⁹

One limitation of these estimates is that they are based on linear equations, so they might accurately capture the change in the average ratio of banks' capital to their total assets (7 percent in their sample) from relatively small changes in capital requirements but are unsuited for evaluating the effect of large increases in regulatory capital ratios.²⁰

Standard economic theory and all asset pricing models predict a positive relationship between the risk of an investment and its expected return: Low-risk assets should earn less, on average over the long run, than high-risk assets. So, if a bank reduces its reliance on leverage, its shareholders should require smaller dividends to invest in the bank. However, Malcolm Baker and Jeffrey Wurgler note that in real-world asset markets, a bank that reduces its risk profile by reducing its leverage does not reduce its cost of raising equity as much as the simplest asset pricing models—including the model used by Kashyap and his coauthors—would predict (indeed, their estimates suggest it ends up costing the bank more to raise capital). They estimate that, in a competitive lending market, increasing capital by 10 percentage points would add 60 to 90 basis points to the lending spread.²¹

Empirical Estimates from Past Crises

Several studies attempt to estimate the costs and benefits of changes in capital regulation by analyzing historical data on interest rates and economic output across countries and then projecting values for those variables based on changes to the current level of capital.²² The basic idea of this approach is to estimate the net effect of higher bank capital, with the costs

stemming mostly from the reduction in GDP that results from wider lending spreads and with the benefits arising from a reduced probability of a financial crisis and its associated costs. To quantify how much the likelihood of a crisis changes with the level of bank capital, these studies estimate how much equity banks would have needed on their books during past crises to absorb enough of the observed losses so that no government recapitalization of the banks would have been necessary.

One such study, by Jihad Dagher and his coauthors, suggests there is a limit to the amount of crisis prevention to be had from raising the floor on capital. They found a strong initial benefit if capital ratios were relatively low to start with. Raising the ratio from 15 to 23 percent rapidly decreased the probability of a crisis. But once capital ratios reached around 23 percent, the marginal benefit of raising them further started to shrink; nearly the same percentage of crises were avoided as when capital minimums were at 30 or even 40 percent.

It is important to note that the estimated size of the marginal benefit that these studies found depended heavily on their assumed loss given default (LGD). When a borrower defaults, the bank typically recovers less than the full value of the loan; this shortfall is its LGD. Different assumptions about LGD have led other studies to estimate greater marginal benefits at higher capital ratios.²³

Cost estimates also vary significantly across studies, but they all indicate that boosting capital might lead banks to charge substantially higher interest rates on loans. For example, a 2016 study by the Federal Reserve Bank of Minneapolis estimated that if capital ratios were increased to 23.5 percent, the level of GDP could drop 1.52 percent annually and loan rates could increase by 60 basis points.

The studies' estimates of the optimal ratio of capital—the amount that would generate the most benefit for the least cost—range from 13 percent to 25 percent, depending largely on their underlying assumptions of LGD and of how much of the change in their financing costs banks pass on to their customers.

Changes in Credit and Output: Model Estimates

Every model of the economy has its limitations, and uncertainty comes with any estimate a model produces. One way that economists seek to reduce the uncertainty about the correct way to model the economy is to use a wide variety of models to produce a range of estimates. Using 13 different models, a report by the Bank for International Settlements Macroeconomic Assessment Group found that a 1 percentage point increase in required capital—the target ratio of tangible common equity to risk-weighted assets—would lead to a maximum decline in the level of GDP of about 0.19 percent relative to no change in required capital. To put this estimate in context, a decline in the level of economic output of this size would be equivalent to a 0.04 percentage point reduction in the annual GDP growth rate, which in recent years has been trending around 2 percent. Using a similar approach to generate a range of estimates, the Bank for International Settlements Basel Committee on Banking Supervision found that a 1 percentage point increase in the capital ratio regardless of the cause—higher regulatory minimums,

higher required buffers, or changes in what qualifies as capital—would reduce the level of GDP by at most 0.6 percent and would widen loan spreads by 13 basis points.

Importantly, these estimates were derived using general equilibrium models, which seek to approximate the economy's dynamic nature by accounting for interconnections across all sectors of the economy and for how regulatory changes affect all prices and quantities. For instance, many of the models used in this study incorporate the effects of international spillovers. Estimates from such dynamic models are not directly comparable with those derived from a more empirical approach that cannot capture the general equilibrium effects of changes in capital ratios. This difference highlights the importance of using general equilibrium models as opposed to linear predictions when estimating the impact of capital requirements, as general equilibrium effects tend to mitigate the costs of changes in capital regulation, for a relatively modest net effect on output.²⁴

A serious limitation of all the foregoing approaches is that they do not tell us anything about how higher capital requirements might change risk-taking, competition, or the efficiency of intermediation in the banking industry. What effects do we estimate if we take into account these real-world channels?

The Three Channels at Work

The literature on the interaction between the banking sector and the overall economy has advanced considerably in the last 10 years. However, most of the analysis is based on models that assume a perfectly competitive financial sector, which allows for a very limited role for changes in the degree of competition and bank risk-taking. In reality, though, the data show that the banking sector is highly concentrated—the top 10 banks' asset market share has more than doubled in the past 20 years—and that bank risk-taking was a significant driver of the financial crisis. In order to study whether incorporating these features is quantitatively relevant, Corbae and I developed a model that features a realistic competitive structure that incorporates all three channels through which higher capital requirements might affect the economy: higher borrowing costs, risk-taking, and competitive effects.²⁵ In our framework, as in real life, many banks compete in an environment in which a few large banks dominate the industry and have market power, while many small banks act as price takers. In addition, new banks form when they expect to make a profit, and unprofitable banks go out of business under limited liability (in economics terms, bank entry and exit are endogenous). As in the real world, banks in the model allocate their funds across different asset classes such as loans, securities, and cash, and finance their investments with deposits and other short-term borrowing.

The model generates several predictions that are in line with the data: Small banks operate with higher capital ratios than large banks do, and default frequency, loan returns, and markups are countercyclical; that is, they increase in bad times and decline in good times. One of the drivers of the observed differences in capital ratios is that small banks' source of short-term funding is more volatile. We estimate that deposits at small banks fluctuate considerably more than at large banks, prompting small banks to maintain larger buffers.

Our framework shows that higher capital requirements alter the mix of bank sizes present in the industry, resulting in a much more concentrated loan market. This new mix in turn amplifies the effect of the change in policy. While banks of all sizes hold more capital, large banks grow larger, putting pressure on small banks to merge or close. As large banks' market power increases, they extract higher profits by raising loan rates, which tightens credit and depresses the economy's output. In addition, far fewer fail even as they take more risks, since their charter value is higher under the tighter requirements. With this effect on industry concentration, an increase in required capital from 4 percent to 8.5 percent widens the lending spread by 18 basis points and reduces the value of loans outstanding about 0.65 percent. These effects result in a decline in GDP of 0.46 percent in the long run. Short-run effects are likely smaller, since the amplification occurs gradually.

Conclusion

The studies I have reviewed suggest that for every 1 percent increase in capital minimums, lending rates will rise by 5 to 15 basis points and economic output will fall 0.15 percent to 0.6 percent. Despite this variation, it is reasonable to expect that increases in borrowing costs of this magnitude may curtail lending enough to create a lasting drag on overall economic activity. Less clear is what harm would ensue from another financial crisis without more well-capitalized banks. Indeed, if the risk-weighted capital ratio had been 6 percent—in line with the new minimum—the International Monetary Fund estimates that large U.S. banks would have had enough capital to cover their losses at the peak of the 2008–2009 crisis. That would have avoided a financial sector meltdown and the severely depressed economic activity and large-scale government intervention that followed. ⁴

FIGURE 4

For Every 1% Increase...

The long run will be impacted.

Lending Rates
Basis Points

▲ 5–15

Economic Output

▼ 0.15–0.6%

Notes

- 1 With enough capital, a bank may be able to handle major losses by cutting dividends, liquidating a fraction of its safe assets, and injecting new capital.
- 2 In economic jargon, capital regulation is intended to reduce the moral hazard of risk-taking by financial institutions that operate under limited liability and deposit insurance. Moreover, bank capital acts like a buffer that may offset losses and save banks' charter value.
- 3 Another reason that it is not always straightforward to measure the cost of a crisis (or the benefit of higher capital requirements) is that crises occur very infrequently in developed economies. Therefore, many studies use information on financial crises in developing economies, which are generally accompanied by currency crises or sovereign debt crises, which complicates comparisons. For historical databases on credit booms and crises, see, among many others, the studies by Moritz Schularick and Alan Taylor; Enrique Mendoza and Marcos Terrones; or Helios Herrera, Guillermo Ordoñez, and Christoph Trebesch.
- 4 A bank's charter value, also called its continuation value, is its ongoing worth to its shareholders as long as it remains a going concern. It can also be understood as the value that would be forgone if the bank were to close its doors.
- 5 Yaron Leitner's 2012 *Business Review* article on contingent bank capital provides an excellent explanation.
- 6 John Kareken and Neil Wallace wrote the seminal paper on the link between deposit insurance, moral hazard, and bank regulation.
- 7 Contagion in this context refers to the potential consequences of a bank's failure for its trading partners and for the trading partners of its trading partners. Problems at one bank can transmit to others fairly quickly when there are numerous linkages among financial institutions. See Leitner's 2002 *Business Review* article on financial contagion and network design.
- 8 All data presented in this article come from the Consolidated Report of Condition and Income (known as Call Reports) that depository institutions submit to the Federal Reserve each quarter. The data can be found under Balance Sheet and Income Statements at <https://cdr.ffiec.gov/public/>.
- 9 In a typical year, about 0.5 percent of the banks maintain the minimum capital required. On average, 75 percent of the banks that operate at the minimum fail or are taken over via a merger within two years.

- 10** Note that a bank's book equity capital (the difference between the reported values of its assets and liabilities) can lag its economic capital (its market value or market capitalization) because a loss of equity market value need not be reflected in book equity. Mark Flannery discusses the differences between book and economic capital and examines the concept of "adequate" capital as it refers to the level of economic capital a bank would need to absorb losses during a crisis.
- 11** The Federal Reserve performed its stress tests in 2016 on the top 35 banks.
- 12** Frederick Furlong and Michael Keeley provide evidence that capital requirements reduce banks' incentive to take risks.
- 13** Michael Koehn and Anthony Santomero, Daesik Kim and Santomero, and Jean Rochet show that improperly chosen risk weights may increase the riskiness of banks.
- 14** Charter value, continuation value, and franchise value are being used synonymously. Lawyers would say that bank stockholders are protected by limited liability.
- 15** See the works by Thomas Hellmann, Kevin Murdock, and Joseph Stiglitz and by Rafael Repullo for discussions of this argument.
- 16** While a possible shift of activities to the shadow banking sector is an important concern, I don't address this issue in this article. Daniel Sanchez's *Business Review* article discusses the role of the shadow banking sector in the last financial crisis.
- 17** The best way to think about this theorem is that it makes precise the conditions in which the debt-equity mix actually does affect the firm's cost of capital. Indeed, much of modern finance is an exploration of the conditions under which the theorem is violated, which include that the firm's mix of debt and equity doesn't affect bankruptcy costs and that its owners and managers do not know more about the firm's prospects than other investors do.
- 18** Kashyap and his coauthors assume that the deductibility of debt payments is the only difference between debt and equity. Their lower estimate assumes that the bank replaces long-term debt with equity, while the higher estimate assumes that they replace short-term debt (deposits) with equity. It is more costly to shift away from deposits because depositors value the liquidity.
- 19** They also warn that higher capital ratios cause lending to migrate to the shadow banking sector, but they do not attempt to quantify this effect.
- 20** These estimates can be understood as *local approximations*, which refers to the approximation of a general function that exploits information on the function and its derivatives around a benchmark point to obtain the value of that function on a neighborhood point.
- 21** The lending spread is defined as the difference between lending rates and the cost of funds. The wider spread that Baker and Wurgler found resulted from an increase in tier 1 capital. For definitions of capital tiers, see "[Raising the Floor Under Capital.](#)"
- 22** See the works by Martin Brooke and his coauthors; Jihad Dagher and his coauthors; and Simon Firestone, Amy Lorenc, and Benjamin Ranish.
- 23** The Federal Reserve Bank of Minneapolis estimates that marginal benefits are still high even beyond 23 percent capital ratios with a loss given default of 62.5 percent.
- 24** Michael Dotsey's *Business Review* article discusses how dynamic stochastic general equilibrium (DSGE) models are used for the analysis of monetary policy.
- 25** In 2008, Skander Van den Heuvel initiated the literature of general equilibrium models looking at optimal capital requirements in a perfectly competitive environment. Other structural models include the models of Repullo and Javier Suarez and of Gianni De Nicolò, Andrea Gamba, and Marcella Lucchetta, as well as the general equilibrium models of Juliane Begenau and Thiên Nguyen. See my research with Dean Corbae for a comprehensive review of the literature.
- 26** The difference between requiring a larger minimum versus requiring a minimum plus a conservation buffer is that banks might continue to operate "as normal" when their capital levels fall into the conservation buffer range. Regulators might impose restrictions on dividend payments as long as capital stays in the buffer range. If a bank fails to meet the minimum capital ratio, it would be subject to capital directives or other formal enforcement action by the FDIC to increase capital. Failure to comply could lead to the bank's liquidation.

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