

FEDERAL RESERVE BANK OF PHILADELPHIA

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# Economic Insights

Government Debt in Domestic  
Hands During a Crisis

Understanding Gentrification's  
Causes

Banking Trends

Research Update

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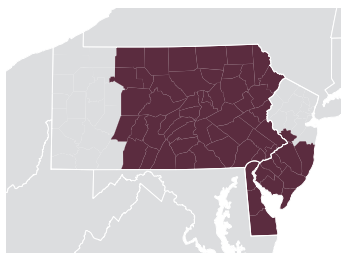
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## Economic Insights

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The views expressed by the authors are not necessarily those of the Federal Reserve.

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On the first attempt to ring it in 1753, the bell that the British colony of Pennsylvania had ordered from a **London foundry** cracked. Recast by Philadelphia metalsmiths John Pass and John Stow, it pealed from atop the Provincial Assembly (later the Pennsylvania State House, now Independence Hall) to mark such occasions as King George III's ascension to the throne in 1761, the Battles of Lexington and Concord in 1775, the ratification of the Constitution in 1787, and the deaths of Benjamin Franklin in 1790 and George Washington in 1799. By 1839, antislavery publications had coined the name Liberty Bell, inspired by its inscription from Leviticus 25:10. Likely in the 1840s it acquired the iconic crack that has left it mostly mute yet fully resonant as a worldwide symbol of freedom. The **Independence Hall Association** offers an account of the Liberty Bell's history.

**Photo Credit:** J. Fusco for Visit Philadelphia.



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# Government Debt in Domestic Hands During a Crisis

When banks load up on their government's bonds, lending to firms and households can get crowded out. But when the sovereign debt market is in turmoil, such concentrations may play a surprising role.

**Burcu Eyigungor** is an economic advisor and economist at the Federal Reserve Bank of Philadelphia. The views expressed in this article are not necessarily those of the Federal Reserve.

BY BURCU EYIGUNGOR

After adopting the euro in 2002, Greece, Ireland, Spain, and Portugal found that banks and investors in other euro area countries were more eager to buy their government bonds. This rise in foreign demand for the sovereign debt of these smaller, less economically robust countries on the periphery of Europe's common currency zone came as no surprise and was in fact intended. A major reason for adopting a single currency was to promote linkages among the national economies and banking systems of the member countries, thereby boosting trade and demand overall.<sup>1</sup> Indeed, the increased desire to invest in peripheral countries' bonds was a sign that markets had begun to view their risk at least partly as a function of the financial strength of the entire euro area (Figure 1), dominated by the major economies of Germany and France.

The rise in foreign demand for the bonds of the peripheral countries kept yields down even as inflation in these economies rose. And their governments, firms, and households took advantage of the resulting decline in borrowing costs, in some cases steeply increasing their national debt as a share of their national gross domestic product and raising their underlying risk of defaulting on their bonds.

The global financial crisis and recession that hit Europe in 2008 led to doubts as to whether heavily indebted euro area countries would be able to repay their bondholders. As doubts about the solvency of these countries increased, yields on their sovereign bonds went up, and the share held by foreign investors sharply reversed. Mirroring the sudden drop in the share held by foreign entities was a surge in the share held by domestic banks and investors.

Why did this reversal happen and why did it matter? Is it something to be discouraged through regulation? The drawback of relying more heavily on domestic investors for government funding is that when banks and other domestic savers increase their investment in their own government's bonds, they have less money to lend to and invest in private domestic enterprises and households. This reduced access to funding across the

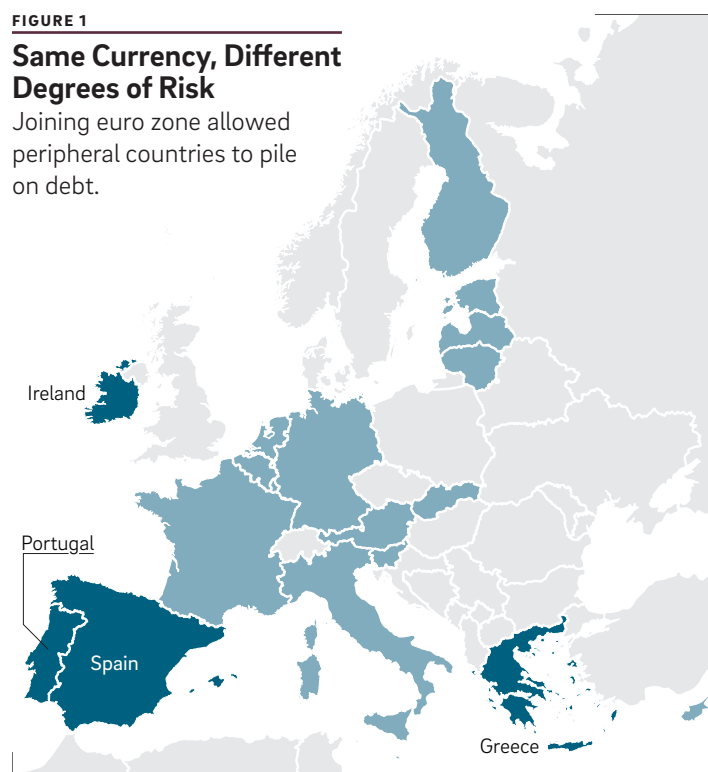
economy can curtail consumer spending and business investment in the country, making a recession even more severe. This channel suggests that the concentration of sovereign debt in the hands of domestic banks and savers is undesirable and may warrant greater capital requirements on sovereign holdings. However, I will show that there may be reason to believe that such concentrations during crises play a unique role in helping countries avoid sovereign default and its ruinous consequences.

To convey how this process of capital flight induces a reversal in sovereign bond ownership, I start with an overview of its connection with default risk.

FIGURE 1

## Same Currency, Different Degrees of Risk

Joining euro zone allowed peripheral countries to pile on debt.



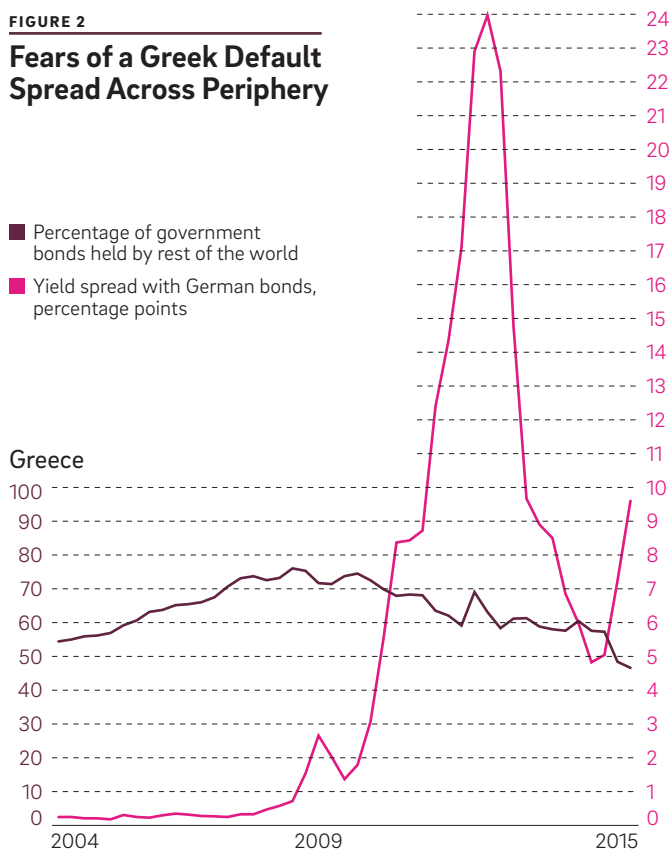
## The Big Shift in Sovereign Bondholders

The extent of the reversal in bond ownership in each country was closely connected to the severity of the increase in its sovereign default risk. The bond market's view of each country's risk is plainly visible in its sovereign yield spread, calculated for a European country as the difference between the interest rate it pays on its bonds and the rate on German bonds, which investors consider essentially free of risk, by virtue of the strength of the German economy. The wider the difference, or spread, in a country's yield, the stronger the perception among investors that the government is at risk of defaulting on payments to its bondholders. From the vantage point of investors, the spread represents the return they require to compensate them for the risk they are taking, sometimes called a risk premium. To economists and policymakers, spreads signal whether default risk is easing, stable, or escalating to the point that the issuing country may soon be unable to pay its creditors. That would lock it out of the sovereign debt market and dry up a major source of government funds—even possibly trigger financial contagion as banks and other holders of the country's bonds struggle to absorb the losses on their investment.

Tracing the spreads on the peripheral countries' bonds illustrates how their default risk evolved (Figure 2). Spreads spiked in the depths of the global financial crisis following Lehman Brothers' default in September 2008, came down shortly after that, but rose again in October 2009 when Greece's fiscal condition was revealed to be much worse than officially reported. Soon afterward, anxiety about the sustainability of Greek

FIGURE 2

### Fears of a Greek Default Spread Across Periphery

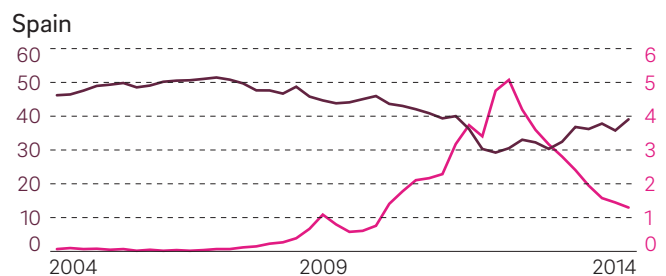
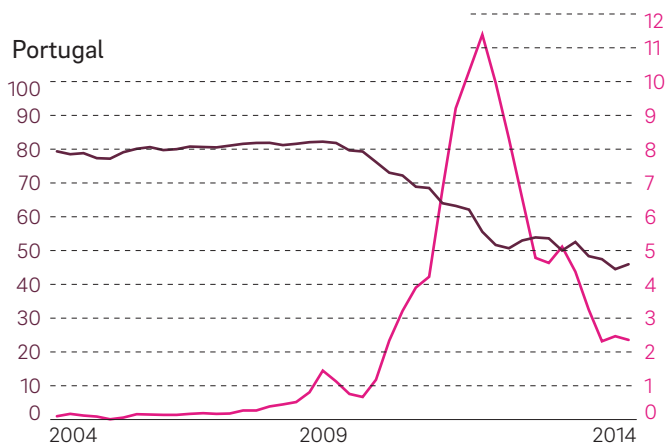
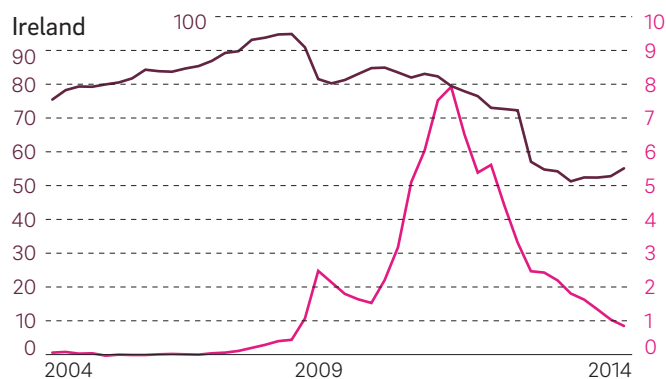


Sources: Haver Analytics, DG II; Eurostat; Merler and Pisani-Ferry (2012).

government debt spilled over to other countries in the euro area periphery, and spreads on all of them went up.

Following the introduction of the euro, the foreign-owned share of each country's government securities went up until 2007, when early rumblings of the financial crisis were being felt in the form of rising defaults on securities backed by subprime mortgages. Governments that markets considered at high risk of defaulting on their bonds during the crisis—Greece, Ireland, Portugal, and Spain—experienced sharp declines in the share of their bonds held by foreigners. And despite the narrowing in spreads over the past few years, the foreign-held share still has not fully recovered. From peak to trough, the share in the hands of foreigners fell 35 percentage points for Portugal, 40 percentage points for Ireland, and 20 percentage points for Spain. The share of German, U.S., and Japanese bonds held by foreigners continued to increase throughout the period (Figure 3).<sup>2</sup>

Why would the spike in default risk cause sovereign bond ownership to reverse? To explore that connection, we can start by considering the roots of the crisis and the European Central Bank's response.



## Evolution of the Crisis

The main reason behind the crisis in the euro area periphery can be traced back to the decline in real interest rates in these countries after the introduction of the euro. After adopting the single currency, euro area countries continued to have wildly different inflation rates (Figure 4). After January 2001, when Greece was also admitted to the union, the inflation rate in the peripheral countries was sometimes more than 3 percentage points higher than what prevailed in Germany. From 2001 to 2007, the average inflation rate was around 1.5 percentage points higher in the peripheral countries relative to Germany.

In general, when the inflation rate is high, one would expect monetary policy to be tightened. That is, a country's central bank will usually raise nominal interest rates in an effort to raise real interest rates. Higher real interest rates make it more expensive to borrow money, prompting people and businesses to save more and spend less, which in turn dampens inflation by cooling

See *Real Versus Nominal Interest Rates*.

demand for goods and services. But because they use a common currency, the countries belonging to the euro zone are subject to a common monetary policy, set by the European Central Bank (ECB). So increasing the policy interest rate for only the peripheral countries was not possible. And because their inflation rates were higher, their real interest rates were lower than real rates in Germany and France.

The lower real interest rates in these countries made borrowing cheaper, leading to an increase in domestic spending and wider current account deficits. In Ireland and Spain, the private sector indulged in high levels of debt. In Portugal and Greece, it was the public sector that loaded up on debt.

### Greece and Portugal

Coming into the Lehman Brothers default in September 2008, Greece already had substantial imbalances: a high ratio of sovereign debt to gross domestic product and a wide trade deficit. As the financial crisis unfolded, the Greek government's budget deficit widened to 16 percent of the country's GDP, and its sovereign debt

## Real Versus Nominal Interest Rates

The real interest rate is equal to the nominal interest rate minus the inflation rate. The nominal interest rate represents how many extra euros one gets next period after saving some euros this period. But to know the real return, we need to take into account that the extra euro we get tomorrow might not buy anything extra if the inflation rate is high.

For example, if the nominal interest rate is 10 percent and the inflation rate is 10 percent, too, the real interest rate is 0 percent. Although we get 10 percent more euros next period for each euro we had saved, prices are also 10 percent higher next period, so the saved euros buy the same amount of goods next period.

Economic theory would suggest that individuals should look at real interest rates to decide how much to save or borrow. In general, if someone can get many more units of goods tomorrow by forgoing one unit of goods today, she will be persuaded to save more.

FIGURE 3

## Foreign-Owned Share Kept Rising in Larger Economies

Percentage of government debt held by foreign investors, 2004–2014.



Source: Haver Analytics, DG II; Eurostat; Merler and Pisani-Ferry (2012); Arslanalp and Tsuda (2012).

climbed to 130 percent of GDP, the highest ratio for any European Union country. Greek banks, which held a big portion of Greece's sovereign bonds, were experiencing large withdrawals, as a Greek government default, which looked more likely by the day, would wipe out their equity and cause them to default as well.

By April 2010, Greek government bonds were downgraded to junk status and their spread widened to 5 percentage points, which was deemed unsustainable, closing the private lending market to Greece. In May 2010, the so-called troika of international monetary institutions—the European Commission, ECB, and International Monetary Fund—bailed out Greece. Similar to Greece, but to a lesser extent, Portugal suffered from a bloated government sector and received a bailout in May 2011.

### Ireland and Spain

In Ireland and Spain, by contrast, most of the borrowing during the boom years occurred in the private sector. With low real rates, property prices went up, and the construction sector boomed. Higher property prices also increased government tax revenue, and their government budgets were, in fact, in surplus until 2007.

For both countries, the crisis was

triggered by a decline in property values. Similar to what happened in the U.S., house price declines led to a sharp increase in default rates for mortgage borrowers. When borrowers default, lenders take ownership of the collateral backing the loans, which in the case of a mortgage is the house itself. But now these properties had much less value than the amount of the loans themselves. This fall in the value of bank assets in many cases led to a depletion of their equity. Both countries' governments chose to rescue their banking sectors, sharply increasing their debt-to-GDP ratios. Even without the burden of the banking sector rescue, their government budgets were in bad shape. The crash in the construction sector and resulting unemployment worsened fiscal deficits by raising outlays for unemployment benefits and other social support while lowering revenue from income taxes.

In another respect, the evolution of the boom and bust in Ireland and Spain was dissimilar to the U.S. experience in that the increase in their government budget deficits and debt levels led to a crisis of confidence in the sovereign bond market, and doubts about their ability to meet obligations increased.<sup>3</sup> By the end of 2010, Irish banks were facing large withdrawals, and guarantees by the Irish government,

which itself had fiscal credibility problems, were not helping much. Ireland came to a bailout agreement with the troika in November 2010. Spain's crisis was more drawn out, and in June 2012, its financial sector also received a support package from the European Stability Mechanism, as the spread on Spanish government bonds had reached 5 percentage points.

So, regardless of whether their crisis started in the government or private sector, both pairs of countries were in trouble in the end. The problems of the governments of Greece and Portugal had pushed their banking systems into crisis territory, given the large amounts of government debt their banks were holding. The banking crises in Ireland and Spain had turned into sovereign debt crises as their governments chose to guarantee their banks' obligations. Especially regarding Ireland, whose banks' obligations were mostly to foreigners, it was widely debated whether the government had done the right thing.

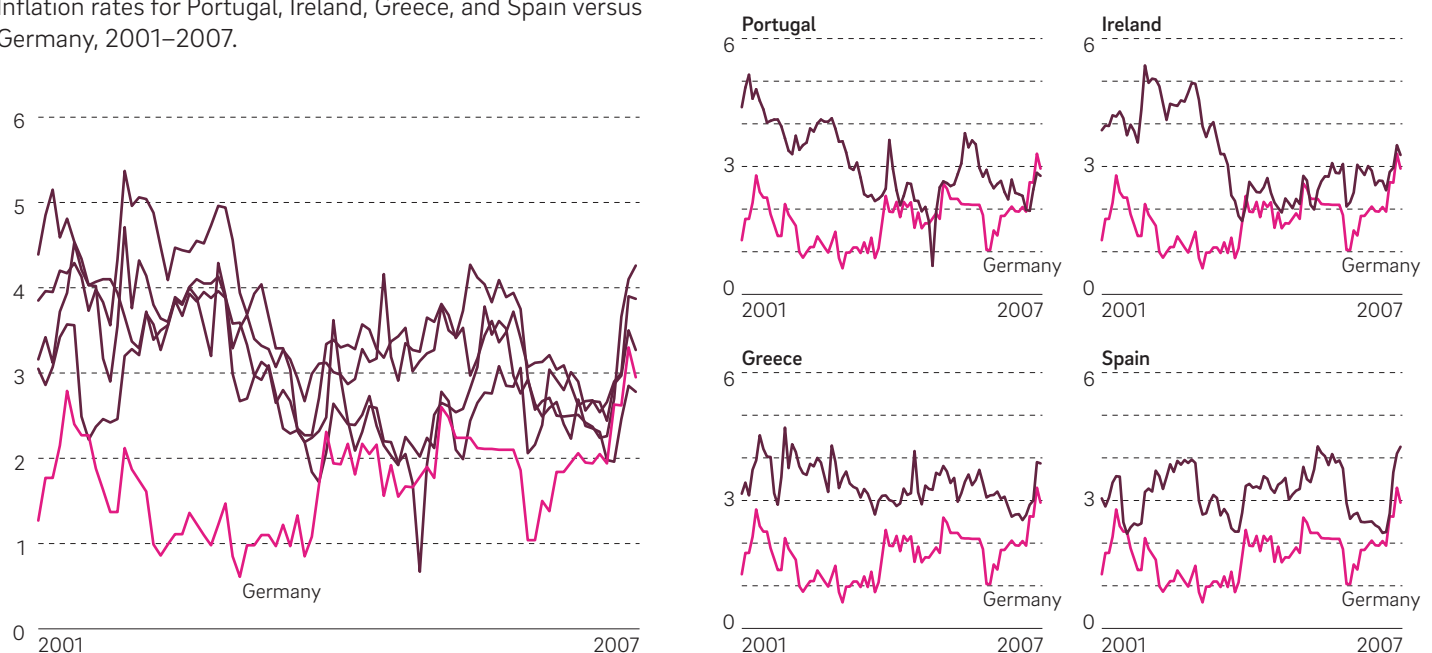
### How Did the ECB Respond?

As the crisis worsened, the ECB had to continually ease its conditions for providing banks with liquidity to help those in the peripheral countries deal with the large withdrawals they were facing.

FIGURE 4

### After Adopting Euro, Inflation Stayed Higher in Peripheral Countries

Inflation rates for Portugal, Ireland, Greece, and Spain versus Germany, 2001–2007.



### Refinancing Facility

During the crisis, the ECB cut its main bank refinancing rate by more than 3 percentage points. This is the rate it charges euro area banks to use its refinancing facility to meet their short-term liquidity needs. In return, banks must post collateral. However, during the depths of the crisis, many banks had trouble providing adequate amounts of acceptable collateral. Credit ratings on their assets had been downgraded as their domestic economies melted down, making their assets ineligible under the central bank's criteria. So the ECB repeatedly eased its collateral requirements by lowering the minimum acceptable credit rating on posted assets (Figure 5). For example, when Greek, Irish, and Portuguese government bond ratings fell below investment grade, the ECB relaxed the investment grade requirement for these countries' bonds at various times, mostly after they signed their respective bailout agreements.

As the crisis deepened and peripheral country banks faced large withdrawals, the ECB further loosened its refinancing operations. One step was to increase the maturity of its loans to banks, first to six months and then to 12. In 2011, it launched two very long-term refinancing operations, extending loan maturities to three years.

### Emergency Liquidity Assistance

The final recourse for liquidity for banks that lacked adequate collateral was their own national central banks, which themselves borrowed the money from the ECB. Under its emergency liquidity assistance (ELA) facility, the national central banks could, at their own risk, provide liquidity to their domestic banks in return for collateral that the ECB could not accept. This work-around meant that if the bank could not pay back the loan and the value of the collateral did not cover the amount, the national central bank—and so the government itself—would be liable to the ECB for the loss. This accommodation was a way to continue to provide liquidity but spared the ECB from possible losses. In reality, this arrangement was inadequate. In all countries suffering from the crisis, the government was in as much financial trouble as the banks. (Remember that even where the crises originated in the banking sector, as in Ireland and Spain, bailouts of the banking sector put the government's solvency in doubt as well). In any case, banks tried to avoid the ELA when they could, as its interest rates were higher than the ECB's direct refinancing rates.

How might some of these policies have helped bonds issued by peripheral euro zone governments to become concentrated in the portfolios of banks headquartered in those countries?

### Why Domestic Holdings Increased

There are two ways in which banks might have increased their holdings of their government's bonds: through capital injections or direct purchases. In the first channel, governments injected their own securities into domestic banks that were undercapitalized, and the bank in turn posted these securities as collateral with either the ECB or their national central bank in return for euros to meet the heightened demand for withdrawals. In the second—and maybe more puzzling—channel, domestic banks bought their government's bonds at primary auctions or in the secondary market. Why would a domestic bank want to do this?

During the crisis, banks whose solvency was being doubted were facing runs. If they already held their government's bonds, they could usually provide them as collateral to get liquidity from the ECB. Banks could also bundle their private sector loans into asset-backed securities or issue covered bonds that were guaranteed by their private sector loans, in order to pledge them as collateral, as individual loans to the private sector did not qualify as collateral for ECB funding. However, the haircuts—or reductions off their face value for collateral purposes—imposed on these securities were higher relative to sovereign bonds. During the crisis, banks naturally preferred to hold assets that they could pledge to the ECB as collateral with minimal haircuts.

In addition, under Basel II, which was the regulatory framework in place during the crisis, banks had to hold more capital for the assets on their books that were deemed more risky.<sup>4</sup> Euro area countries' sovereign debt denominated in their domestic currency was assumed to have zero risk, while the normal risk calculation had to be made for private sector loans. One effect of this assumption that domestic sovereign bonds were risk-free was that, during the crisis, when banks were having problems meeting their capital requirements, sovereign debt became more appealing relative to domestic private sector loans, which would have required banks to hold more capital against them. While the switch away from private sector loans might be understandable, it is not clear why banks would want to increase their holding of domestic sovereign bonds per se.

When a bank received some cash, it could use it to meet its liquidity demands in one of three ways: One, it could pay the cash directly to claimants who are calling their loans or withdrawing their deposits. Two, it could buy sovereign bonds from a country with a higher credit rating, say, Germany, to use as collateral with the ECB in return for euros. Or three, it could buy its government's bonds to use as collateral to get euros from the ECB to pay claimants.

The question that remains is: When the bank has a choice, why would it choose the third option?

## Limited Liability of Banks in Crisis Countries

A reasonable explanation that has been offered is that if a bank's government does default, the bank will become severely undercapitalized, and its fate would be up to the relevant authorities.<sup>5</sup> Given that there is not much the bank can do to affect the outcome when its government defaults, the best it can hope for is to restore public confidence in the bank as long as its government does not default. Confidence is best achieved by increasing its profits to help it recapitalize.

Among the three alternatives, the third option gives the bank the highest profits, as long as the government does not default. The bank purchases its government's bonds at a discount, as their low prices and high yields reflect a substantial probability of default. That is, if the government does not default, the bond pays a high interest rate. So, a euro area bank can post the bond as collateral to get a low interest rate loan from the ECB, and if its government does not default, it gets paid the high return on the bond, which is more than enough to pay back the

ECB. It earns the difference between the yield on the sovereign bond and the ECB refinancing rate as its profit. These profits are valuable in recapitalizing the bank so it can cover the losses it has incurred on loans that have gone bad and in regaining public confidence.

Why would, say, a German bank not be as attracted to the high returns on Irish bonds? If the Irish government were to default, the shareholders of a German bank holding Irish debt would not shut down and its shareholders would not be wiped out, so the German bank would have to register this investment as a substantial loss on its books. But an undercapitalized Irish bank will go bankrupt if the Irish government defaults regardless of the relatively small change in the quantity of Irish bonds on its books. And once the bank is bankrupt, shareholder value will be zero regardless of the losses incurred.

### Pressure by Authorities

Another possibility is that the governments of these countries push domestic banks to hold more of their bonds by either overt

pressure or indirectly through regulations or other channels. One channel through which such financial repression might be happening in euro area countries with wide spreads is bank governance. As evidence for this channel, there was a positive relationship between government representation on the boards of banks in these countries and an increase in their government bond holdings during 2011-2013.<sup>6</sup>

### Keeping Their Government Afloat

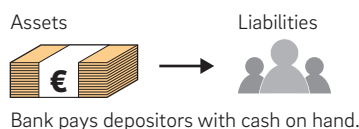
Another motivation for domestic banks to increase their holdings might be to keep their government afloat. When investor confidence in the government's ability to pay its bondholders ebbs, governments may need help rolling over their maturing debt. Entities such as the troika might take on this task, but such negotiations usually take a long time. Domestic banks already hold large amounts of their governments' debt, and the domestic firms and households to whom they have lent money would be harmed by their governments' default. Collectively,

FIGURE 5

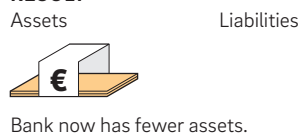
## Why Would a Bank Buy Its Troubled Government's Bonds?

One reason a bank facing a run might choose Option 3 is to try to shore up confidence by boosting profits.

### Option 1



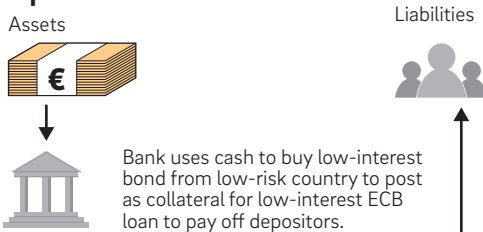
#### RESULT



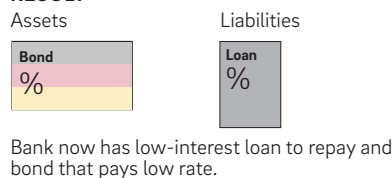
#### EXPECTED PROFITABILITY



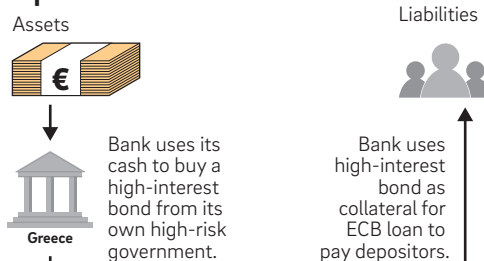
### Option 2



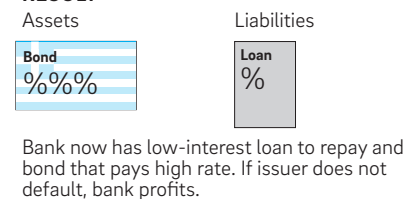
#### RESULT



### Option 3



#### RESULT



domestic banks would have a lot to lose from a sovereign default and their support might be large enough to keep their government solvent for at least a short time, especially if they have access to ECB lending facilities. Without domestic entities stepping in to prop up demand during a selloff by foreigners, the spreads on government bonds would increase further, as dwindling demand would drive down their price and compel the government to pay higher interest rates on new issues. That would make rolling over its existing debt more costly and make default more likely. In this way, domestic banks act as lenders of last resort to their own government, buying its bonds with the money they have borrowed from the ECB.

### Is This Concentration Good or Bad?

Economists who view the concentration of sovereign bonds in domestic banks as a negative emphasize that it crowds out private domestic investment. Indeed, a bank for which capital is scarce and that holds more of its own government's debt will have a harder time lending to domestic entities. To be clear, this mechanism might always be at work for any government's debt, but in times of crisis, the sudden shift is toward domestic government debt. In addition, many households and small businesses rely on the domestic banking sector for loans. For example, as sovereign default risk rose in the peripheral euro area countries, net loans to nonfinancial corporations as a share of their GDP declined rapidly.<sup>7</sup>

It is hard to know whether such declines in private sector loans are demand driven or supply driven. That is, do firms themselves want to borrow less because of a lack of investment opportunities during a recession, or are banks less willing to lend to private firms because they would rather hold their government's bonds? The cause matters: When business lending drops because banks are reluctant to lend, GDP drops more than it would have had the banks not been burdened by government debt.

Yet, in times of capital flight, the only entities willing to lend to the government might be domestic banks. If one focuses on the fact that without them the government might have to default, such concentration seems more benevolent. Even if loading up on government bonds makes domestic banks less willing to make business loans, domestic firms might not mind so much if the alternative is government default. In turn, a greater concentration of its debt in domestic hands might make a government—at least a democratic government—less willing to default if it would disproportionately hurt the country's own banks, households, and firms versus foreign ones. And a government that is less willing to default could see its yield spread ease, possibly enough that it could resume funding its operations through the sovereign debt market.<sup>8</sup>

### Conclusion

The concentration of sovereign debt in domestic entities during a crisis leaves banks with less money to lend to domestic firms and households, which makes an ongoing recession worse. One remedy could be to diminish banks' incentives to load up on their countries' debt: Under current regulations, banks can treat their holdings of euro area sovereign bonds as cash for regulatory purposes, and no capital needs to be held against them. The rules could arguably be changed such that as spreads on sovereign bonds increase, banks would need to hold more capital against them, just as they have to do for loans on their books to domestic firms and households.

But one needs to proceed with caution when trying to deal with the symptoms and not the disease. When banks are loading up on their own government's debt, that is usually also the time when foreigners do not want to buy them. During these times, government bond purchases by domestic entities might be crucial to prevent the government from defaulting on its debt until a political agreement is reached. 

## Notes

- 1** One risk that the single currency dispensed with was the exchange rate risk between countries' currencies, thus allowing further integration.
- 2** Unfortunately, no data are available that would tell us what happened during debt crises in various developing countries outside the euro area.
- 3** A leading explanation for why the U.S. experience differed is that the U.S. has its own national monetary policy and would not have let interest rates rise sharply. The presumption was that, if foreigners began selling off their U.S. Treasury bonds, the U.S. central bank—the Federal Reserve—would step in and print money to absorb the excess supply of bonds, which would have prevented a spike in interest rates. This implicit guarantee prevented a selloff by foreigners.
- 4** The Bank for International Settlements provides an overview of the regulations in place under Basel II at <http://www.bis.org/publ/bcbsca.htm>.
- 5** See the work by Igor Livshits and Koen Schoors.
- 6** See the findings by Bo Becker and Victoria Ivashina.
- 7** Boz, D'Erasmus, and Durdu note this correlation.
- 8** See the papers by Tamon Asonuma, Said Bakhache, and Heiko Hesse and by Varadarajan Chari, Alessandro Dovis, and Patrick Kehoe.

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# Understanding Gentrification's Causes

What do three centuries of Philadelphia history tell us about today's changing neighborhoods?

BY JEFFREY LIN

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**R**ecent gentrification in central city U.S. neighborhoods has generated controversy and increased interest from policymakers, researchers, and the public regarding the consequences of neighborhood change. In gentrifying areas, some residents raise concerns about rising rents and changing demographics, while others may welcome the increased property values and new neighborhood amenities that accompany gentrification. In response, policymakers have acted to both stem and accelerate the pace of neighborhood change. But while press accounts and studies of gentrification's effects have stirred public interest, less attention has been focused on its causes. Although much remains to be learned, our understanding of what triggers neighborhood transformation is improving.

History shows that neighborhoods decline and rebound more frequently than is generally realized. It also suggests that past transformations and the current wave of gentrification stem from shifts in four fundamental factors: amenities, productivity, access, and prices. Over long spans of time, changes in people's tastes, in what and how businesses produce, and in transportation technology have interacted with changes in certain key characteristics of neighborhoods to generate changes in the socioeconomic structure of our cities. Recognizing these influences may help decision-makers anticipate shifts in the socioeconomic status of residential areas and respond with more effective policies. In this article, I trace how these factors have reshaped neighborhoods and even entire metropolitan areas by looking back in time at America's original big city, Philadelphia.

## Recent and historical neighborhood change

Since 2000, a growing number of downtown neighborhoods across the U.S. have gentrified.<sup>1</sup> The term gentrification has many meanings. In this article, I use it to refer to increased investment and an influx of residents of higher socioeconomic status into a lower socioeconomic status neighborhood. The increased socioeconomic status of U.S. downtowns today is a reversal of the

trend in the early to mid-20th century, during which white, higher-income households left central neighborhoods for the suburbs. Gentrification today is also happening more broadly and more quickly compared with the gentrification of isolated cities and neighborhoods that occurred in the 1970s and 1980s, a period of overall central city decline.<sup>2</sup>

Despite these distinctions, recent gentrification resembles earlier periods of rapid neighborhood change in at least two ways. One, history shows changes in neighborhood status are quite common. The likelihood that the relative status of a neighborhood will decline or rebound hasn't increased over several decades. And two, neighborhoods tend to move back toward the average over time: High-status neighborhoods decline, while low-status neighborhoods improve.

To observe the first phenomenon, we need a way to measure neighborhood status. Note that the idea is to determine an area's relative status among other areas in the same metro area. In this way, we can see how often a community moves up and down in the ranking order over time. To show this, I summarize data from decennial U.S. censuses and the American Community Survey to describe how neighborhoods have changed over 10-year periods. For each decade, I measure a neighborhood's status as the percentile rank of its average household income compared with all other neighborhoods in that metropolitan area.<sup>3</sup> A neighborhood's percentile rank is always between 0 and 1. For example, in the Philadelphia metropolitan area, a portion of Gladwyne had a measured percentile rank of 0.998 in 2010, meaning that Gladwyne's average household income was higher than in 99.8 percent of Philadelphia metropolitan area neighborhoods. Now I can measure the change in a neighborhood's status by computing the change in its percentile rank in each decade.

But remember that we want to know the likelihood of neighborhood status changes for the whole metro area. For that, I need to compute the average absolute value of change in neighborhood percentile rank that takes into account both

neighborhood decline and improvement. Otherwise, if I were to use positive and negative changes, the average would always be zero, since one neighborhood's gain relative to other neighborhoods in the metropolitan area must mean another neighborhood's decline. For both the Philadelphia metropolitan area and the average across U.S. metropolitan areas in recent decades, neighborhood change did not become more likely (Figure 1).

The historical precedent of striking neighborhood change is more evident when we examine longer time horizons. Using long-run data from a smaller number of metropolitan areas, over the 60 years between 1950 and 2010, the average U.S. neighborhood moved a full quartile, or 25 percentile points (Figure 2).<sup>4</sup>

Now let's examine the second feature shared by recent and historical neighborhood change: mean reversion—that is, the tendency for above-average neighborhoods to decline and for below-average neighborhoods to improve. Though some neighborhoods stay rich or poor, it's relatively common for neighborhoods to go in and out of fashion. For example, Society Hill, a neighborhood dating to the 1680s bordering Philadelphia's Old City historic district, experienced decline

FIGURE 1

### Consistent Likelihood of Change in Neighborhood Status

Average absolute change in percentile rank within metropolitan areas over recent 10-year periods, percentile points.

|       | All U.S. metros | Philadelphia metro |
|-------|-----------------|--------------------|
| 1980s | 0.09            | 0.07               |
| 1990s | 0.09            | 0.06               |
| 2000s | 0.09            | 0.07               |

Sources: Census Bureau and author's calculations.

Note: The U.S. average is computed across 378 metropolitan areas totaling about 260 million people in 2010.

between 1880 and 1950, followed by a dramatic reversal in the 1960s in the midst of urban renewal programs (Figure 3).<sup>5</sup> About five miles northwest of Society Hill, the city's Strawberry Mansion neighborhood had initially been wealthy in the 19th century but experienced a prolonged decline in the 20th century that persists today.

Neighborhoods' continual reversion toward the average status becomes visible when we track the change in neighborhoods' percentile rank over the course

FIGURE 2

### Large Shifts More Evident Over Longer Periods

Average absolute change in percentile rank within metropolitan areas over 60-year periods, percentile points.

|           | All U.S. metros | 10 U.S. metros | Philadelphia metro |
|-----------|-----------------|----------------|--------------------|
| 1930–1990 | 0.27            | 0.27           | N/A                |
| 1940–2000 | 0.28            | 0.29           | 0.26               |
| 1950–2010 | 0.25            | 0.25           | 0.30               |

Sources: Census Bureau and author's calculations.

Note: The 10 U.S. metro average holds fixed the sample of metro areas determined by the data available in 1930. Philadelphia neighborhood data are not available for 1930.

of a century. Figure 4 summarizes how much neighborhoods with different initial statuses changed over 10-year intervals. Each point represents a neighborhood's rank in an initial year (horizontal axis) and 10 years later (vertical axis). On average, as shown by the dark solid line, the bottom-ranked neighborhood (0.0 on the horizontal axis) increased in status to the 10th percentile 10 years later (0.1 on the vertical axis). In contrast, a neighborhood initially at the median status (0.5) experienced, on average, no change in status. Overall, neighborhoods ranked below the 50th percentile at the start of a 10-year period tended to increase in rank over the 10 years, while neighborhoods that started out above the 50th percentile tended to decline.<sup>6</sup>

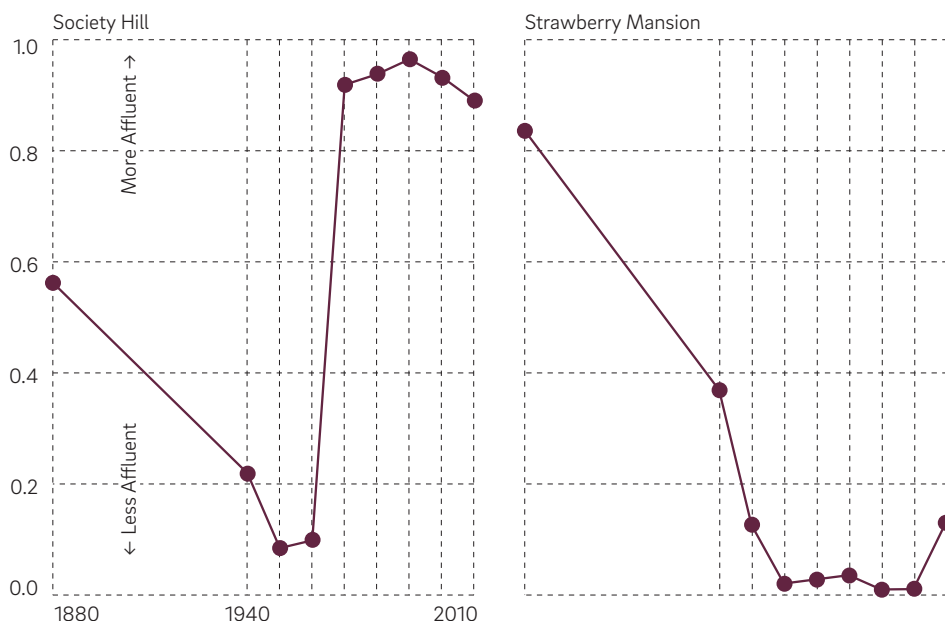
The segmented pink line traces the evolution of Society Hill's relative status between 1940 and 2010: For instance, the point labeled 1950 shows its rank in 1950 compared with its rank in 1940. Society Hill's reversal in the 1960s is clearly visible. While such dramatic transitions are relatively rare, they contribute to the overall pattern of neighborhood mean reversion.

Overall, these historical patterns—both the frequency of dramatic neighborhood change and the tendency for neighborhoods to mean revert—echo previous research, including Stuart Rosenthal's analysis of Philadelphia neighborhoods between 1900 and 2000. So why isn't the commonplace nature of neighborhood change more widely appreciated among households and policymakers? Rosenthal

FIGURE 3

### Neighborhoods Go In and Out of Fashion

Neighborhood income status for census tracts 10.01 in Society Hill and 151.01 in Strawberry Mansion, 1880–2010.



Sources: Census Bureau and author's calculations.

notes that “possibly this is because most families remain in their homes (and neighborhoods) far less than ten years, a horizon too brief for the change in neighborhood economic status to be readily apparent.”<sup>7</sup> Intriguingly, the commonplace nature of dramatic neighborhood change hints that recent gentrification and historical neighborhood change may share common causes.

## What causes neighborhood change?

Given how often neighborhoods change, we have to wonder: Why do they change? One starting point is to categorize neighborhood features that may affect the socioeconomic status of its households and the types of activities found there into four types: amenities, productivity, access, and prices. Then we can understand changes in neighborhood status via changes in one or more of these four factors.

First, an amenity is a feature of a neighborhood that some household is willing to pay for in order to enjoy—for example, a good school, a view of the ocean, or a wide variety of restaurants all increase the amenity value of a neighborhood. Households’ demand for a neighborhood amenity may depend in part on economywide factors. For example, the entry of the millennial generation into their 20s—larger in size and more highly educated than the baby boom generation—is thought by some to have contributed to the recent revitalization of dense urban neighborhoods.<sup>8</sup>

Second, workers may be more productive in certain neighborhoods compared with others. For example, a deep seaport may

increase the productivity of the local transportation sector in coastal neighborhoods. At one time, waterfalls provided power for early manufacturing. Likewise, a high density of customers may enable a provider of business services to economize on transportation costs and thus increase productivity. Over time, the kinds of products and services produced in Philadelphia have depended on the city’s comparative advantage at the time, and the location of their production has depended on the comparative advantages of its neighborhoods.

Third, households and businesses do not just consume and produce in their own neighborhoods; they require access to products and customers located elsewhere. Successive improvements in transportation technology, from horses to electricity to internal combustion, have changed the relative accessibility of central versus outlying neighborhoods. In addition, investments in transportation infrastructure such as rails, highways, and mass transit have favored certain neighborhoods over others.

Finally, if all else is equal, households choose houses with lower prices. While economists believe that the prices of land and houses generally reflect the attributes of the house or the neighborhood, there may be factors that temporarily create attractive pricing conditions in certain locations. One key example of this mechanism stems from the durability of houses. High-income households tend to choose neighborhoods with newer housing. Because houses last a long time, the location of these neighborhoods varies over a city’s history. Because cities grow outward from their centers, new houses are typically built in outlying areas. As houses reach the end of their useful life, their deterioration attracts redevelopment. Echoing earlier work by Neil Smith, the article by Jan Brueckner and Rosenthal highlights the timing of the replacement of old homes as an important factor in determining when and which neighborhoods are likely to gentrify.

Changes in even one of these four factors can be enough to transform a neighborhood. These changes may be driven by broader changes in the economy that affect neighborhoods differently according to their initial endowments. For example, generally rising incomes may shift demand toward larger houses or restaurant variety, favoring certain neighborhoods with abundant supplies. Or a change favoring home ownership over renting, perhaps stemming from demographic shifts or policy changes, might tilt demand away from city apartment lifestyles. New technologies might favor producers in new locations (manufacturers near waterfalls) versus old ones (traders near ports). Alternatively, the stock of neighborhood assets may change over time, as with the deterministic aging of structures or neighborhood-specific investments in local infrastructure or place-targeted policies.

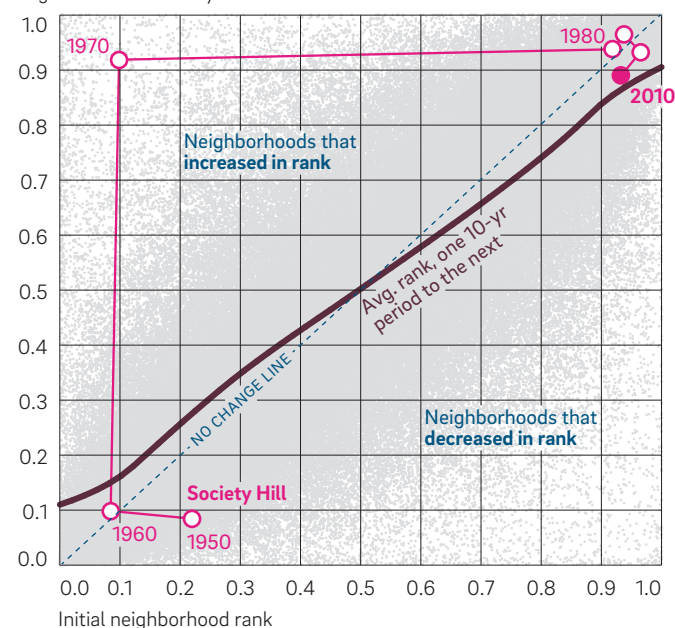
A final consideration in examining how these four factors trigger neighborhood change is that shifts in one or more of them might set in motion either a “virtuous” or a “vicious” cycle that reinforces and amplifies the initial factor. For example, a small initial improvement in neighborhood amenity value—say, the opening of a supermarket—may attract more residents, encouraging new restaurants to open, further improving neighborhood amenities, and attracting residents of higher means. On the flip side, a deteriorating house may lower the value of nearby

FIGURE 4

### Lower-Ranked Areas Tend to Rise and Vice Versa

Mean reversion in neighborhood income status, 1910–2010.

Neighborhood rank 10 years later



Sources: Census Bureau and author’s calculations.

Note: The pink segmented line shows status changes over time for census tract 10.01 in Society Hill.

houses, causing residents to flee, further lowering demand for housing in the neighborhood, and causing its amenities to decline. One implication of such endogenous, or internally generated, reinforcement is that the initial shift in an underlying factor need not be large to dramatically change a neighborhood.

## Evidence on the Causes from Philadelphia's History

The history of Philadelphia illustrates how evolving technologies, tastes, and fixed neighborhood factors have shaped changes in neighborhood status and the internal structure of the overall city and metropolitan area by affecting the four key factors of amenities, productivity, access, and prices.

In Philadelphia's early history, productivity and access played major roles in shaping neighborhoods. Around 1750, Philadelphia emerged as an important trading center and the largest city in British North America.<sup>9</sup> In his contribution to *Philadelphia: A 300-Year History*, Theodore Thayer notes that given the importance of trade, early industrial activity had concentrated near the banks of the Delaware River and in the vicinity of the shipyards. Shipbuilding and related activities, such as blacksmith shops and foundries, were joined by tanneries, distilleries, breweries, carriage shops, and other industries that often relied on imported inputs.<sup>10</sup>

In that era, Philadelphia was also America's financial capital. Banks were clustered on lower Chestnut Street, just blocks from the trade that had attracted capital and had inspired many local financial innovations such as marine insurance.<sup>11</sup> As transportation options were limited, almost all Philadelphia residents and workers lived within three or four blocks of the Delaware River.<sup>12</sup> That's not to say that amenities did not matter—the very affluent, such as William Penn's early patrons, sometimes had bucolic estates far outside the city limits. But in the burgeoning city, even the rich lived near the Delaware, though they often chose larger plots overlooking the river.<sup>13</sup> Overall, the spatial structure of 18th century Philadelphia was largely determined by the importance of the port for trade, which led to the concentration of industry along the Delaware River, and the high cost of travel, which led to the concentration of workers, even high-status ones, within a few blocks.

In the 19th century, several trends affecting neighborhood productivity, amenity, and access intersected to dramatically alter the spatial structure of the city (Figure 5). One, the city's economic lifeblood shifted from trade and finance to manufacturing. Two, the size and complexity of manufacturing establishments increased. Three, faster modes of transportation were developed. A brief look at the city's economic and social history shows how these trends interacted to transform neighborhoods.

By the 1820s, Philadelphia's early advantages in trade, commerce, and finance had lapsed in favor of New York.<sup>14</sup> However, new entrepreneurs and investments soon made Philadelphia a manufacturing hub, which fueled Philadelphia's growth for nearly a century more. In terms of the spatial structure of the city, these shifts meant that employment shifted west from the Delaware waterfront toward Broad Street.<sup>15</sup> Some manufacturers,

particularly of textiles, were attracted to Manayunk in order to take advantage of waterpower on the Schuylkill River. The growing size of factories and mills also pushed apart work and residence. According to one analysis, the share of Philadelphia's manufacturing workforce employed at small firms—defined as those with fewer than 26 employees—fell from over 40 percent to less than 20 percent between 1850 and 1880.<sup>16</sup>

This growing separation between work and home was reinforced by faster modes of transportation such as the omnibus and the streetcar. Artisans and skilled workers took advantage of new technologies such as the horse-drawn streetcar, introduced to Philadelphia in 1858, to live in the more amenable “streetcar suburbs” of West Philadelphia, Germantown, and Chestnut Hill. As an example of neighborhood transformation during the 19th century, between 1850 and 1860, in the northwest Philadelphia district encompassing Germantown, the proportion of households in the middle class increased from 13 percent to 27 percent, while the proportion of unskilled households decreased from 38 percent to 25 percent.<sup>17</sup> In 1882, the opening of Broad Street Station allowed commuters from the affluent Main Line access to Center City, and commutes by high-status workers lengthened between 1850 and 1880.<sup>18</sup> By moving to these early suburbs, higher-income residents could escape the disamenities of 19th century urban life, including periodic epidemics of influenza and yellow fever.<sup>19</sup>

By 1880, the highest-status neighborhoods had already shifted several kilometers away from downtown, as can be seen in Figure 6. Each line plotted provides a snapshot of relative neighborhood income at different distances from City Hall in six census years between 1880 and 2010.<sup>20</sup> As a group, the six snapshots illustrate the long-term status shift in favor of suburban neighborhoods as well as the small but notable shift after the turn of the 21st century back toward the central city. The decentralization of income and status that was perceptible by the late 19th century was of course a preview of the more dramatic suburbanization to come in the 20th century.

In the 20th century, amenities, productivity, and access all played major roles in shaping neighborhood status. Central Philadelphia's status declined markedly as high-income and middle-income households, usually white, left the city. Several factors contributed to these changes.

One, advances in transportation technology and infrastructure further decoupled the location of work and home. Car ownership became commonplace, and public investment in the Interstate Highway System further decreased commuting costs, increasing the access advantages of the suburbs. Nathaniel Baum-Snow has found that highways caused central city populations in the U.S. to decline by 25 percent between 1950 and 1990. Two, rising incomes also increased demand for amenities and space, again favoring suburban locations that could offer these features. Three, the de-urbanization of manufacturing employment, historically centered in the city, also eroded the position of central Philadelphia. Four, social and racial problems mounted in the city. Leah Boustan has found that the influx of African Americans into Northern cities such as Philadelphia prompted “white flight” to the suburbs. As Philadelphia was a longtime magnet for African American migrants, this

FIGURE 5

## Westward Shift in 19th Century, Renewal in 20th

In the mid-19th century, commerce remained concentrated closer to the Delaware River, and covered wagons remained in use alongside trolleys, as seen in the photograph taken in 1870 of Walnut Street, looking west from Fourth Street (1). The importance of trade to Philadelphia's economy was still keeping activity near the port, which is also seen in the merchant signs for coal shipping, insurance, and rail. But by the late 19th century, activity had shifted several blocks west, and electric streetcars had become popular, as visible in the 1894 photograph of 12th and Market Streets (2). More than 70 years later, the Delaware waterfront experienced a resurgence as high-rises sprouted on the eastern edge of Society Hill, a neighborhood that dates from colonial times (3).

**Photos:** Photo 1 courtesy of Free Library of Philadelphia, Print and Picture Collection; photos 2 and 3 courtesy of PhillyHistory.org, a project of the Philadelphia Department of Records.



FIGURE 6

## Late 19th Century a Precursor to the Mid-20th Century

Neighborhood income status by percentile ranks of census tracts in Philadelphia, by distance to city center for select years between 1880 and 2010.



Sources: Census data and author's calculations.

white flight may have played a large role in Philadelphia's evolution over the 20th century. One study found that riots in the 1960s drove down urban employment, incomes, and housing values, and by that study's classification, Philadelphia had several severe riots.<sup>21</sup> Some of the urban renewal policies of the 1960s may also have eroded the amenity value of central Philadelphia.<sup>22</sup> And poor public finance and city services have been identified as contributing to the erosion of quality of life in the city.<sup>23</sup>

In the 1990s, incomes and population in central Philadelphia stopped declining, as they did in other big U.S. cities, and the population of higher-income households in Center City rebounded (Figure 6). Interestingly, the average improvement in percentile rank for a central Philadelphia neighborhood is similar in magnitude to the average absolute change in neighborhood status over the last several decades reported in Figure 1.

As in earlier periods, changes in amenity, productivity, and access values of downtown neighborhoods have contributed to the recent turnaround. One, aggregate shifts in employment toward education and health services have increased the comparative advantage of downtown neighborhoods. Because many of these institutions were located downtown historically, employment downtown has benefitted as these industries have grown, making nearby neighborhoods more attractive to these workers. Across all U.S. cities, similar shifts in the U.S. production structure since 1980 have tended to favor downtown neighborhoods.<sup>24</sup>

Two, rising incomes overall and perhaps shifts in preferences among millennials have also attracted more highly educated households back to downtowns. Today's high-income and college-educated households appear to value urban consumption amenities—restaurants, theaters, etc.—more than these types of households did in earlier periods.<sup>25</sup> Higher incomes also raise the opportunity cost of commuting—in other words, an hour spent in traffic represents a greater loss of gainful productivity for a higher-wage commuter than it does for a lower-wage one. This cost may be another mechanism driving increased demand for

downtown living.<sup>26</sup>

Three, urban amenities have also improved. One study suggests that the decline in central city crime played a role in recent gentrification.<sup>27</sup> Relative access values have changed, too: Reduced investment in new transportation infrastructure in recent decades has meant that, in the face of a growing population and increased congestion, the access advantages that suburban locations once provided has eroded. One theory holds that high-income households may have returned to downtown neighborhoods because the tradeoff between access and space has now become more favorable in downtown neighborhoods.<sup>28</sup>

Finally, as the housing stock and other structures in certain neighborhoods aged, property prices there declined enough to make these areas attractive for redevelopment.<sup>29</sup> Policies such as the City of Philadelphia's property tax abatement have reinforced these pricing advantages. As a result, vacant lots and the old housing stock have been replaced with new, higher-priced apartments and condos.

Looking back across the centuries has made it plain that the four factors have not been equally important in driving ups and downs in the city's neighborhoods. Over Philadelphia's history and right up to today, access—whether by foot, horse, rail, or car—has consistently been an important factor shaping neighborhood dynamics. In contrast, productive factors such as waterpower have faded in importance compared with amenable characteristics such as bicycle paths and restaurants. Policy and the aging of the city's housing stock have also been important for understanding recent neighborhood change.

## The Future

What does Philadelphia's future hold? The current geography of the metropolitan area is characterized by a downtown with a concentration of business services, high-income households, and a high quality of life; a transportation network centered on downtown; and relatively high home prices in downtown neighborhoods. But the region is also characterized by affluent neighborhoods in suburban locations and many high-productivity

service industries, such as pharmaceuticals and finance, located outside the city.

In the future, many factors might reshape this economic geography. Policy such as wage and business tax rates, particularly in the city of Philadelphia, will affect whether central areas will attract more high-paying jobs to follow the recent inflow of higher-income households. Automated transportation technologies such as self-driving cars and deliveries via drones may reduce the cost of commuting, turning the tide back toward more decentralization. But these technologies may also affect where different types of households choose to live in our region by, for instance, changing how people shop, reducing the need for parking, and changing leisure choices. The current revival of Center City could face other setbacks as well. The next generational wave of young adults may not value urban amenities so highly. Or the region's comparative advantage in "eds and meds" may fade in response to changes in policy or larger shifts in the structure of the economy.

The history of Philadelphia over three centuries reminds us that neighborhood change is constant and, to some extent, unavoidable. Intriguingly, some neighborhood development may be spontaneous, occurring without apparent external cause. Economists typically call these random, outside events exogenous shocks, but the authors of one novel study just call them "surprises." William Easterly and his coauthors track the ups and downs of a single New York City block over nearly 400 years and conclude that wider events that no one foresaw or likely could have influenced repeatedly swept into and out of the

block at random intervals, interacting with existing conditions there to unexpectedly alter its fortunes.

The Dutch did not expect New York to thrive when they gave the Greene Street block to slaves and then gave up New York altogether in favor of Suriname (Surprise 1). The affluent residents of the block in 1830–1850 did not expect brothels (Surprise 2). The brothel owners, workers, and customers in 1880 were likely surprised to see a thriving garment industry take over the block (Surprise 3). The garment industry did not expect the severe downturn after 1910 (Surprise 4). The urban planners in the 1940s and 1950s did not anticipate the block would explode in value again, first with art galleries (Surprise 5), and then with today's luxury retail stores and residences (Surprise 6). The block's story ends in the present at a high point in real estate value, but the history reminds us that the next surprise could be negative.

These researchers note that the essentially "leaderless" nature of development forces may argue against policies designed to support specific neighborhoods—often called place-based policies—in favor of social support aimed at individuals. But they also note that their study wasn't able to factor in the urban planning and policies such as good schools or modern infrastructure that can underpin the long-run growth of a city or region. Regardless of the nature and sources of these shocks, the common thread is the economic mechanisms through which these shocks transform neighborhoods: amenities, access, productivity, and prices. 

## Notes

**1** See the articles by Nate Baum-Snow and Daniel Hartley, Victor Couture and Jessie Handbury, and my article with Jackelyn Hwang.

**2** There is substantial debate about whether gentrification leads to displacement, in which rising rents and taxes from increased investment could price lower-income residents out of their neighborhood. There are several challenges in determining whether displacement is occurring. For example, low-status neighborhoods have high rates of both in- and out-migration. When such neighborhoods gentrify, it is difficult to distinguish out-migrants who are displaced by higher-income in-migrants from out-migrants who would have left the neighborhood anyway, even without gentrification. Lance Freeman and Frank Braconi, Terra McKinnish and her coauthors, and Lei Ding and his coauthors discuss these issues in their articles.

**3** I use consistent-boundary census tracts to define neighborhoods. Historical data are adjusted so that they reflect 2010 census tract boundaries. Alternative ways of measuring relative neighborhood status, including income, housing prices, and educational attainment yield similar rankings. Some later figures use average housing prices or average educational attainment to rank neighborhoods in early census years when income was not reported. For more details on these data and comparisons, see my paper with Sanghoon Lee.

**4** While patterns of household sorting by income or status have undergone significant churn over time, the pattern of population density within cities has remained remarkably persistent, as documented recently in an *Economic Insights* article by Jeff Brinkman.

**5** The American Planning Association summarizes Society Hill's evolution in its Great Places in America series, <https://www.planning.org/greatplaces/neighborhoods/2008/societyhill.htm>.

**6** Some readers might object that the mean reversion in percentile ranks might be mechanically driven. That is, since percentile ranks are between 0 and 1, any change in the bottom-ranked neighborhood can only be up, and vice versa for the top-ranked neighborhood. For example, suppose the highest-status neighborhood experiences a large increase in income and the lowest-status neighborhood experiences a large decrease in income. Despite the divergence in incomes in this example, the percentile rankings would indicate no change in the relative status of the neighborhoods. Yet, interestingly, mean reversion emerges even when using the change in average household income as the measure of neighborhood change: Neighborhoods with higher initial incomes tend to decline more in average household income over the subsequent 10 years. This suggests that the use of percentile rankings to measure mean reversion is not driving these findings.

- 7** See p. 818 of Rosenthal's article.
- 8** See the paper by Dowell Myers.
- 9** The article by Joseph Gyourko discusses each phase of Philadelphia's growth.
- 10** See p. 75.
- 11** See the book by Robert E. Wright.
- 12** See the contribution on p. 14 by Mary Maples Dunn and Richard S. Dunn to *Philadelphia: A 300-Year History*.
- 13** See p. 34 of Edwin Bronner's chapter in *Philadelphia: A 300-Year History*.
- 14** Among other reasons, New York's superior natural harbor and the opening of the Erie Canal; the Napoleonic Wars which disrupted trade with continental Europe, an important market for Philadelphia; tighter links between New York and London; and the eventual lapse in the charter of the Second Bank of the United States are all cited as contributing to Philadelphia's decline (both Gyourko's article and Wright's book have more on these factors).
- 15** According to Alan Gin and Jon Sonstelie, by 1880, 45 percent of adult males worked within 1 mile of Broad and Market Streets.
- 16** See the analysis of the U.S. census of manufactures by Theodore Hershberg and his coauthors.
- 17** Kenneth Jackson's book documents this neighborhood transformation.
- 18** Hershberg and his coauthors document the growing commute times.
- 19** See the working paper by Patricia Beeson and Werner Troesken.
- 20** The year 1880 was the first for which neighborhood-level census information is available about residents' occupations and educational attainment.
- 21** See the work by William Collins and Robert Margo.
- 22** See the paper by William Collins and Katharine Shester.
- 23** Articles by Joseph Gyourko and Robert Inman highlight these factors.
- 24** See Baum-Snow and Hartley's 2016 work.
- 25** See Victor Couture and Jessie Handbury's paper.
- 26** See the paper by Lena Edlund and her coauthors.
- 27** See the work by Ingrid Ellen and her coauthors.
- 28** As Stephen LeRoy and Jon Sonstelie have theorized.
- 29** See the article by Brueckner and Rosenthal.

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# The Rise in Loan-to-Deposit Ratios: Is 80 the New 60?

Liquidity ratios at small banks have climbed in recent decades. Why has this happened? Should regulators be concerned?

BY JAMES DISALVO AND RYAN JOHNSTON

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A traditional signal that a bank may not have enough liquid assets to cover a sudden loss of funding has increased dramatically at small banks in recent decades. Small banks' median ratio of the value of their loans outstanding to the value of their deposits has risen from around 60 percent in the second half of the 1980s to around 80 percent today. Meanwhile, the same measure of liquidity has increased about 5 percentage points at large banks. How can we explain this big increase in loan-to-deposit (LTD) ratios among small banks? Are higher LTD ratios here to stay? Do they pose risks to the safety and soundness of our small banks?

### High LTD Ratios Linked to Risk

LTD ratios—defined as total loans divided by total deposits—were basically flat from 1984, when our data begin, until the early 1990s. In the 1990s, the median LTD ratios at both small and large banks increased steadily until the financial crisis hit in 2008, then fell precipitously until 2012 and have been rising again for the past five years.<sup>1</sup> Over the past three decades, the median LTD ratio at small banks increased from about 60 percent to close to 80 percent at the end of 2016 (Figure 1).<sup>2</sup> While LTDs were already higher at large banks, they increased less rapidly, from around 80 percent to over 85 percent during the same period.<sup>3</sup> During the buildup to the real estate bubble in the early and mid-2000s, LTDs at large banks approached 95 percent as their residential real estate lending expanded rapidly. This increase was quickly reversed during the crisis, and LTDs at large banks have settled at roughly their level in 2000. In

this article, we focus not on the precrisis rise in LTDs but on the longer-term trend.

Traditionally, analysts and regulators have monitored banks' LTD ratios as a measure of liquidity. For a bank, liquidity essentially comes down to whether it can sell enough assets in exchange for cash without having to accept large discounts in their value. A bank needs a basic amount of liquid assets—such as Treasury securities or cash itself—just to fund its day-to-day operations. But what we are concerned with here is how well prepared a bank would be in the event of unexpectedly large withdrawals of its short-term funds.

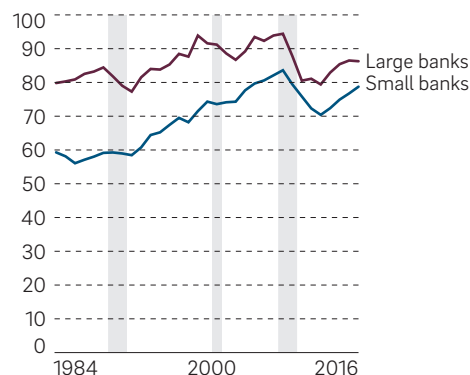
Why does comparing a bank's loan exposure against its deposits tell us something about the sufficiency of its liquidity? Deposits (especially, as we will see, insured deposits) are a stable source of funding for banks. A bank that finds itself with too few deposits to fund loans must rely more heavily on nondeposit sources of funds, whose availability and price are much more

sensitive to changing economic or financial conditions. For example, rising market interest rates or concerns about a bank's financial health can prompt investors to swiftly move their nondeposit funds to another bank or outside the banking system altogether. If these non-deposit funding sources become too expensive or dry up, the bank could be forced to not renew its borrowers' loans, curtail its overall lending, or even sell off loans or other illiquid assets on its books at a substantial discount, possibly weakening the bank's health or even threatening its viability as a going concern.

That is what happened, on a wide scale, following the failure of the investment banking giant Lehman Brothers in 2008, which triggered a more general crisis in

**FIGURE 1**  
**Big Rise in Small Banks' LTD Ratios**

Median loan-to-deposit ratios, 1984–2016, percent.



Source: Federal Financial Institutions Examination Council Call Reports.

money markets. Money market conditions grew very tight for all financial institutions that relied on wholesale funds—that is, funds from more costly sources such as institutional investors as opposed to deposits from a bank’s own customers.<sup>4</sup> Banks that had relied on nondeposit funding sources found that they were unable to secure funds on the open market except at very high prices and only for a very short term—overnight. In response, these banks had no choice but to stop making new loans and to not renew existing loan commitments as they matured. Some banks even reneged on their commitments to lend and closed down credit card accounts. The government responded by increasing the size of individual accounts covered by federal deposit insurance from up to \$100,000 to up to \$250,000.<sup>5</sup>

More generally, LTD ratios are related to banks’ financial health. Examiners have found that banks with LTD ratios that are well above the average are more likely to be risky along many dimensions besides liquidity risk. For example, banks with large amounts of loans relative to their deposits may be more aggressive lenders. That is, they may have lower lending standards than more conservatively run institutions. They also may invest in riskier securities to generate higher returns to offset the higher cost of borrowing nondeposit funds.

This does not mean that every bank with a high LTD ratio is very risky or that the high LTD ratio is the underlying source of the risks. However, banks with high LTD ratios often score high along other measures of risk monitored by examiners. In the Third District, examiners have found that banks flagged by their early warning model of potential problems often have very high LTD ratios.

## Small Banks Have Grown Bigger

The larger the bank, generally the higher the LTD ratio, all else being equal. One reason is that large banks typically have an advantage over small banks in making some kinds of loans. For example, making a very large loan is not feasible for a small bank, even if the funding of the loan is divided up among many banks.<sup>6</sup>

And while a large bank has the resources to maintain a department dedicated to making small business loans, the converse is not true: A small bank would find it unduly risky to expose a major share of its loan portfolio to a single large borrower. Its smaller asset size means it needs to spread out its risk of nonrepayment by making numerous smaller loans, each for no more than it could readily absorb in the event of the borrower’s default.

Another reason large banks do not rely as heavily on their deposits is that they have greater access to funds from multiple nondeposit sources such as federal funds and commercial paper.<sup>7</sup> Access to these markets requires maintaining a continual presence as a borrower, which requires having the personnel on staff with the specialized knowledge needed to procure and manage these funding sources. Assembling such a department would be excessively costly for many small banks. Also, small banks may have some advantages in securing funds from small depositors and small businesses because of customer relationships.

However, small banks have been getting larger since the 1990s, mainly because regulatory restrictions that had prevented them from achieving an efficient size have been removed.<sup>8</sup> In 1984, the median size of a small bank was about \$67.3 million in total assets (adjusted for inflation). By 2016, the median small bank had reached \$200.5 million in assets.<sup>9</sup>

This growth raises the question: How much of the increase in LTD ratios is attributable to the increase in banks’ size distribution alone? To estimate the effect of increased bank size on LTD ratios, we split small banks into three size categories.<sup>10</sup> The average LTD ratio for 2016 is the sum of the average LTD ratios within each size category weighted by the percentage of banks within that category. Our thought experiment is to ask: If the LTD ratio within each size category had not changed between 1984 and 2016—and the only change was the fraction of banks in each size class—how much would average LTD ratios have changed? This question gives us a measure of how much of the change in LTD ratios can be explained by a change in the size distribution of small banks alone. Then we perform a different thought experiment.

We assume that the fraction of banks in each size category did not change from 1984 to 2016, but we allow the average LTD ratio within each size class to change from its 1984 level to its 2016 level. This provides a rough estimate of how much of the change in average LTD ratios might be explained by other factors that affect all banks within a particular size group.<sup>11</sup>

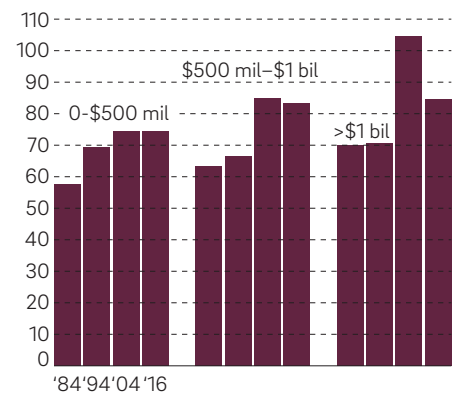
Using this methodology, we calculate that about 8 percent of the change in LTD ratios between 1984 and 2016 was accounted for solely by the change in the distribution of banks among size categories, and about 85 percent of the change in LTD ratios was due to other factors. Indeed, we can see in Figure 2 that average LTD ratios within each size class have increased since 1984.

**See Factors Explaining Changes in LTD Ratios.**

FIGURE 2

## LTDs Have Risen in Each Size Range Since 1984

Average loan-to-deposit ratios in select years from 1984–2016 for small banks, grouped by size, percent.



Source: Federal Financial Institutions Examination Council Call Reports.

Keeping in mind that our exercise provides only a rough estimate of the magnitudes, we conclude that the increase in bank size can explain some of the increase in LTD ratios during this period—perhaps 10 percent. Because this estimated impact of bank size is so modest, we think it is safe to assume that most of the LTD increase has been due to other causes.<sup>12</sup> Looking at the market and regulatory environment for banking during these years, two factors stand out.

## Factors Explaining Changes in LTD Ratios

For our thought experiment, we used the following identity:

$$\sum_i \Delta(F_i * (L/D)_i) \stackrel{\text{def}}{=} \sum_i (\Delta F_i * (L/D)_i) + \sum_i (F_i * \Delta(L/D)_i) + \sum_i (\Delta F_i * \Delta(L/D)_i)$$

where  $F_i$  is the share of banks in size category  $i$  and  $(L/D)_i$  is the average LTD ratio in size category  $i$ .  $\Delta F_i$  is the change in the fraction of banks in size category  $i$  between 1984 and 2016 and  $\Delta(L/D)_i$  is the change in the average LTD ratio within size category  $i$  between 1984 and 2016. The summation is over the three size categories.  $\sum_i (\Delta F_i * (L/D)_i)$  represents how much the LTD ratio would have changed if the only change was the fraction of banks in each size category.  $\sum_i (F_i * \Delta(L/D)_i)$  represents how much of the change in the LTD ratio is explained by other factors, and  $\sum_i (\Delta F_i * \Delta(L/D)_i)$  represents the interaction between the change in LTDs due to size and other factors.

## Regulatory and Market Changes

One factor behind the rise in LTDs may be greater competition for deposits. Developments in the 1980s and 1990s increased the competition for people's savings. Interest rates soared in the late 1970s and early 1980s, and money market mutual funds and other types of mutual funds began to compete aggressively for depositors' money. At the time, regulations did not permit banks to pay interest on demand deposits (checking accounts), and interest rates on other types of deposits were capped. Savers had always moved their liquid funds away from banks and into other investments whenever market interest rates rose above the regulatory caps. But in the high interest rate environment of the 1970s, banks' loss of funds became endemic.

This competition did not abate after 1980, when regulations changed and banks were permitted to pay interest on demand deposits and interest rate caps on other deposits were removed.<sup>13</sup> Apart from continued competition from non-banks such as mutual funds and thrifts, competition among banks also heightened. Banks were now increasingly able to search more widely for customers—first anywhere within a state as intrastate banking restrictions disappeared, and then across state lines as interstate banking restrictions fell away. More aggressive competition for savers' funds has become a permanent feature of the banking landscape. The effect of this new competitive environment was to reduce the advantage of funding loans with deposits versus wholesale funds by making deposits more expensive to attract and keep and more likely to be withdrawn.<sup>14</sup>

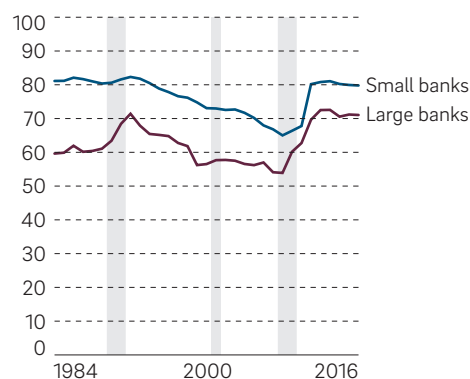
One concrete measure of the effect of this increased competition is the decline in core deposits from the 1990s up until the financial crisis in 2008 (Figure 3). Core deposits are usually defined as insured domestic deposits excluding brokered deposits—deposits that are too large to be insured and so are split into smaller, insurable pieces by insurance brokers.<sup>15</sup> Core deposits are typically a stable source of funding for banks.<sup>16</sup> Insured depositors don't withdraw their money at the first sign of trouble at their bank, as opposed to uninsured depositors and other uninsured funding sources. Also, small depositors, who provide the bulk of core deposits, are typically not very rate sensitive. That is, they don't constantly move their money around in response to competing offers from other banks and nonbank investment vehicles.

From 1992 until 2008, core deposits as a percent of total assets declined around

FIGURE 3

### Core Deposits Declined Until the Financial Crisis

Median share of core deposits to total assets, percent.



Source: Federal Financial Institutions Examination Council Call Reports.

17 percentage points at small banks and around 18 percentage points at large banks. This trend reversed during the financial crisis, when depositors withdrew their money from money market funds and other investments and placed them in banks, which savers considered safer because their deposits were insured. At least part of the postcrisis increase in core deposits came from the expansion of federal deposit insurance from \$100,000 to \$250,000, which added to the number of accounts that are considered core deposits.

A second factor behind the rise in LTDs has been banks' ability to take advantage of funding from Federal Home Loan Banks (FHLBs). Until the late 1980s, the FHLB system exclusively served the thrift industry, providing funding to thrifts so they could make home loans. Banks gained membership to the FHLB system through the Federal Institutions Reform, Recovery, and Enforcement Act of 1989, which allowed banks that held at least 10 percent of their assets in residential mortgage loans to become members.

Following the savings and loan crisis of the 1980s, the thrift industry began its steady decline, and banks replaced thrifts as the primary providers of residential real estate loans. In turn, most banks could satisfy the 10 percent cutoff for borrowing from home loan banks. In 1999, the Gramm-Leach-Bliley Act dropped the 10 percent residential mortgage requirement for banks with less than \$500 million in total assets, allowing even more of them to become FHLB members.<sup>19</sup> As of 2016, 2,498 small banks and 87 large banks had FHLB advances on their books.

After passage of the 1989 law, FHLB advances at banks increased rapidly until the financial crisis hit in 2008. After a sharp decline during the crisis, the average ratio of FHLB advances has recovered to 3 percent of assets for small banks and over 4 percent for large banks (Figure 4).<sup>20</sup> Thus, the rise in FHLB funding equals roughly one-quarter of the increase in the average LTD ratio for small banks since 1984.<sup>21</sup>

Following an initial rise in 2006, the share of FHLB advances declined during

See **Federal Home Loan Bank System.**

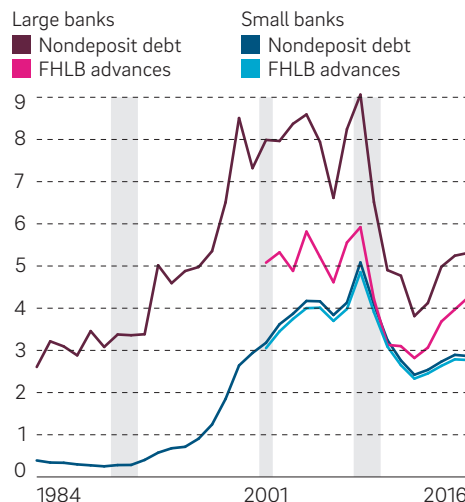
the crisis for a number of reasons. On the demand side were government programs such as the increase in deposit insurance limits and the FDIC's guarantee of bank debt under the Temporary Liquidity Guarantee Program.<sup>22</sup> These supports made banks more attractive to depositors and other suppliers of short-term debt, thereby decreasing banks' need for FHLB advances. On the supply side, the value of the residential loans and mortgage-backed securities that banks use to secure FHLB advances decreased substantially. Thus, deposits became cheaper for banks at the same time that FHLB advances became more expensive, resulting in fewer FHLB advances.

Since FHLBs are government-sponsored entities, they are relatively stable sources of funding, and the home loan banks provide a wide range of maturities and pricing options to help banks manage their liabilities. For example, an advance from a home loan bank might have a five-year maturity, longer than most certificates of

FIGURE 4

## 1989 Law Paved Way for Rise in FHLB Advances

Average share of nondeposit debt to total assets, percent.



Source: Federal Financial Institutions Examination Council Call Reports.

deposit. To receive an advance from its home loan bank, the member bank must post mortgages or mortgage-backed securities as collateral. But studies have shown that the availability of collateral is not a binding constraint for most banks seeking advances.<sup>23</sup>

Thus, FHLB advances serve the same purpose as core deposits: They are a stable source of funds even when the economy suffers shocks. Small banks use advances from the home loan banks to avoid reducing their residential real estate lending in the face of rising market interest rates or declines in GDP, according to a study by Scott Frame, Diana Hancock, and Wayne Passmore.

## Is the Increase in LTD Ratios Permanent?

Once the effects of the crisis began to abate, LTD ratios started rising back toward their peak of 2008. This rebound seems to suggest that the decline during

## The Federal Home Loan Bank System

The Federal Home Loan Bank (FHLB) System was established in 1932 as a government-sponsored enterprise to promote the development of housing and thereby increase home ownership. It carries out this mission by providing funding to institutions that are primarily engaged in home lending. There are currently 11 regional FHLBs with a total of over 7,000 member institutions, and each FHLB is cooperatively owned by its members. Originally, nearly all FHLB members were thrift institutions—savings and loans and savings banks—with a smattering of insurance companies.

In 1989, as an answer to the savings and loan crisis of the 1980s, Congress enacted the Federal Institutions Reform, Recovery, and Enforcement Act, one provision of which allowed banks to become FHLB members. As a result, thrift institutions now make up only about 11 percent of FHLB members, with nearly all of the rest being banks and credit unions.<sup>17</sup>

The primary way that FHLBs provide funding is through loans, or as the FHLBs refer to them, "advances." These advances are

collateralized by the borrowing institutions' residential loans and mortgage-backed securities. The terms on FHLB advances can range from overnight to 30 years, repayment can be through single payments or amortizing, and their interest rates can be fixed or adjustable.

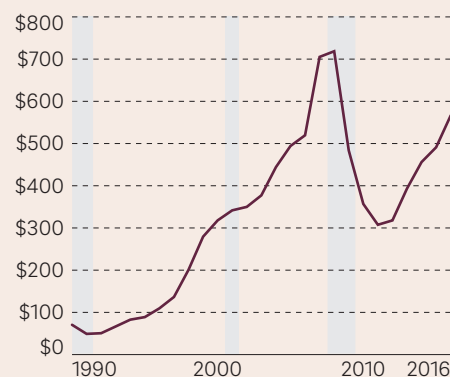
FHLB lending increased substantially at the onset of the financial crisis in 2007, peaking in the third quarter of 2008, as Adam Ashcraft, Morten Bech, and W. Scott Frame have documented (Figure 5). As financial conditions worsened and government programs were put in place that encouraged investors to shift funds back into the banking system, FHLB advances plummeted. Since their low plateau in 2011 and 2012, FHLB advances have risen back to levels like those in the early 2000s.

While the original purpose of FHLB advances was to provide funding for residential real estate, borrowing institutions can use the funding for any purpose. Thrift institutions were mainly residential real estate lenders, so when they were the majority of FHLB members, there was a fairly close link

FIGURE 5

## FHLB Lending Shot Up Leading Into Financial Crisis

Federal Home Loan Bank advances, billions, in 2016 dollars.



Source: Federal Reserve Flow of Funds.

between FHLB advances and overall residential real estate lending. But most banks today have a significant portion of their loan portfolios tied up in commercial real estate and commercial and industrial loans, so the link is substantially weaker.<sup>18</sup>

the crisis was the aberration and that higher LTD ratios have become a permanent feature of the banking landscape.

We have estimated that perhaps 10 percent—probably somewhat more—of the increase in LTD ratios at small banks is due to an increase in bank size. Certainly, this portion of the rise is permanent because banks will continue to get larger. We have also seen that since the early 1990s, small banks have supplemented their core deposits with FHLB advances, thereby permitting higher LTD ratios. It is possible that legislation could limit lending or investment activities by the home loan banks. But reforms have been proposed that would target home loan bank advances more narrowly toward small financial institutions.<sup>24</sup> It seems unlikely that small banks will lose access to this source of funding any time soon.

## Notes

**1** Average LTDs tell a slightly different story than the median, with a very sharp rise in the 2000s at large banks and an equally sharp decline during the crisis. This rise was driven by very high LTDs at just two now-defunct institutions, MBNA America Bank and Countrywide Financial, that had financed large increases in residential lending with market funding. Unless otherwise indicated, we define the average as the unweighted mean; that is, to get a more accurate measure of the “typical” bank, we do not weight each bank’s contribution to the average by its assets.

**2** All ratios are calculated for the entire organization; that is, the numerator and denominator are the sum of all banks within a particular holding company.

**3** Small banks are defined as those that are not in the top 100 banking organizations in terms of assets in a given year, including only the assets of their commercial bank subsidiaries. Large banks are defined as banking organizations such as bank holding companies that are ranked in the top 100 in banking assets in that year, including assets of only their commercial bank subsidiaries.

**4** See Gary Gorton’s book *Slapped by the Invisible Hand: The Panic of 2007* for an expanded account of the stresses in money markets that were triggered by the failure of Lehman. Allen Berger, Christa Bouwman, and Dasol Kim provide evidence that during the financial crisis small banks—which are less reliant on wholesale funding than large banks are—provided funding for firms that had previously been customers of large banks.

**5** The higher limits were made permanent under the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010.

**6** For example, a commercial and industrial (c&i) loan to a large firm often exceeds \$1 billion, and the money comes from a number of banks—a loan syndicate. But dividing such a loan into pieces tiny enough so that small banks can participate would require a very large syndicate, which would raise the costs of syndication significantly.

The loan-to-deposit ratio is a relatively crude measure of an institution’s liquidity. Recently, regulators have focused on more sophisticated measures of liquidity such as the liquidity coverage ratio and the amount of high-quality liquid assets a bank holds, both of which probably provide a more accurate picture of an institution’s ability to weather a sudden and unexpected withdrawal of funds or rise in the cost of funds. There is anecdotal evidence from bank regulators that a small bank with an LTD ratio of around 80 percent would have been a source of concern in 1990 but that in 2017 this is no longer the case. For small banks now, regulators consider LTD ratios of around 80 percent to be the new normal. 

**7** Commercial paper refers to a short-term (up to nine months but on average about 30 days) unsecured promissory note that a corporation issues as an alternative to taking out a bank loan. Commercial paper is not usually issued on a one-time basis, but rather is continually rolled over. Since it’s unsecured, the issuing firm must have an established credit rating. Smaller banks are not publicly traded and therefore don’t usually have an established credit rating or file standard reports with the Securities and Exchange Commission.

**8** See our *Banking Trends* article, “How Our Region Differs,” for a discussion of the underlying reasons for increasing bank size.

**9** The corresponding averages were \$182.8 million in 1984 and \$489.8 million in 2015.

**10** Based on small banks’ assets in 2016, the three size categories are: (1) less than \$500 million in assets, (2) \$500 million to \$1 billion, (3) \$1 billion to the size of the 101st largest banking organization in 2016 (roughly \$9.3 billion). We do the same split for banks in 1984, with the size categories adjusted for inflation.

**11** Our statistician readers will recognize our thought experiments as the familiar calculation of the between and within components of the change in LTD ratios. They will also note that we have left out a residual component of the change in LTD ratios that is harder to interpret. Broadly, it reflects the interaction between changes in size and changes in LTDs. Since we do not include this, our percentages do not add up to 100 percent. See *Factors Explaining Changes in LTD Ratios*.

**12** Our calculation probably underestimates the effect of size alone because, within each group, the average size is increasing. We could seek a more precise estimate of the effect of size alone, but the three decades since 1984 have witnessed major changes in the structure of banking markets. Any attempt to isolate precisely the effect of changing size would be heroic.

**13** The Depository Institutions Deregulation and Monetary Control Act of 1980 allowed all banks to offer negotiable order of withdrawal (NOW)

accounts and ended the Federal Reserve's power to set maximum interest rates on any account other than demand deposits. For further information, see Alton Gilbert's paper.

**14** This does not mean that deposit markets became fully competitive and that deposit funding and wholesale funding are equally costly. In their article, Itamar Dreschler, Alexi Savov, and Philipp Schnabl provide evidence that banks have some market power that lowers the rates they must pay depositors.

**15** Prior to 2011, core deposits are defined as domestic deposits less the sum of insured brokered deposits and time deposits greater than \$100,000. From 2011 onward, they are defined as domestic transactions accounts, money market deposit accounts, other savings deposits, and time deposits less than \$250,000, minus insured brokered deposits.

**16** In contrast, brokered deposits shift quickly toward whichever banks are paying the highest rates.

**17** At the end of 2016, 63.5 percent of FHLB members were commercial banks, 19.5 percent were credit unions, 10.9 percent were thrifts, 5.5 percent were insurance companies, and 0.6 percent were community development financial institutions, according to the Federal Home Loan Banks Office of Finance 2016 Annual Report.

**18** For additional information on the FHLB system, see Scott Frame's paper.

**19** The 10 percent limit was dropped for institutions with less than \$500 million in total assets as of the time Gramm–Leach–Bliley was passed, and there was a provision to adjust that limit for inflation using the consumer price index. As of the end of 2016, the exemption would apply to any institution with a little under \$700 million in total assets.

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**20** FHLB advances were not reported separately by banks until 2001, so Figure 4 shows total nondeposit debt for all years, with separate lines for FHLB advances only after 2001. For small banks, FHLB advances are essentially 100 percent of nondeposit debt. Thus, the rise in small banks' nondeposit debt beginning around 1992 was due to rising FHLB advances. We use only average ratios because the median value was zero for much of the 1990s. While borrowings at small banks increased immediately following the passage of the 1989 Financial Institutions Reform, Recovery, and Enforcement Act, more than half of small banks did not borrow at all from the home loan banks until well into the 1990s.

**21** For large banks, the ratio of FHLB advances to assets is now 4.3 percent, down from almost 6 percent before the financial crisis hit. At the onset of the crisis, liquidity-constrained large banks borrowed heavily from the home loan banks, so much so that Adam Ashcraft and his coauthors refer to them as "lenders of next-to-last resort."

**22** The Temporary Liquidity Guarantee Program was implemented on October 14, 2008, and fully insured all noninterest-bearing demand deposits, regardless of the amount, for a limited time. It was initially set to expire on December 31, 2009, but was later extended to December 31, 2010. The Federal Deposit Insurance Corporation provides more information at <https://www.fdic.gov/regulations/resources/tlgp/index.html>.

**23** Most banks have portfolios of residential real estate loans or mortgage-backed securities well in excess of their desired level of FHLB borrowings.

**24** The Treasury and Housing and Urban Development Departments made these proposals in their 2011 report to Congress. Two components would reduce the FHLBs' connections with larger banks. First, a bank could be a member of only one FHLB at a time. Second, the size of FHLB advances would be capped. Together, these proposals would limit the usefulness of FHLBs to large banks, thus freeing up funds for small and medium-size banks.

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# Research Update

These papers by Philadelphia Fed economists, analysts, and visiting scholars represent preliminary research that is being circulated for discussion purposes.

The views expressed in these papers are solely those of the authors and should not be interpreted as reflecting the views of the Federal Reserve Bank of Philadelphia or Federal Reserve System.

## Where Do Students Go When For-Profit Colleges Lose Federal Aid?

Recent federal investigations and new regulations have resulted in restrictions on for-profit institutions' access to federal student aid. The authors examine the enrollment effects of similar restrictions imposed on over 1,200 for-profit colleges in the 1990s. Using variation in regulations linked to student loan default rates, the authors estimate the impact of the loss of federal aid on the enrollment of Pell Grant recipients in sanctioned institutions and their local competitors. Enrollment in a sanctioned for-profit college declines by 53 percent in the five years following a sanction. For-profit sanctions result in negative spillovers on unsanctioned competitor for-profit colleges in the same county, which experience modest enrollment declines. These enrollment losses in the for-profit sector are offset by gains in enrollment in local community colleges, suggesting that the loss of federal student aid for poor-performing for-profit colleges does not reduce overall college-going but instead shifts students across higher education sectors. Finally, the authors provide suggestive evidence that students induced to enroll in community colleges following a for-profit competitor's sanction are less likely to default on their federal loans.

Working Paper 17-12. Stephanie R. Cellini, George Washington University; Rajeev Darolia, University of Missouri–Columbia and Federal Reserve Bank of Philadelphia Payment Cards Center Visiting Scholar; Lesley J. Turner, University of Maryland.

## Fiscal Surprises at the FOMC

This paper provides a detailed examination of a new set of fiscal forecasts for the U.S. assembled by Croushore and van Norden (2017) from FOMC briefing books. The data are of particular interest because (1) they afford a look at fiscal forecasts over six complete business cycles and several fiscal policy regimes, covering both peacetime and several wars, (2) the forecasts were precisely those presented to monetary policymakers, (3) they include frequently updated estimates of both actual and cyclically adjusted deficits, (4) unlike most other U.S. fiscal forecasts, they were neither partisan nor constrained by unrealistic assumptions about future fiscal policy, and (5) forecasts for other variables (GDP growth, inflation) from the same forecasters are known to compare favorably with most other available forecasts.

The authors detail the performance of forecast federal expenditures, revenues, surpluses, and structural surpluses in terms of accuracy, bias, and efficiency. They find that (1) fiscal forecast errors can be economically large, even at relatively short forecast horizons, (2) while the accuracy of unemployment rate forecast errors improved after 1990, that of most fiscal variables deteriorated considerably, (3) there is limited evidence of forecast bias, and most of this evidence is confined to the period before 1993, (4) the forecasts appear to be efficient with respect to both the fed funds rate and CBO projections, and (5) cyclically adjusted deficit forecasts appear to be over-optimistic around both business cycle peaks and troughs.

Working Paper 17-13. Dean Croushore, University of Richmond and Federal Reserve Bank of Philadelphia Visiting Scholar; Simon van Norden, HEC Montréal, CIRANO, and Federal Reserve Bank of Philadelphia Visiting Scholar.

## Reorganization or Liquidation: Bankruptcy Choice and Firm Dynamics

In this paper, the authors ask how bankruptcy law affects the financial decisions of corporations and its implications for firm dynamics. According to current U.S. law, firms have two bankruptcy options: Chapter 7 liquidation and Chapter 11 reorganization. Using Compustat data, the authors first document capital structure and investment decisions of non-bankrupt, Chapter 11, and Chapter 7 firms. Using those data moments, they then estimate parameters of a firm dynamics model with endogenous entry and exit to include both bankruptcy options in a general equilibrium environment. Finally, the authors evaluate a bankruptcy policy change recommended by the American Bankruptcy Institute that amounts to a “fresh start” for bankrupt firms. The authors find that changes to the law can have sizable consequences for borrowing costs and capital structure, which via selection affects productivity (allocative efficiency rises by 2.58%) and welfare (rises by 0.54%).

Working Paper 17-14. Dean Corbae, University of Wisconsin–Madison and NBER; Pablo D’Erasmus, Federal Reserve Bank of Philadelphia Research Department.

## Don’t Know What You Got Till It’s Gone: The Effects of the Community Reinvestment Act (CRA) on Mortgage Lending in the Philadelphia Market

The Community Reinvestment Act (CRA), enacted in 1977, has served as an important tool to foster access to financial services for lower-income communities across the country. This study provides new evidence on the effectiveness of CRA on mortgage lending by focusing on a large number of neighborhoods that became eligible and ineligible for CRA credit in the Philadelphia market because of an exogenous policy shock in 2014. The CRA effects are more evident when a lower-income neighborhood loses its CRA coverage, which leads to a 10 percent or more decrease in purchase originations by CRA-regulated lenders. Lending institutions not subject to CRA can substitute approximately half, but not all, of the decreased lending by CRA lenders. The increased market share of nondepository institutions in previously CRA eligible neighborhoods, however, was accompanied by a greater involvement in riskier Federal Housing Administration lending. This study demonstrates how different lenders respond to the incentive of CRA credit and how the use of metropolitan division median family incomes can generate unintended consequences on CRA lending activities.

Working Paper 17-15. Lei Ding, Federal Reserve Bank of Philadelphia Community Development Studies & Education; Leonard I. Nakamura, Federal Reserve Bank of Philadelphia Research Department.

## Positive Trend Inflation and Determinacy in a Medium-Sized New Keynesian Model

This paper studies the challenge that increasing the inflation target poses to equilibrium determinacy in a medium-sized New Keynesian model without indexation fitted to the Great Moderation era. For moderate targets of the inflation rate, such as 2 or 4 percent, the probability of determinacy is near one conditional on the monetary policy rule of the estimated model. However, this probability drops significantly conditional on model-free estimates of the monetary policy rule based on real-time data. The difference is driven by the larger response of the federal funds rate to the output gap associated with the latter estimates.

Working Paper 17-16. Jonas E. Arias, Federal Reserve Bank of Philadelphia Research Department; Guido Ascari, University of Oxford, University of Pavia, and Bank of Finland; Nicola Branzoli, Bank of Italy; Efrem Castelnuovo, University of Melbourne and University of Padova.

## Fintech Lending: Financial Inclusion, Risk Pricing, and Alternative Information

Fintech has been playing an increasing role in shaping financial and banking landscapes. Banks have been concerned about the uneven playing field because fintech lenders are not subject to the same rigorous oversight. There have also been concerns about the use of alternative data sources by fintech lenders and the impact on financial inclusion. In this paper, the authors explore the advantages/disadvantages of loans made by a large fintech lender and similar loans that were originated through traditional banking channels. Specifically, they use account-level data from the Lending Club and Y-14M bank stress test data. The authors find that Lending Club's consumer lending activities have penetrated areas that could benefit from additional credit supply, such as areas that lose bank branches and those in highly concentrated banking markets. The authors also find a high correlation with interest rate spreads, Lending Club rating grades, and loan performance. However, the rating grades have a decreasing correlation with FICO scores and debt-to-income ratios, indicating that alternative data is being used and performing well so far. Lending Club borrowers are, on average, more risky than traditional borrowers given the same FICO scores. The use of alternative information sources has allowed some borrowers who would be classified as subprime by traditional criteria to be slotted into "better" loan grades and therefore get lower priced credit. Also, for the same risk of default, consumers pay smaller spreads on loans from the Lending Club than from traditional lending channels.

Working Paper 17-17. Julapa Jagtiani, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department; Catharine Lemieux, Federal Reserve Bank of Chicago.

## The Agglomeration of American Research and Development Labs

The authors employ a unique data set to examine the spatial clustering of about 1,700 private research and development (R&D) labs in California and across the Northeast corridor of the United States. Using these data, which contain the R&D labs' complete addresses, the authors are able to more precisely locate innovative activity than with patent data, which only contain zip codes for inventors' residential addresses. The authors avoid the problems of scale and borders associated with using fixed spatial boundaries, such as zip codes, by developing a new point pattern procedure. Our multiscale core-cluster approach identifies the location and size of significant R&D clusters at various scales, such as a half mile, one mile, five miles, and more. Our analysis identifies four major clusters in the Northeast corridor (one each in Boston, New York–Northern New Jersey, Philadelphia–Wilmington, and Washington, D.C.) and three major clusters in California (one each in the Bay Area, Los Angeles, and San Diego).

Working Paper 17-18. Kristy Buzard, Syracuse University; Gerald A. Carlino, Federal Reserve Bank of Philadelphia Research Department; Robert M. Hunt, Federal Reserve Bank of Philadelphia Payment Cards Center; Jake K. Carr, Ohio State University; Tony E. Smith, University of Pennsylvania.

## Not in My Backyard? Not So Fast. The Effect of Marijuana Legalization on Neighborhood Crime

This paper studies the effects of marijuana legalization on neighborhood crime using unique geospatial data from Denver, Colorado. We construct a highly local panel data set that includes changes in the location of marijuana dispensaries and changes in neighborhood crime. To account for endogenous retail dispensary locations, we use a novel identification strategy that exploits exogenous changes in demand across different locations. The change in geographic demand arises from the increased importance of access to external markets caused by a change in state and local policy. The results imply that retail dispensaries lead to reduced crime in the neighborhoods where they are located. Reductions in crime are highly localized, with no evidence of benefits for adjacent neighborhoods. The spatial extent of these effects are consistent with a policing or security response, and analysis of detailed crime categories provides indirect evidence that the reduction in crime arises from a disruption of illicit markets.

Working Paper 17-19. Jeffrey Brinkman, Federal Reserve Bank of Philadelphia Research Department; David Mok-Lamme.

## Banking Panics and Output Dynamics

This paper develops a dynamic general equilibrium model with an essential role for an illiquid banking system to investigate output dynamics in the event of a banking crisis. In particular, it considers the ex-post efficient policy response to a banking crisis as part of the dynamic equilibrium analysis. It is shown that the trajectory of real output following a panic episode crucially depends on the cost of converting long-term assets into liquid funds. For small values of the liquidation cost, the recession associated with a banking panic is protracted as a result of the premature liquidation of a large fraction of productive banking assets to respond to a panic. For intermediate values, the recession is more severe but short-lived. For relatively large values, the contemporaneous decline in real output in the event of a panic is substantial but followed by a vigorous rebound in real activity above the long-run level.

Working Paper 17-20. Daniel Sanches, Federal Reserve Bank of Philadelphia Research Department.

## Household Credit and Local Economic Uncertainty

This paper investigates the impact of uncertainty on consumer credit outcomes. The authors develop a local measure of economic uncertainty capturing county-level labor market shocks. They then exploit microeconomic data on mortgages and credit-card balances together with the cross-sectional variation provided by their uncertainty measure to show strong borrower-specific heterogeneity in response to changes in uncertainty. Among high risk borrowers or areas with more high risk borrowers, increased uncertainty is associated with housing market illiquidity and a reduction in leverage. For low risk borrowers, these effects are absent and the cost of mortgage credit declines, suggesting that lenders reallocate credit towards safer borrowers when uncertainty spikes. A similar pattern is observed in the unsecured credit market. Taken together, local uncertainty might independently affect aggregate economic activity through consumer credit markets and could engender greater inequality in consumption and housing wealth accumulation across households.

Working Paper 17-21. Marco Di Maggio, Harvard Business School and NBER; Amir Kermani, University of California, Berkeley, and NBER; Rodney Ramcharan, University of Southern California; Edison G. Yu, Federal Reserve Bank of Philadelphia Research Department.

## Concentration of Control Rights in Leveraged Loan Syndicates

Corporate loan contracts frequently concentrate control rights with a subset of lenders. In a large fraction of leveraged loans, which typically include a revolving line of credit and a term loan, the revolving lenders have the exclusive right and ability to monitor and renegotiate the financial covenants in the governing credit agreements. Concentration is more common in loans that include nonbank institutional lenders and in loans originated subsequent to the financial crisis, when recognition of bargaining frictions increased. The authors conclude that concentrated control rights maintain the benefits of lender monitoring and minimize the costs of renegotiation associated with larger and more diverse lending syndicates.

Working Paper 17-22. Mitchell Berlin, Federal Reserve Bank of Philadelphia Research Department; Greg Nini, Drexel University; Edison G. Yu, Federal Reserve Bank of Philadelphia Research Department.

## Appraising Home Purchase Appraisals

Home appraisals are produced for millions of residential mortgage transactions each year, but appraised values are rarely below the purchase contract price. The authors argue that institutional features of home mortgage lending cause much of the information in appraisals to be lost: some 30 percent of recent appraisals are exactly at the home price (with less than 10 percent below it). The authors lay out a novel, basic theoretical framework to explain how lenders' and appraisers' incentives lead to information loss in appraisals (that is, appraisals set equal to the contract price). Such information loss is more common at loan-to-value boundaries where mortgage insurance rates increase and appears to be associated with a higher incidence of mortgage default, after controlling for pertinent borrower and loan-level characteristics. Appraisals do, in some cases, improve default risk measurement, but they are less informative than automated valuation models. An important benefit of appraisals reported below the contract price is that they help borrowers renegotiate prices with sellers.

Working Paper 17-23. Paul S. Calem, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department; Lauren Lambie-Hanson, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department; Leonard I. Nakamura, Federal Reserve Bank of Philadelphia Research Department.

## Accounting for Growth in the Age of the Internet: The Importance of Output-Saving Technical Change

The authors extend the conventional Solow growth accounting model to allow innovation to affect consumer welfare directly. Their model is based on Lancaster's New Approach to Consumer Theory, in which there is a separate "consumption technology" that transforms the produced goods, measured at production cost, into utility. This technology can shift over time, allowing consumers to make more efficient use of each dollar of income. This is "output-saving" technical change, in contrast to the Solow TFP "resource-saving" technical change. One implication of the authors' model is that living standards can rise at a greater rate than real GDP growth.

Working Paper 17-24. Charles Hulten, University of Maryland and NBER; Leonard I. Nakamura, Federal Reserve Bank of Philadelphia Research Department.

## Political Distribution Risk and Aggregate Fluctuations

The authors argue that political distribution risk is an important driver of aggregate fluctuations. To that end, they document significant changes in the capital share after large political events, such as political realignments, modifications in collective bargaining rules, or the end of dictatorships, in a sample of developed and emerging economies. These policy changes are associated with significant fluctuations in output and asset prices. Using a Bayesian proxy-VAR estimated with U.S. data, the authors show how distribution shocks cause movements in output, unemployment, and sectoral asset prices. To quantify the importance of these political shocks for the U.S. as a whole, the authors extend an otherwise standard neoclassical growth model. They model political shocks as exogenous changes in the bargaining power of workers in a labor market with search and matching. The authors calibrate the model to the U.S. corporate non-financial business sector and they back up the evolution of the bargaining power of workers over time using a new methodological approach, the partial filter. The authors show how the estimated shocks agree with the historical narrative evidence. They document that bargaining shocks account for 34% of aggregate fluctuations.

Working Paper 17–25. Thorsten Drautzburg, Federal Reserve Bank of Philadelphia Research Department; Jesus Fernandez-Villaverde, University of Pennsylvania and Federal Reserve Bank of Philadelphia Visiting Scholar; Pablo Guerron-Quintana, Boston College, ESOL, and Federal Reserve Bank of Philadelphia Visiting Scholar.

## Do Phillips Curves Conditionally Help to Forecast Inflation?

This paper reexamines the forecasting ability of Phillips curves from both an unconditional and conditional perspective by applying the method developed by Giacomini and White (2006). The authors find that forecasts from their Phillips curve models tend to be unconditionally inferior to those from their univariate forecasting models. Significantly, the authors also find conditional inferiority, with some exceptions. When the authors do find improvement, it is asymmetric—Phillips curve forecasts tend to be more accurate when the economy is weak and less accurate when the economy is strong. Any improvement they find, however, vanished over the post-1984 period.

Working Paper 17–26. Michael Dotsey, Federal Reserve Bank of Philadelphia Research Department; Shigeru Fujita, Federal Reserve Bank of Philadelphia Research Department; Tom Stark, Federal Reserve Bank of Philadelphia Research Department.

## Credit Enforcement Cycles

Empirical evidence suggests that widespread financial distress, by disrupting enforcement of credit contracts, can be self-propagatory and adversely affect the supply of credit. The authors propose a unifying theory that models the interplay between enforcement, borrower default decisions, and the provision of credit. The central tenets of their framework are the presence of capacity constrained enforcement and borrower heterogeneity. The authors show that, despite heterogeneity, borrowers tend to coordinate their default choices, leading to fragility and to credit rationing. Their model provides a rationale for the comovement of enforcement, default rates and credit seen in the data.

Working Paper 17–27. Lukasz A. Drozd, Federal Reserve Bank of Philadelphia Research Department; Ricardo Serrano-Padial, Drexel University.

## Stress Tests and Information Disclosure

The authors study an optimal disclosure policy of a regulator that has information about banks (e.g., from conducting stress tests). In their model, disclosure can destroy risk-sharing opportunities for banks (the Hirshleifer effect). Yet, in some cases, some level of disclosure is necessary for risk sharing to occur. The authors provide conditions under which optimal disclosure takes a simple form (e.g., full disclosure, no disclosure, or a cutoff rule). They also show that, in some cases, optimal disclosure takes a more complicated form (e.g., multiple cutoffs or nonmonotone rules), which they characterize. The authors relate their results to the Bayesian persuasion literature.

Working Paper 17–28. Itay Goldstein, the Wharton School, University of Pennsylvania; Yaron Leitner, Federal Reserve Bank of Philadelphia Research Department

Supersedes Working Paper 15–10.

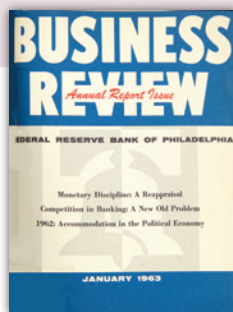
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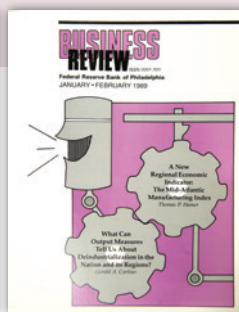
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1989



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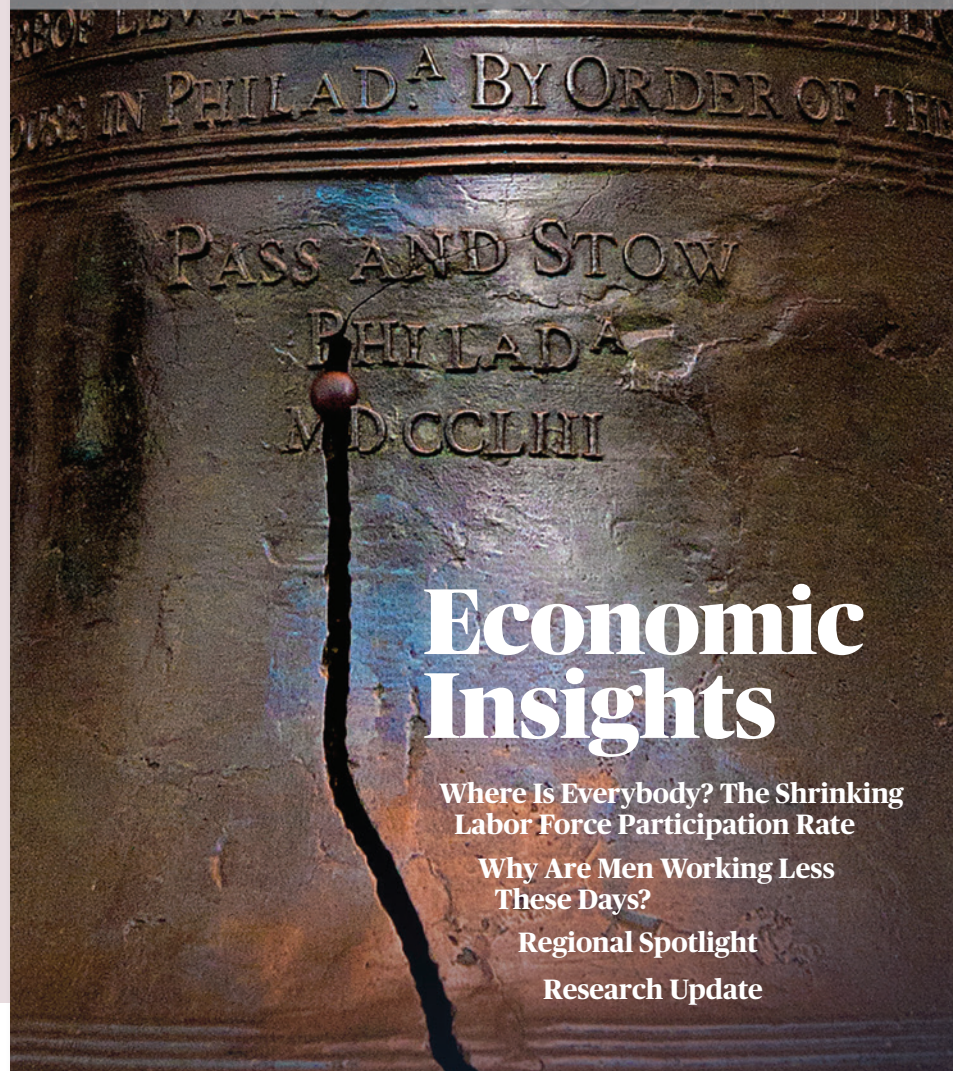
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### Economic Insights

Economic insights features nontechnical articles on monetary policy, banking, and national, regional, and international economics, all written for a wide audience.

First Quarter 2017

- Making Sense of Urban Patterns**  
In cities worldwide, density peaks near city hall and thins out the farther one travels in all directions. Jeffrey Brinkman explores what drives this pattern, what sparks big shifts such as the postwar suburban migration and today's taste for city life, and why it all matters for urban policy.
- Did the Fiscal Stimulus Work?**  
The federal government poured hundreds of billions of dollars into the economy in an attempt to combat the Great Recession. Gerald A. Carlino examines just how much bang taxpayers got for their bucks.
- Banking Trends: Credit Unions' Expanding Footprint**  
New rules expand credit unions' capacity to make business loans, a key niche for small banks. James DiSalvo and Ryan Johnston explore whether there is any evidence the change could cost small banks market share.

Research Update