ECONOMIC INSIGHTS

FEDERAL RESERVE BANK OF PHILADELPHIA

INSIDE

On the cover: The art of foiling counterfeiters can be seen by tilting a new $100 bill to reveal the Liberty Bell inside Ben Franklin's inkwell. Learn more about currency security features at https://uscurrency.gov/. Photo by Peter Samulis.

Monetary Policy and the New Normal

Is the economy in for a prolonged spell of slow growth, as some believe, or a burst of innovation and productivity? In either event, policymakers must pay close attention to productivity trends.

BY MICHAEL DOTSEY

There is growing debate regarding whether the U.S. economy has entered a period of long-run, or secular, stagnation. The Great Recession has certainly increased interest in that discussion. While the onset of the stagnation is said to predate the Great Recession by 35 years, labor productivity has slowed further since 2010. History shows that recessions, even the Great Depression, have not generally had any effect on long-run economic growth. However, one still wonders whether this latest recession's legacy will exacerbate any fundamental decline in U.S. economic growth, perhaps through a lingering deterioration in job skills arising from historically high long-term unemployment or through inefficiencies from overregulation in response to the financial crisis. Whether we will see stagnation or a rebirth of productivity obviously has serious implications for Americans' standard of living. But as I will show, it also has important implications for how monetary policy may need to adjust.

What historically matters for the economy in the long run are changes in the trend growth rate of labor productivity, which measures how much the economy produces per hour worked. Indeed, as Paul Krugman famously said, even though productivity isn't everything, in the long run it is almost everything. The reason is that productivity growth leads directly to greater efficiency in production and hence to greater output per hour. The greater productivity of labor in turn results in higher wages, income, and consumption.[1]

The difference that the productivity rate makes over time can be seen in Figure 1, which depicts what average hourly productivity would have been in 2012 (in 2005 dollars) if the 1948–1972 trend had continued uninterrupted

as opposed to its following the 1972–1996 trend. The difference is substantial.

What Might Have Been?
Growth trends in output per hour over selected intervals.
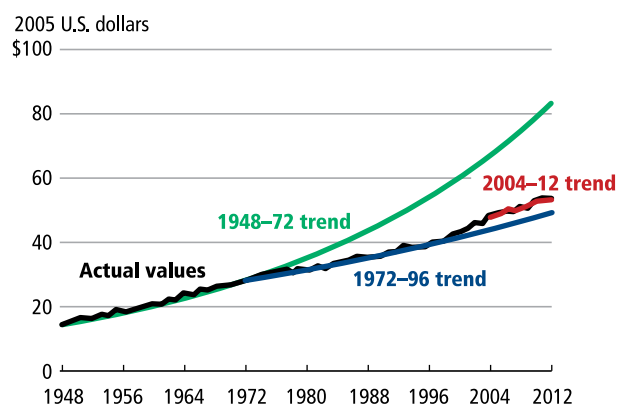
Sources: Adapted from Gordon (2012); Bureau of Labor Statistics.

INDUSTRIAL VS. DIGITAL REVOLUTIONS

Robert Gordon of Northwestern University has been one of the leading voices asserting that a secular stagnation is well underway. He points out that, apart from a spurt of productivity between 1996 and 2004, the U.S. economy has roughly returned to its less robust growth rate of 1972–1996. Moreover, he believes that productivity is

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likely to remain on this slower track. As evidence, he points first to history.

Three inventions, all introduced in 1879, sparked the second industrial revolution: the electric light bulb, the internal combustion engine, and radio communication.[2] These inventions led to many spinoffs that resulted in the electrification of America, the age of the automobile, and mass communication, leading not only to a new way of life but also to increasingly more efficient means of production and distribution.

But Gordon does not expect today's advances in information technology and communications to have as many spinoffs as resulted from those earlier breakthroughs. In Gordon's view, growth has slowed because all the low-hanging fruit on the tree of innovation has been picked. Thus, he believes that, combined with demographic and educational trends, the U.S. may experience only 0.9 percent per capita growth going forward. Such an eventuality would represent more than a halving of the per capita growth rate of 2.33 percent over the period 1891–1972.

Adding to the dire picture Gordon paints, educational attainment has plateaued, which he attributes partly to a dysfunctional U.S. educational system, which impedes the growth of human capital. Further, population growth is slowing, causing the overall population to age. And an older population implies a lower worker-to-population ratio, which reduces output growth per capita as the employed share of the population shrinks and the nonworking share grows. An aging population also strains resource redistribution, as a greater share of the population depends on support funded by payroll taxes such as Medicare and Social Security, leading to higher taxes and a corresponding reduction in entrepreneurial incentives, which can stifle innovation. Gordon also cites as headwinds inequality, globalization, energy and environmental restrictions, and debt-burdened consumers and government. Although he doesn't mention it, growth is arguably also saddled by regulatory burdens that have been growing over time. Some of the increase in regulation has been motivated by the financial crisis and some represents a continuing increase in administrative interference in the economy.

The combined effects of these headwinds can be seen in the slowing rates in labor productivity compared with 1891–1972 (Figure 2).[3] Again, the effects of this decline are quite meaningful.

That is indeed a dire prediction, but let's not confine ourselves to this interpretation. Perhaps the right question to ask is: Will history repeat itself? Research by Chad Syverson

Despite Tech Spurt, Trend Is Clearly Lower
Average U.S. labor productivity growth rates over selected intervals.
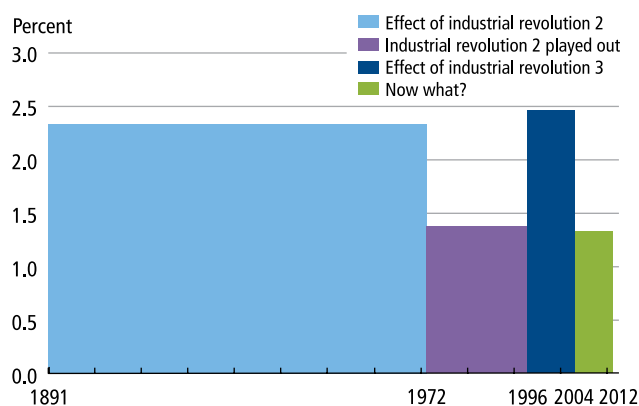
Sources: Adapted from Gordon (2012); Bureau of Labor Statistics.

has compared the productivity profile of the second industrial revolution with that of the potential third revolution brought on by the digital age. He dates the start of that revolution, if it indeed is underway, as 1970. In Figure 3, the blue line plots productivity growth from the second industrial revolution. Initially, growth was not very robust. Then there is a short interval after 1915 in which growth picks up, but then it slows again. It is not until the early 1930s that the exceptional growth associated with electrification actually picks up.[4] Thus, if Gordon had been writing in the late 1920s, he might have come to a similarly premature conclusion.

Now compare our growth experience during the Internet era (the black line). It, too, started out rather unexceptionally, prompting Nobel laureate economist Robert Solow to famously observe in 1987 that "computers are found everywhere but in the productivity data."[5]

Productivity growth did pick up briefly in the late 1990s but has since tapered off. Whether we will we see an inflection point in the near future is hard to say, but some economists are much more optimistic than Gordon. Joel Mokyr of Northwestern University notes that it is not just that scientific discoveries lead to improved technology but that improved technology leads to scientific discoveries. For instance, microscopes led to the development of the germ theory of disease, which in turn led to antibiotics. Current advances in our ability to process data or to work with materials at a submolecular level could easily result in scientific advances that are difficult to anticipate. The low-hanging fruit may have been picked, but we now have ladders.

Will History Repeat Itself?
U.S. labor productivity growth during the electrification and Internet eras.

Index 1995=100
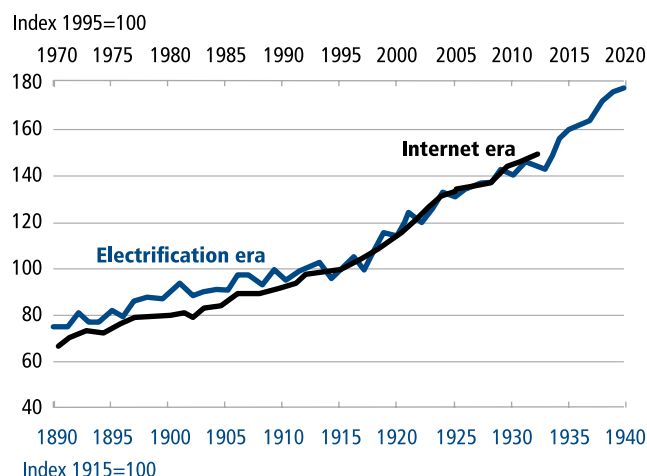
Sources: Adapted from Gordon (2012); Bureau of Labor Statistics.

Erik Brynjolfsson and Andrew McAfee are unguardedly optimistic.[6] They point to the tremendous gains in computational speed and power as well as the development of software that they believe will serve as launch pads for an upcoming inflection point in productivity. Many revolutionary advances, such as polymerase chain reaction that allows for replicating DNA sequences, did not involve revolutionary ideas but occurred via the creative stringing together of already-worked-out scientific procedures. They point out that faster computational speeds and algorithmic development are making computers capable of stringing together ideas that could prove productive. And it is clear from their analysis that there are a lot of ideas out there. Man combined with machines is a powerful tool. It's true that IBM's Deep Blue computer famously beat world chess champion Garry Kasparov in 1997. But by 2005, the even more advanced Hydra computer was no match for two amateur players aided by three ordinary laptops.[7]

PRODUCTIVITY AND MONETARY POLICY

It is clear that there is great uncertainty surrounding our future prospects for growth. But although the headwinds Gordon refers to represent serious challenges to growth, many of these headwinds are manmade and can be unmade. Also, it is not as if the 20th century lacked headwinds. Two world wars and a Great Depression caused major

societal disruptions. Further, the second industrial revolution witnessed a steep decline in the workweek, from around 60 hours a week to less than 40. Yet, per capita output growth remained strong.

However things play out, monetary policymakers must be attentive to trend changes in productivity. Gauging an ongoing change in trend is a particularly difficult statistical challenge, because it generally requires many decades of data to arrive at any definitive conclusion. Yet, any such change will need to be incorporated into the design of monetary policy. The reason is that growth and interest rates are joined at the hip.

Basically, when productivity growth is high, it pays to sacrifice a bit of consumption and instead save and invest. That's because putting resources to work while productivity is increasing rapidly yields greater income and future consumption than it does when productivity growth is slow.[8] That greater future productivity is reflected in higher *current* interest rates that are needed to induce individuals to provide the necessary capital in order for firms to make the necessary investments. For their part, firms are willing to pay higher interest rates because their investments are more profitable when productivity growth is high. In this way, the real interest rate helps efficiently allocate the resources that provide growth consistent with the underlying rate of technological progress.

Put another way, policymakers seek to calibrate monetary policy with the neutral federal funds rate, which is the natural real rate plus whatever inflation rate they consider optimal for keeping price increases stable and output growing at its potential. Thus, the neutral level of the funds rate will vary positively with the economy's long-run growth potential. So whether one thinks monetary policy is accommodative or restrictive will in part depend on one's views of underlying longer-run economic growth.[9]

Note that, just as with secular changes in productivity, cyclical changes in productivity also influence what the federal funds rate target should be. When productivity is temporarily growing fast, augmenting the capital stock by encouraging saving is desirable, and that augmentation is accomplished by allowing interest rates to rise. The rise in interest rates that accompanies a fast-growing economy should not be viewed as an attempt to cool the economy down, but merely as the appropriate reaction to a higher return to capital. It is also the correct response in terms of preserving price stability, because overheated economies typically give rise to inflationary pressures. Other cyclical factors such as changes in fiscal policy also influence where

the federal funds rate is set at any particular moment, and indeed these cyclical factors dominate federal funds rate movements. But where the federal funds rate is eventually headed is determined by its long-run neutral level. That anchoring affects the likely path that the federal funds rate will take, and it is the entire path of the funds rate and its resulting effect on longer-term interest rates that affect the economy, not its setting at any particular point in time.

If the members of the Federal Reserve's monetary policy-setting arm, the Federal Open Market Committee, incorrectly believe that the neutral federal funds rate is lower than it actually turns out to be, they will, at least over the medium term, set the actual funds rate lower than is consistent with the inflation target, and monetary policy will have an inflationary bias. The large runup in inflation that occurred in the 1970s represented an episode in which the FOMC kept interest rates persistently below their neutral level. The opposite is true if the neutral funds rate is perceived to be higher than it really is, and policy will have a disinflationary bias. Therefore, in order to avoid persistent mistakes, productivity measures will remain in the forefront of policy decisions. ∎

NOTES

[1] Labor productivity is discussed with a minimum of technical detail in the Bureau of Labor Statistics' *Beyond the Numbers* feature.

[2] Gordon also emphasizes the impact of running water and indoor plumbing. He marks the first industrial revolution as the introduction of steam engines, railroads, and advances in cotton spinning between 1750 and 1830.

[3] Productivity slowed further in 2013 and 2014. Adding those two years to the most recent interval, using revised BLS labor productivity data, would result in a 2004–2014 growth rate of about 1.16 percent.

[4] After large declines in employment, output, and labor productivity at the start of the Depression, all three series grow rather robustly beginning in 1934. The only exception is 1938, when the economy experiences another recession.

[5] For more on "Solow's paradox," see the interview by the Minneapolis Fed in 2002.

[6] See their book, *The Second Machine Age*.

[7] See Clive Thompson's book, *Smarter Than You Think*.

[8] The relationship between economic growth and the real interest rate is spelled out quite nicely in the economics textbook coauthored by Olivier Blanchard and Stanley Fischer.

[9] President Williams of the San Francisco Fed and Jeffery D'Amato discuss the role of the natural rate in monetary policy and the challenge of estimating it.

REFERENCES

Blanchard, Olivier Jean, and Stanley Fischer. *Lectures on Macroeconomics*, Cambridge, MA, and London: MIT Press, 1989.

Brynjolfsson, Erik, and Andrew McAfee. *The Second Machine Age*, New York and London: W.W. Norton & Company, 2014.

Byrne, David M., Stephen D. Oliner, and Daniel E. Sichel. "Is the Information Technology Revolution Over?" Federal Reserve Board Finance and Economics Discussion Series 2013–36 (2013).

Cowen, Tyler. *The Great Stagnation: How America Ate All the Low-hanging Fruit of Modern History, Got Sick, and Will (Eventually) Feel Better*, New York: Dutton, 2011.

D'Amato, Jeffery D. "The Role of the Natural Rate of Interest in Monetary Policy," Bank for International Settlements Working Paper 171 (March 2005).

Dotsey, Michael. "How the Fed Affects the Economy: A Look at Systematic Monetary Policy," Federal Reserve Bank of Philadelphia *Business Review* (First Quarter 2004).

Federal Reserve Bank of Minneapolis. "Interview with Robert Solow," *The Region* (September 1, 2002), www.minneapolisfed.org/publications/the-region/interview-with-robert-solow.

Gordon, Robert G. "Is U.S. Economic Growth Over? Faltering Innovation Confronts Six Headwinds," National Bureau of Economic Research Working Paper 18315 (August 2012).

Krugman, Paul. *The Age of Diminished Expectations: U.S. Economic Policy in the 1990s*, Washington, D.C.: Washington Post Company, 1994.

Mokyr, Joel. "The Next Age of Invention," *City Journal* (Winter 2014).

Sprague, Shawn. "What Can Labor Productivity Tell Us About the U.S. Economy?" U.S. Bureau of Labor Statistics *Beyond the Numbers*, 3:12 (May 2014), http://www.bls.gov/opub/btn/volume-3/pdf/what-can-labor-productivity-tell-us-about-the-us-economy.pdf.

Syverson, Chad. "Will History Repeat Itself? Comments on 'Is the Information Technology Revolution Over?'" *International Productivity Monitor*, 25 (2013), pp. 37–40.

Thompson, Clive. *Smarter Than You Think*, New York: Penguin Group, 2014.

Williams, John C. "The Natural Rate of Interest," Federal Reserve Bank of San Francisco *Economic Letter* 2003–32 (October 31, 2003), www.frbsf.org/economic-research/publications/economic-letter/2003/october/the-natural-rate-of-interest/.

Did Quantitative Easing Work?

Did QE lower yields and stimulate the economy? What about risks? Weighing the evidence requires a bit of theory.

BY EDISON YU

As the economy began to falter amid the financial crisis in the fall of 2007, the Federal Reserve responded in the usual fashion by lowering its short-term interest rate target. But by the end of 2008, with short-term rates down to virtually zero and the economy and financial system still in trouble, the Federal Reserve adopted an unorthodox program known as quantitative easing (QE) that sought to directly lower long-term interest rates and thus stimulate the economy. To carry out QE, the Fed embarked on three rounds of purchases of long-term securities that increased its balance sheet more than fourfold, to about $4.5 trillion in 2015. As we will see, economic theory tells us that long-term rates are mainly determined by what investors expect short-term rates to be in the future. So why did policymakers think they had a shot at lowering long-term rates when short-term rates were already as low as they could go? As former Fed Chairman Ben Bernanke quipped in 2012, "Well, the problem with QE is it works in practice, but it doesn't work in theory." So what is the theoretical reasoning behind QE? Did QE lower long-term yields? Did it actually stimulate the economy? And what does the evidence so far say about the costs of the Fed's unprecedented accumulation of assets?

WHY QE?

The federal funds rate — what banks pay each other to borrow funds overnight — is the conventional tool that the Fed uses to conduct monetary policy. The Fed typically raises it to prevent the economy from expanding so quickly that it stokes inflation and lowers it when the economy is weak.

A lower federal funds rate reduces banks' costs, which then leads other market interest rates, such as bank prime lending rates and mortgage rates, to fall as well, which lowers the cost of capital for firms and households and thus stimulates borrowing and hence the economy (Figure 1).

FIGURE 1

Lower Funds Rate Lets Lenders Charge Less
Federal funds rate and bank prime rate over time.
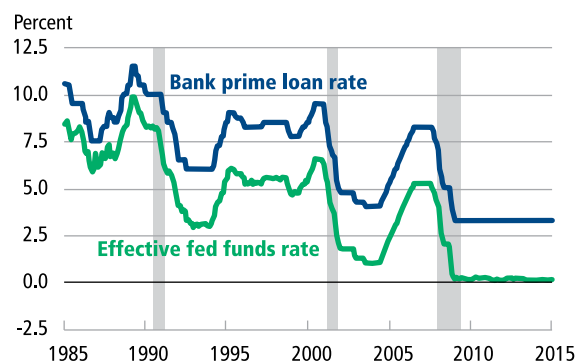
Source: Federal Reserve Board of Governors.

But when the federal funds rate hits what economists call the *zero lower bound*, the Federal Reserve cannot further stimulate the economy by cutting interest rates. In theory, the nominal interest rate cannot go below zero because cash pays zero interest. If the federal funds rate were set below zero — that

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is, if banks had to start paying interest on the cash they lend to other banks — banks could get around that cost by simply holding onto the cash, rendering the negative interest rate policy ineffective. In practice, economists and policymakers have recently been surprised to find that even market interest rates can go negative, likely because storing cash can be costly and risky.[1]

By December 2008, the Federal Open Market Committee (FOMC), the Federal Reserve's policymaking arm, had lowered the federal funds rate from 5.25 percent in September 2007 to virtually zero — around 10 basis points. Yet, the economy continued to contract dramatically, the unemployment rate shot up, and the financial crisis was in full force. Policymakers were concerned that the U.S. economy could fall into a *deflation spiral*, in which a contracting economy causes prices to fall, which causes consumers and firms to hold off even more on spending in anticipation of yet-lower prices, which further depresses the economy. But with the federal funds rate already at zero, the Fed faced a conundrum. What could it do in the face of persistent weakness in the economy? Japan's "lost decade" of the 1990s, marked by slow economic growth, stagnant wages, and periods of deflation, convinced U.S. policymakers that quick, unconventional action was needed to counter the crisis. Indeed, in his 2004 article and 2009 remarks, Chairman Bernanke had argued for Japan to adopt an aggressive QE program to combat deflation. In an attempt to get around the zero lower bound, the Federal Reserve started to purchase large quantities of Treasury and mortgage-backed securities (MBS) of longer maturities (Figure 2).

Unlike the conventional monetary tool, which has been studied extensively, quantitative easing triggered a contentious debate on the theory and mechanism through which it should work and, for that matter, whether it would work at all. Indeed, economic theory predicts that in a perfect, *frictionless* market, QE should have very little effect.

WHY SHOULDN'T QE WORK?

With the short-term interest rate at zero, QE is intended to lower rates at the longer end of the *yield curve*. To understand why this approach was theoretically problematic, it will help to first understand the yield curve. U.S. government bills and bonds of various maturities pay different interest rates. This spectrum of rates (or yields) from the shortest (overnight) to the longest (usually 30 years) is known as the *term structure* of interest rates.[2] The yield curve is simply a graphical representation of the term structure of interest rates.

The yield curve can take different shapes. It can slope upward, as on July 21, 2015, with yields for longer-maturity Treasuries being higher than those for shorter-maturity Treasuries (Figure 3). Infrequently, it can also slope downward, as was the case on August 8, 2007, when three-month Treasuries carried higher interest rates than 10-year Treasuries (Figure 4). So what determines the shape of the yield curve?
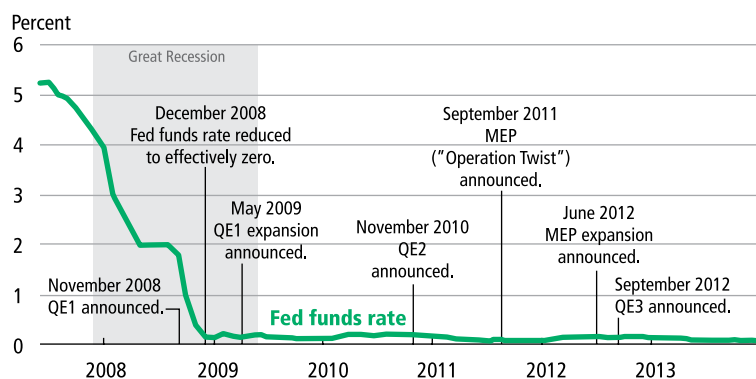
Investor expectations determine the term structure. Under ideal conditions, the *no-arbitrage condition* stipulates a relationship between short-term and long-term interest rates on securities of comparable credit quality. Think of a world in which investors — whom we will call arbitragers for reasons that will become clear — are risk neutral and are willing and able to buy or sell any security in unlimited quantities as long as they expect the trade to be profitable.[3] Even though real-life investors — think of Wall Street traders — don't have unlimited amounts of money to invest or assets to sell and have limits as to how much credit or inflation risk they care to take on, the no-arbitrage condition provides a useful benchmark for understanding how the shape of the yield curve is determined.

For example, if our arbitrager sees that a three-month Treasury note yield is "too low" compared with the yield on a 10-year Treasury bond, the trader will keep buying 10-year bonds (lowering the yield on the bond) and selling three-month notes (raising the yield on the note) until it is no longer profitable to do this

FIGURE 2
Timeline of the Fed's Quantitative Easing Program

Percent

Great Recession

December 2008
Fed funds rate reduced
to effectively zero.

September 2011
MEP
("Operation Twist")
announced.

May 2009
QE1 expansion
announced.

November 2010
QE2
announced.

June 2012
MEP expansion
announced.

November 2008
QE1 announced.

Fed funds rate
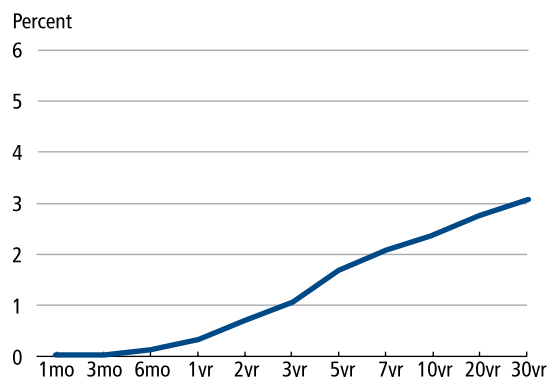
September 2012
QE3 announced.

2008　2009　2010　2011　2012　2013

Sources: Congressional Research Service, Federal Reserve.

The Yield Curve Typically Slopes Upward
Treasury yields across maturity spectrum on July 21, 2015.

Percent
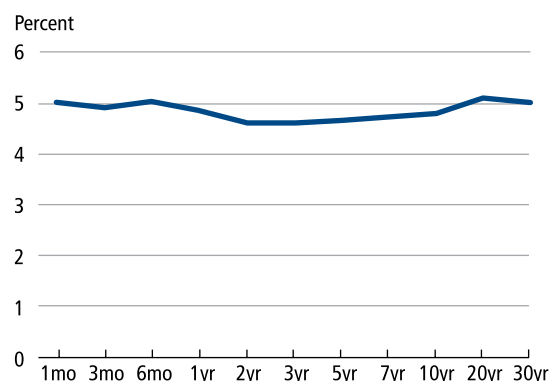

Source: U.S. Treasury.

Downward Slope Ahead of Great Recession
Treasury yields across maturity spectrum on August 8, 2007.

Percent

Source: U.S. Treasury.

trade. So in theory the two yields equal out, so to speak. After all, why would someone pay more for a 10-year bond than they would to continually roll over three-month notes? As we will see, real-life circumstances might create exceptions to this logic, but only fleetingly.

Thinking about this for a moment, this logic says that the yield on a 10-year Treasury bond will just equal the average of the yields on three-month notes over the next 10 years — that is, the yield on the current three-month note, the yield on a three-month note purchased three months from now, then six months from now, etc., all the way through the next 10 years. So, for this example, the yield curve would be upward sloping if the future interest rate on three-month notes is higher than the current interest rate

on three-month notes and downward sloping if the future interest rate on three-month notes is lower than the current three-month rate. Of course, investors don't really know what the rate on a three-month Treasury note is going to be in three months, but they can form expectations of this rate. And these expectations can be measured by forward rates. In the market, investors can obtain these future short rates by buying forward interest rate agreements, which are customized contracts that specify the interest rate to be paid or received on a future date.

For example, an investor can enter into a forward rate agreement with a counterparty in which, in two years, the investor will receive a fixed rate of 5 percent for one year on a principal of $1 million. In other words, at the end of the two years, regardless of the prevailing market interest rate at that time, the investor will lend the $1 million to the counterparty for one year and get the 5 percent interest that was fixed by the forward contract. In these contracts, the fixed rate that investors will receive reflects their expectations about future rates. So, to adjust our previous claim slightly, the yield on the 10-year Treasury bond must equal the average of the *expected* yields on three-month Treasury notes over the 10-year horizon. Going back to our yield curve examples in Figures 3 and 4, the upward sloping yield curve on July 21, 2015, suggests that investors expected short-term rates to increase in the future, while the downward sloping

When No Arbitrage Holds

For the purposes of this article, *arbitrage* is the practice of taking advantage of differences in the market prices of investments to earn risk-free profits. An arbitrage strategy usually involves buying or selling a combination of securities to generate a positive cash flow without risk.

For example, say the same security is listed at the same time on two different stock exchanges in two countries at two different prices. An investor can take advantage of this discrepancy by buying the security at the lower price and then selling it at the higher price to make a riskless profit.

When market prices do not allow for profitable arbitrage, they reach the *no-arbitrage* condition. In practice, profitable arbitrage is rare. For our example, prices of the same security are usually the same across all exchanges, taking into account transaction costs. Investors' risk aversion and capital constraints, as well as market frictions such as transaction costs and market segmentation, make a risk-free arbitrage difficult to pull off.

yield curve on August 8, 2007, suggests that investors expected the economy to weaken and interest rates to therefore fall in the future.

In this theoretical world, long-term rates are *completely* determined by investors' expectations of future short-term rates. This is called the *expectations hypothesis*. So if the Fed hoped to lower long-term rates by buying long-term securities without somehow lowering investors' expectations about future interest rates, arbitragers would simply do the opposite — that is, buy short-term securities and sell long-term securities — and the yield curve would not change.

In addition, investors demand a term premium. Now let's add a touch of realism to the model. Economists have long noticed that the yield curve has a systematic tendency to be more upward sloping than can be explained by investors' expectations about future rates. As we've seen in Figure 4, this doesn't mean that the yield curve always slopes upward, only that it tends to do so even when investors don't expect interest rates to rise.

The most straightforward explanation for this bias is that investors are not risk neutral. Instead, they tend to prefer less risky investment strategies. In particular, they worry: "What will happen if I am forced to sell my 10-year bond before it matures?" Here's the concern: If interest rates rise, the price of a 10-year bond falls, and vice versa if interest rates fall. If the investor needs to sell the bond in, say, year seven, he will take a loss if interest rates have risen in the interim. This means that a risk-averse investor will demand a higher interest rate as compensation for bearing this risk.[4] Longer-maturity bonds suffer larger price swings for the same change in interest rates, so risk-averse investors will demand more compensation for longer-maturity bonds, consistent with the empirical bias toward an upward slope in the yield curve. Economists refer to this compensation as a *term premium*. The size of the term premium reflects the expected volatility of the interest rate — because higher rate volatility increases the likelihood of large bond price swings — and the degree of investors' risk aversion. On the face of it, it is not immediately obvious that the Fed's bond purchases would affect either of these factors.

The expectations model, supplemented by a term premium model, makes up the "theory" that Bernanke was referring to. Traditional theory has held that the shape of the yield curve is determined by investors' expectations about the path and volatility of future interest rates and by

investors' degree of risk aversion. According to this theory, buying large quantities of long-term bonds should not affect long-term bond rates except to the extent that these purchases somehow affect either expected future rates or investors' degree of risk aversion.

WHY MIGHT QE WORK?

QE may affect expectations about future rates. One way for the Fed to affect long-term interest rates is to announce that it will hold the fed funds rate at zero for a long period, an example of *forward guidance*. As long as investors believe that the Fed will do as it says, then long-term rates will fall via the expectations channel. But what does this effect have to do with QE?

Some economists have argued that amassing a large portfolio of securities might help commit the Fed to carrying out its announced policy. According to this argument, investors might worry that the Fed will raise the fed funds

> Traditional theory has held that the shape of the yield curve is determined by investors' expectations about the path and volatility of future interest rates and by investors' degree of risk aversion.

rate if the inflation rate rises even slightly above the Fed's 2 percent target, thereby breaking its promise to keep rates low. If investors think this way, the Fed's announcement would not lower long-term rates because investors wouldn't find it credible. According to this view, the Fed might need some way to convince investors that the Fed is willing to keep interest rates low even if inflation moves somewhat above target. They have argued that QE might make the Fed's promise to hold rates low for a long time more credible, making QE a *signaling mechanism*.[5] While this is possible, the precise connection between amassing a large balance sheet and making credible commitments is complicated and hard to pin down.

Markets may be *segmented*. One implication of the no-arbitrage condition is that the supply of securities with particular maturities should not matter for the shape of the yield curve. However, when markets are segmented, bonds of different maturities are no longer perfect substitutes, the

no-arbitrage condition does not hold, and the supply of particular maturities can affect their yields.[6] As an example of market segmentation, life insurance companies like to hold longer-term bonds because their liabilities, such as annuity payouts, are also longer term. When QE reduced the supply of long-term bonds, their price increased and their yield fell.

Why wouldn't arbitragers undo the difference between the yields on long-term and short-term bonds, as dictated by the no-arbitrage logic? The assumption that investors can buy or sell unlimited amounts of securities does not hold in reality; it is a simplification to help economists isolate the factors affecting the yield curve. In reality, a host of factors — especially limited financing — restricts the size of the positions that investors can take. Real-life arbitragers typically rely on investors or the firms that employ them for the funds to finance their position. The sources of finance are not unlimited, and investors are not infinitely patient. So an arbitrager might not have enough financing or time to complete an arbitrage, even it is well founded. For example, the life insurance industry is a large player in the bond market. Arbitragers might not have sufficient capital to complete an arbitrage if long-term rates are lower than expected short-term rates (taking into account the term premium), or their sources of finance may dry up if investors are too impatient to wait until the arbitrage is completed. So when the Fed buys long-term Treasuries, the long-term yield can be lower — and stay lower — than what would be expected by rolling over short-term securities.

Portfolio effects may be important. QE can also affect the term premium by reducing the overall risk tolerance of investors — the *duration risk channel*. QE entered the market by reducing the quantity of riskier long-term assets — Treasury bonds and MBS — held by private investors and increasing the amount of safer assets such as short-term Treasuries. This shift reduced the total amount of risky assets investors held, and their portfolios become safer. As a result, investors may have required less compensation to hold risky bonds and were more willing to tolerate the duration risk of long-term bonds. This effect may have lowered the risk premium on long-term bonds.

EMPIRICAL EVIDENCE OF THE EFFECT OF QE

These three channels — expectations, segmented markets, and lower duration risk — explain why QE can work when we deviate from the no-arbitrage condition. But what does the evidence say? As I will show, the evidence so far suggests that QE did significantly lower long-term rates in

the short run, and there is some evidence that QE worked over the longer term, also.

One way to measure the effect of QE is through an event study. That is, we can examine the changes in interest rates of Treasuries of different maturities right after QE announcements. For example, the 10-year Treasury yield dropped 107 basis points two days after the announcement of QE1. Economists have made plausible arguments for using a wider window to examine the announcement effect. Depending on the length of the event window and the methodology used, estimates of the reduction in long-term U.S. rates range from 90 to 200 basis points.[7]

Evidence for the signaling effect. First, QE may have changed investors' expectations about future federal funds rates through the signaling effect. As mentioned before, forward rates reflect investors' expectations of future short rates. Over a two-day window around the announcement of QE1, the expected federal funds rate fell, indicating that QE1 lowered investors' expectations of future short-term interest rates.[8] Assuming the expectation hypothesis holds, Arvind Krishnamurthy and Annette Vissing-Jorgensen estimate the signaling effect through the magnitude of shifts of the forward rate yield two days after the announcement of QE.[9] The estimated signaling effect from lowering investors' expectations accounted for a significant portion of the decrease in 10-year bond rates — about 20 basis points for QE1, which was about 20 percent of the total change in yields over the same time. For QE2, the signaling effect accounted for about 12 basis points, or about 66 percent of the total change in yields. The signaling effect was found to be very small in magnitude for Operation Twist — formally known as the maturity extension program (MEP) — and QE3.[10] The signaling effect was negligible for the MEP and accounted for only a 1 basis point change around QE3.[11] This suggests that those later QE programs did not shift investor expectations as much as the earlier programs had. Michael Bauer and Glenn Rudebusch argue that similar measures of expectations may mismeasure the signaling effect because they ignore the effects of QE on bond risk premiums. They suggest, through a model-based approach, that the signaling effect may account for up to 50 percent of the drop in long-term yields.

Evidence for market segmentation. Michael Cahill and his coauthors found that yields on Treasury bonds of the same maturity as those purchased through QE fell the most around QE events. For example, QE1's purchases focused on two- to 10-year Treasury bonds, whose yields dropped more around the time of the QE1 announcement than yields

for other maturities did. This difference indicates market segmentation and that QE worked by lowering the supply of bonds of particular maturities.[12]

Evidence from abroad. In response to the financial crisis, countries besides the U.S. implemented similar unconventional monetary policies. How effective were those programs? Since 2009, the Bank of England has purchased over 375 billion pounds of assets, mostly British government securities, known as *gilts*. Event study evidence shows that interest rates dropped 75 to 100 basis points around Britain's QE announcements. The Bank of Japan's purchases of

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Remember that the goal of QE was to stimulate the broader economy. Did QE help do that? Was the effect long lasting?

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almost 187 trillion yen in assets between 2009 and 2012 lowered Japanese interest rates an estimated 50 basis points.[13]

Summing up the evidence, while the evidence for the precise channel through which QE worked is mixed and inconclusive, QE did seem to lower long-term government bond yields around the announcement windows for at least a few days. But remember that the goal of QE was to stimulate the broader economy.[14] Did QE help do that? Was the effect long lasting? And what are the potential costs?

QE'S EFFECTS ON THE BROADER ECONOMY

So far, I have focused on the effects of the Fed's QE policy on Treasury yields. However, as noted earlier, the Fed also purchased MBS as part of QE in the hope of stimulating housing demand. What was the effect of QE on mortgage rates? Krishnamurthy and Vissing-Jorgensen showed that QE also lowered mortgage rates significantly on announcement dates. Similarly, Andreas Fuster and Paul Willen showed that QE announcements prompted an immediate reduction in mortgage rates.

Economists have also found evidence that QE affected markets other than those in which the Fed intervened directly. Corporate bonds yields dropped significantly upon the announcement of QE1. For example, top-rated corporate bonds fell 77 basis points for QE1 over a two-day period after the announcement. Krishnamurthy and Vissing-Jorgensen argue that the drop could be due to QE1's effect

on reducing the default risk of corporate bonds. QE1 was implemented during the peak of the financial crisis, when the credit market was severely malfunctioning. By purchasing a large amount of securities from the private sector, QE1 increased liquidity in the economy and thus reduced firms' default risk. They also suggest that corporate bond yields dropped modestly for the MEP and very little for QE2 and QE3. Using U.K. data, Michael Joyce and his coauthors suggest that QE led institutional investors to increase the share of corporate bonds in their portfolios, increasing the demand for corporate bonds and hence lowering their yields.

Summing up the event studies: QE1 not only reduced long-term Treasury rates but also reduced borrowing costs for households and firms, at least immediately following its implementation. As for QE2 and QE3, the evidence for similar spillover effects is less conclusive.

Using relatively narrow announcement windows allows researchers to identify the event affecting interest rates with some precision but makes it difficult to establish longer-term effects. Over weeks and months, lots of things happen in the economy, so it becomes increasingly hard to know precisely what is affecting interest rates. Thus, other methods are needed to estimate the longer-term effects of QE.

The longer-term effect of QE. Although event studies show significant immediate effects of QE1 on Treasury yields and on yields of certain types of private sector debt, the reduction would need to persist to affect the real economy. Preliminary estimates of how long lasting QE's effects were on yields have been mixed, ranging from a few months to a few years.[15] But is there evidence of a positive, persistent effect on the real economy?

Through statistical analysis, most studies have found that QE had a positive association with GDP growth and inflation, although the size and persistence of the effects vary widely. Most estimates suggest that the three QE events are associated with a total increase in U.S. GDP of about 2 percentage points, but the range of estimates is very large — between 0.1 and 8.0 percentage points — and the effects were mostly short-lived. Estimates of the correlation of QE and inflation are large but again range widely.[16] Evidence on QE's effect on inflation expectations, house prices, stock prices, consumer confidence, and exchange rates is mixed and thus inconclusive.[17]

My coauthors and I have found some evidence that the MEP affected firm behavior. Firms differ in how much they rely on long-term debt, mainly because they wish to match

the maturity of their real assets and their debts. When we measured a firm's dependence on long-term debt by its historical average of long-term debt over total debt, we found that firms that were more dependent on long-term debt issued more long-term bonds following the MEP to fund more capital investment. Overall, there is some evidence that QE not only affected the yield curve but also had some positive, persistent effects on the economy.

THE RISKS OF QE

Despite the significant uncertainty about the size of the effects of QE and the channels through which it operated, the weight of the evidence says that QE lowered rates on Treasuries and mortgages, and there is some evidence that it also had positive effects on the real economy.

Nonetheless, some economists and policymakers have expressed serious concerns about the potential risk and costs associated with the program. QE is a very new policy tool, and it is difficult to know whether the unprecedented quadrupling of the Fed's balance sheet will lead to too much liquidity and ultimately unacceptably high inflation. That is, when banks begin to lend out the reserves they have built up, the economy might grow so fast that the Fed might find

it difficult to raise interest rates in time to avert runaway inflation.[18] In addition, a policy of prolonged monetary accommodation has increased risk-taking behavior among investors. With yields on long-term assets very low, investors may allot a greater share of their portfolios to riskier assets, such as stocks or high-yield corporate "junk" bonds.[19] Such "reaching for yield" leaves investors' portfolios more sensitive to interest rate changes and market volatility.

While there is limited evidence of greater financial instability due to QE, the risk is likely to grow the longer the policy is in place.[20] That might lead to more market volatility as the Fed raises interest rates and when it starts to shrink its balance sheet. A disorderly exit from QE could pose a risk to financial stability. Some Federal Reserve officials have stressed that maintaining financial stability is important for effective monetary policymaking as the Fed raises interest rates.[21] Others have expressed concern that QE has put the Fed in the business of supporting particular sectors — especially housing — at the expense of others.[22] The Fed ended QE3 and stopped expanding its balance sheet in late 2014. By early 2016, high inflation as a result of QE had yet to be seen, but as the economy continues to expand, such potential costs of QE may become reality, and future research would be needed to quantify them. ∎

NOTES

[1] For instance, in January 2016, the Bank of Japan lowered its policy interest rate to -0.1 percent. The European Central Bank lowered its interest rate to -0.1 percent in June 2014. Interest rates in Switzerland, Sweden, and Denmark also went below zero. See the 2013 article by Richard Anderson and Yang Liu.

[2] The yield of a bond is its annualized interest rate over its maturity and is usually computed from market prices. Given the market price of the bond P with maturity t, the yield of the bond is $P(t)^{-(1/t)}-1$. The yield of a bond is inversely related to its price — the lower the price, the higher the yield. For example, if a 10-year bond is traded at 60 cents in exchange for a $1 payoff in 10 years, its yield is roughly 5.2 percent per year $(0.6^{(-1/10)} -1)$. The formula here applies to zero coupon bonds. When a bond pays a coupon, it is usually first converted to an equivalent zero coupon bond before applying the computation above.

[3] A risk-neutral investor's investment decision is not affected by the degree of uncertainty in investment outcomes. So, for example, an investment that yielded 100 percent half the time and 0 percent half the time would be equivalent to one that yielded 50 percent with certainty. A risk-averse investor would prefer the certain investment over the riskier investment, even though their expected returns are the same.

[4] Our bond trader might also think about this possibility if his compensation were tied to the success of his trading positions measured on a yearly basis. The market value of his positions changes with market interest rates even if he doesn't actually have to sell any bonds before maturity.

[5] See Brett Fawley and Luciana Juvenal, and Saroji Bhattarai and his coauthors, for example.

[6] Economists often distinguish between segmented markets and the *preferred habitat* theory, which says that investors prefer securities of particular maturities but will also respond to profitable opportunities outside their preferred maturities. For my purposes, *segmented markets* can refer to either view.

[7] See the event studies by Arvind Krishnamurthy and Annette Vissing-Jorgensen. Also see the studies by Tatiana Fic and by Joseph Gagnon and his coauthors and the IMF reports.

[8] Krishnamurthy and Vissing-Jorgensen.

[9] They minimize the risk premium effects by using near-term contracts, which are less affected by bond risk premiums.

[10] A Federal Reserve Board video explains the MEP: www.federalreserve.gov/faqs/money_15070.htm.

[11] The 10-year bond yield dropped only 3 basis points over a two-day window after the QE3 announcement. So in percentage terms, the signaling effect is still significant.

[12] The evidence for a broad-based reduction in duration risk is more mixed. Some studies suggest that up to half the term premium reduction can be attributed to the duration risk channel. Other studies show that the duration risk effect was minimal. Another good reference is the paper by Michael Joyce and his coauthors.

[13] See the IMF reports and the Fic paper for more discussion on the international evidence of the effectiveness of QE.

[14] QE1 was pursued to thaw credit markets during the financial crisis but was also intended to stimulate the real economy by increasing *aggregate demand* — basically, consumer spending and business investment — according to Chairman Bernanke's 2008 speech.

[15] Jonathan Wright, Christopher Neely, and Joyce and his coauthors provide some initial estimates.

[16] See the IMF reports.

[17] See Brett Fawley and Luciana Juvenal's paper and the book by Kjell Hausken and Mthuli Ncube for more details. Andreas Fuster and Paul Willen find that QE substantially boosted mortgage refinancings, though not purchase mortgages.

[18] See the speeches by Charles Plosser and Jeffrey Lacker, for example.

[19] See Joyce and his coauthors and Bo Becker and Victoria Ivashina for more details.

[20] See the IMF's Global Financial Stability Report.

[21] See William Dudley's speeches, for example.

[22] See Plosser and Lacker.

REFERENCES

Anderson, Richard, and Yang Liu. "How Low Can You Go? Negative Interest Rates and Investors' Flight to Safety," Federal Reserve Bank of St. Louis *Regional Economist* (January 2013).

Bauer, Michael, and Glenn Rudebusch. "The Signaling Channel for Federal Reserve Bond Purchases," *International Journal of Central Banking* (September 2014), pp. 233–289.

Becker, Bo, and Victoria Ivashina. "Reaching for Yield in the Bond Market," *Journal of Finance*, (forthcoming).

Bernanke, Ben. "The Crisis and the Policy Response," remarks at the Stamp Lecture, London School of Economics, London, England, January 13, 2009.

Bernanke, Ben. "Federal Reserve Policies in the Financial Crisis," speech to the Greater Austin Chamber of Commerce, Austin, TX, December 1, 2008. www.federalreserve.gov/newsevents/speech/bernanke20081201a.htm.

Bernanke, Ben, Vincent Reinhart, and Brian Sack. "Monetary Policy Alternatives at the Zero Bound: An Empirical Assessment," *Brookings Papers on Economic Activity*, Brookings Institution, 35:2 (2004), pp. 1–100.

Bhattarai, Saroji, Gauti Eggertsson, and Bulat Gafarovy. "Time Consistency and the Duration of Government Debt: A Signaling Theory of Quantitative Easing," unpublished manuscript (2015).

Cahill, Michael, Stefania D'Amico, Canlin Li, and John Sears. "Duration Risk Versus Local Supply Channel in Treasury Yields: Evidence from the Federal Reserve's Asset Purchase Announcements," Federal Reserve Board of Governors Finance and Economics Discussion Series 2013–35 (2013).

Dudley, William. "The 2015 Economic Outlook and the Implications for Monetary Policy," remarks at Bernard M. Baruch College, New York City, December 1, 2014.

Dudley, William. "Why Financial Stability Is a Necessary Prerequisite for an Effective Monetary Policy," remarks at the Andrew Crockett Memorial Lecture, Bank for International Settlements 2013 Annual General Meeting, Basel, Switzerland, June 23, 2013.

Fawley, Brett, and Luciana Juvenal. "Quantitative Easing: Lessons We've Learned," Federal Reserve Bank of St. Louis *Regional Economist* (July 2012).

Fic, Tatiana. "The Spillover Effects of Unconventional Monetary Policies in Major Developed Countries on Developing Countries," United Nations Department of Economic and Social Affairs Working Paper 131 (2013).

Foley-Fisher, Nathan, Rodney Ramcharan, and Edison Yu. "The Impact of Unconventional Monetary Policy on Firm Financing Constraints: Evidence from the Maturity Extension Program," SSRN Working Paper 2537958 (2015).

Fuster, Andreas, and Paul Willen. "$1.25 Trillion Is Still Real Money: Some Facts About the Effects of the Federal Reserve's Mortgage Market Investments," Federal Reserve Bank of Boston Public Policy Discussion Paper 10–4 (2010).

Gagnon, Joseph, Matthew Raskin, Julie Remache, and Brian Sack. "The Financial Market Effects of the Federal Reserve's Large-Scale Asset Purchases," *International Journal of Central Banking*, 7:1 (2011), pp. 3–43.

Hausken, Kjell, and Mthuli Ncube. "Quantitative Easing and Its Impact in the U.S., Japan, the U.K. and Europe," New York: Springer–Verlag, 2013.

International Monetary Fund. "Global Impact and Challenges of Unconventional Monetary Policy," IMF Policy Paper (October 2013).

International Monetary Fund. "Unconventional Monetary Policies — Recent Experience and Prospects," IMF Policy Paper (April 2013).

International Monetary Fund. "Do Central Bank Policies Since the Crisis Carry Risks to Financial Stability?" Global Financial Stability Report, Chapter 3 (April 2013).

Joyce, Michael, Matthew Tong, and Robert Woods. "The United Kingdom's Quantitative Easing Policy: Design, Operation and Impact," Bank of England *Quarterly Bulletin*, 51:3 (2011), pp. 200–212.

Krishnamurthy, Arvind, and Annette Vissing-Jorgensen. "The Ins and Outs of LSAPs," proceedings of the Economic Policy Symposium, Jackson Hole, WY (2013).

Labonte, Marc. "Federal Reserve: Unconventional Monetary Policy Options," Congressional Research Service, February 6, 2014, www.fas.org/sgp/crs/misc/R42962.pdf.

Lacker, Jeffrey. "Richmond Fed President Lacker Comments on FOMC Dissent," press release, Federal Reserve Bank of Richmond (October 26, 2012), www.richmondfed.org/press_room/press_releases/2012/fomc_dissenting_vote_20121026.

Neely, Christopher. "How Persistent Are Monetary Policy Effects at the Zero Lower Bound?" Federal Reserve Bank of St. Louis Working Paper 2014–004A (2014).

Plosser, Charles. "Good Intentions in the Short Term with Risky Consequences for the Long Term," speech at the Cato Institute's 30th Annual Monetary Conference, "Money, Markets, and Government: The Next 30 Years," Washington, D.C., November 15, 2012.

Plosser, Charles. "Economic Outlook and a Perspective on Monetary Policy," speech at the Wharton Fall Members Meeting, Philadelphia, October 1, 2011.

Plosser, Charles. "Economic Outlook and Challenges for Monetary Policy" speech at the Philadelphia Chapter of the Risk Management Association, Philadelphia, January 11, 2011.

Wright, Jonathan. "What Does Monetary Policy Do to Long-Term Interest Rates at the Zero Lower Bound?" *Economic Journal*, 122 (2012), pp. 447–466.

BANKING TRENDS

How Dodd–Frank Affects Small Bank Costs

Do stricter regulations enacted since the financial crisis pose a significant burden?

BY JAMES DISALVO AND RYAN JOHNSTON

"With respect to supervisory regulations and policies, we recognize that the cost of compliance can have a disproportionate impact on smaller banks, as they have fewer staff members available to help comply with additional regulations."

— *Federal Reserve Chair Janet Yellen*

New regulations imposed on banks since the financial crisis and Great Recession are primarily directed toward large banks, especially banks that regulators deem systemically important. However, small banks have argued that the stricter regulations are excessively costly for them. Often they have identified the Dodd–Frank Wall Street Reform and Consumer Protection Act of 2010 as the main culprit, and this charge has been taken up by politicians who have cited the higher regulatory burden on small banks as a reason that various parts of Dodd–Frank ought to be repealed. Small banks have also complained that new capital requirements under the international Basel III accord have been unduly burdensome. Recently, some regulators have made proposals to lower regulatory costs for small banks.[1]

We examine the effects of regulatory changes since the Great Recession on banks with assets below $10 billion, which we refer to as small banks.[2] We show that new home mortgage lending rules imposed by the Consumer Financial Protection Bureau likely significantly affected small banks, despite a wide range of exemptions that limit the effects of new regulations. Another important line of business for small banks, commercial real estate lending, may also be significantly affected by new risk-based capital requirements. However, regulations on debit card transaction fees do not appear to have hurt small banks, despite complaints from bankers.

Because direct measures of regulatory costs are not available, we mainly use a rough indicator of regulatory burden: the share of bank portfolios potentially affected by new regulations. Apart from these measures of bank activity that might be affected, regulatory compliance costs — in particular, the standardized reports required to qualify for the exemptions — may hit small banks disproportionately hard, as Chair Yellen has argued. These costs are largely anecdotal and hard to measure, but we report some estimates from economists at the Minneapolis Fed.[3]

In this article, we examine only the costs imposed on small banks without factoring in some new regulations that reduce their costs such as lower FDIC assessments.[4] Nor do we discuss the intended benefits of the new regulations. We focus on the three regulatory changes that have elicited the most complaints from small bankers and their representatives: the qualified mortgage rule, Basel III capital standards, and the Durbin Amendment.

QUALIFIED MORTGAGE RULE

This rule mandated by Dodd–Frank is designed to force banks to maintain higher lending standards for home mortgages. It imposes rigorous standards of proof that a loan is not high risk. Notably, banks must document that a borrower has the ability to repay the loan and that the mortgage has no nonstandard contract structures, such as balloon payments. A mortgage that meets these conditions is called a *qualified mortgage*.[5] Mortgages are presumed to be qualified mortgages if they are guaranteed by a

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government entity such as the Federal Housing Administration (FHA) or the Department of Veterans Affairs (VA) or meet the standards of a government-sponsored enterprise (GSE) such as Fannie Mae.

For the small bank, the key benefit of making qualified mortgages is that it then has protection against lawsuits by borrowers and against attempts by borrowers to avoid foreclosure.[6] The legal protections are even stronger for qualified mortgages that are not *high priced.* A high-priced loan is one with an interest rate that exceeds the average prime rate by more than 1.5 percentage points for a loan secured by a first lien or by 3.5 percentage points for a junior lien. In recent surveys conducted by Fannie Mae and the Fed, small bankers report higher lending costs and lower approval rates because of the new qualified mortgage requirement.[7]

We can estimate the fraction of small bank portfolios affected by the qualified mortgage rule by examining the share of mortgages that would not have qualified for legal protections in the year before the new requirements were imposed. We use 2013 numbers because the economy had substantially recovered from the Great Recession by 2013 and because the rule was imposed in 2014.[8] Unfortunately, Home Mortgage Disclosure Act (HMDA) data do not include enough information about each loan to know for certain whether a loan is a qualified mortgage or whether it is high priced, but we construct a rough approximation. First, the data do indicate whether a loan is FHA or VA insured, so those loans are automatically qualified mortgages. Our proxy for whether a loan conforms to GSE standards is that the face value of the loan is lower than the conforming loan limit for the geographic area of the property for which the loan was made.[9] We also construct a proxy for high-priced loans.[10] Our conservative measure of loans affected by the qualified mortgage rule adds nonconforming loans and conforming loans that are high priced. We call these loans *affected loans.*

Figure 1a illustrates that the median share — think of it as the measure for the "typical" bank — of affected loans by *number* of loans was approximately 10 percent for banks with less than $100 million in assets, dropping to under 5 percent for banks with assets of $2 billion to $10 billion. The average number of affected loans was about 22 percent for the smallest banks, dropping to 9 percent for the largest category (Figure 1b). (The median share of affected loans by *dollar value* is somewhat higher than the share by number, ranging from 9 percent to 13 percent for different size banks, while the averages ranged from about 26 percent for the smallest banks to 17 percent for the largest.) The difference

Qualifying Mortgage Rule Affects Small Bank Mortgage Lending
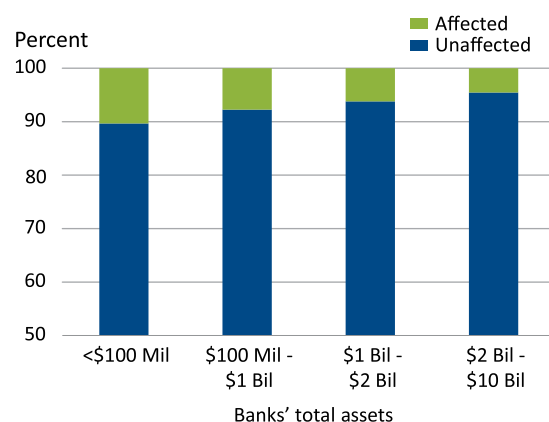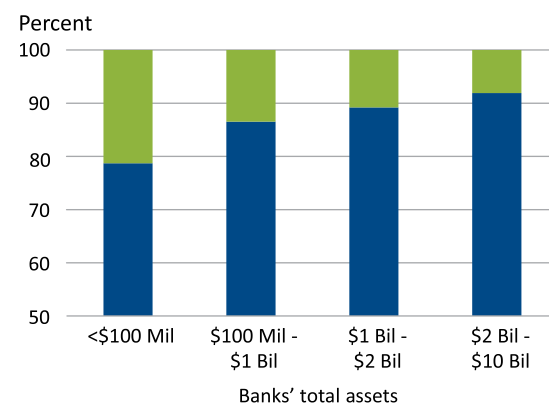Median share of affected and unaffected mortgages by number of loans, 2013.

FIGURE 1b

Average share of affected and unaffected mortgages by number of loans, 2013.

Source: Home Mortgage Disclosure Act data.
Note: Affected mortgages include nonconforming loans and conforming loans that are high priced. Unaffected mortgages include FHA insured loans, VA insured loans, and conforming loans that are not high priced.

between the median and average values indicates that some banks in each size class specialized in lending mortgages that are affected by the qualified mortgage rule, but a closer examination of individual banks shows that the higher average values were not driven by a small number of banks with high concentrations of nonexempt mortgage lending. No less than 20 percent of the banks in each size class dedicated at least 10 percent of their portfolios to affected loans.

The number of loans is probably most relevant for thinking about compliance costs, which must be borne regardless of loan size. The dollar value is more relevant for

thinking about lost profits should small banks make fewer affected loans.

To sum up, the qualified mortgage rule affects a significant share of mortgage lending by small banks, and by some measures, the effect appears to be greatest for the smallest banks.[11]

BASEL CAPITAL STANDARDS

While not directly the result of Dodd–Frank, capital requirements for banks have been raised and the risk weights on some classes of assets have risen significantly since the Great Recession.[12] The rise in total capital requirements primarily affects large banks, especially systemically risky banks.[13] But the rise in the risk weights on certain types of commercial real estate (CRE) may have disproportionately affected small banks because they invest relatively heavily in commercial real estate. Indeed, CRE represents approximately 50 percent of small bank loan portfolios, compared with just over 25 percent of large bank portfolios. Raising the cost of making CRE loans could reduce small banks' competitiveness because detailed knowledge of local real estate markets is probably a significant source of comparative advantage for small banks.

Specifically, the new capital requirements impose a 150 percent risk weight on particularly risky CRE loans known as high-volatility commercial real estate.[14] For the purpose of determining a bank's capital requirements, this means that each dollar lent through such loans raises the value of bank assets by $1.50.[15] Previously, the risk weights on CRE had not exceeded 100 percent. Apart from concerns about the higher risk weight, bankers have also argued that the rules for determining whether a particular deal is a high-volatility loan are flawed.

While we can't directly determine the share of high-volatility CRE in small bank loan portfolios, we can get an upper-bound estimate of the share that could be classified as high-volatility CRE.[16] First, the 89 percent of commercial banks with assets of less than $1 billion are exempt from the higher capital requirement. For the remaining small banks, while CRE is a large component of small bank lending, neither mortgages for multifamily housing nor construction loans for one- to four-family housing — detached single-family homes plus attached homes of two to four units — can be classified as high-volatility CRE under the new capital standards. Figure 2 shows that the construction loans that might be so classified represent approximately 5 percent of total loans (2 percent of total assets) for the median commercial

FIGURE 2

New Requirements Affect Modest Portion of Small Bank Portfolios

Affected and unaffected commercial real estate loans as share of total loans, 2013.
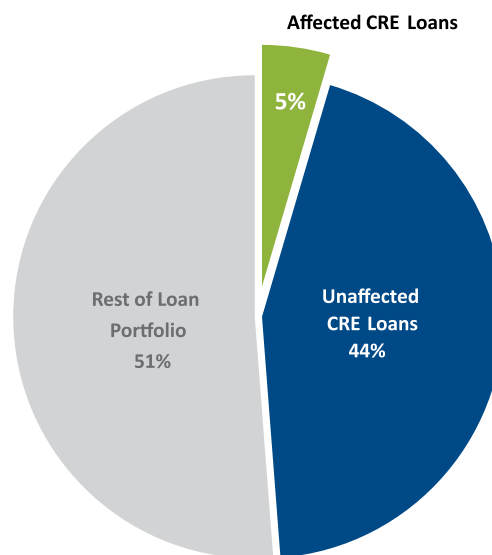
Source: Federal Financial Institutions Examination Council Call Reports.
Notes: Affected CRE loans are defined as all construction loans for purposes other than constructing one- to four-family residential properties, all land development loans, and all other land loans. Total CRE loans include construction and land development loans, real estate loans secured by farmland, real estate loans secured by multifamily (five or more) residential properties, and real estate loans secured by nonfarm nonresidential properties.

bank with total assets below $10 billion, while the average values are slightly larger.[17] While this is an upper bound on the share of CRE loans actually subject to the higher capital requirements, it may be the appropriate measure for judging higher compliance costs. Even if a loan doesn't qualify as high-volatility CRE, the bank must provide adequate documentation to demonstrate that to examiners.[18]

In summary, the new capital requirements potentially affect a modest, but certainly not insignificant, portion of small banks' CRE portfolios.

THE DURBIN AMENDMENT

The Durbin Amendment of Dodd–Frank, which the Federal Reserve implemented as Regulation II in 2011 and amended in 2012,[19] requires regulators to impose a ceiling on the *interchange fees* that covered banks charge for debit card transactions.[20] Each time a customer buys something with a debit card, the bank that issued the card charges the merchant's bank an interchange fee. All banks with assets below $10 billion are exempt from the regulation. But

according to the American Bankers Association, "Interchange is one of the most important sources of non-interest income for community banks, and the severe reductions in debit-card interchange income that would result from the implementation of Durbin would be a major hit to the overall earnings of community banks."[21]

Since the regulation imposes a ceiling on interchange fees only on banks with assets of more than $10 billion, how would that affect small banks? Small bankers have argued that competition between large card issuers and small issuers would effectively impose the ceiling on small banks. What does the evidence say?

There is substantial evidence that the ceiling did lower interchange fees collected by banks with assets above $10 billion, from around 44 cents to about 22 cents per transaction.[22] But there was no such decline for small banks. Furthermore, after the ceiling was imposed, the volume of transactions conducted with cards issued by exempt banks grew faster than it did for large banks.[23] Finally, Zhu Wang shows that interchange revenue fell substantially at large banks after the fee ceiling was imposed but continued rising for small banks.[24]

In sum, the evidence does not support the claim that competitive forces have effectively imposed the interchange fee ceiling on small banks, although it is possible that longer-term competitive effects might yet put small banks at a disadvantage.

COMPLIANCE COSTS

Regulations can impose significant costs if they increase regulatory reporting and compliance requirements. For example, the information required to document for regulators that a particular commercial real estate loan is not a high-volatility loan might be more costly to acquire than the information that the bank would routinely collect as part of its own due diligence and monitoring efforts. And to the extent that these costs are not divisible — for example, if the bank must hire a lawyer to ensure its regulatory compliance — then the small bank may be at a competitive disadvantage compared with a large bank that already has a legal department.

To date, reports of the costs of regulatory compliance have been largely anecdotal. But economists at the Minneapolis Fed have developed a simple methodology for estimating compliance costs for very small banks, measured by the cost of adding an employee dedicated solely to managing regulatory compliance. They estimate that 40 basis points is the minimum return on assets that investors require of a small bank.[25] They find that nearly 18 percent of banks with less than $50 million in assets would fall below this minimum return if they had to hire an additional full-time employee, while 2.5 percent of banks with assets of $500 million to $1 billion would fall below the minimum.

While it is plausible that the fixed costs of hiring another employee impose a larger burden on small banks, it should be kept in mind that many small banks use consultants and vendors to handle regulatory compliance. These outside contractors spread their own fixed employment costs across their many small bank clients. Ultimately, the magnitude of the rise in regulatory costs due to Dodd–Frank and the accompanying regulatory changes since the Great Recession is an empirical question that will require more time and analysis to determine. However, even with years of data in hand, it will remain difficult to disentangle regulatory costs from other factors that affect small banks' cost structures.

CONCLUSION

The inconclusive nature of the evidence notwithstanding, we note one interesting proposal from Federal Reserve Governor Daniel Tarullo, echoing a more detailed proposal by FDIC Vice Chairman Thomas Hoenig, designed to reduce regulatory costs for small banks. It offers small banks a trade. In exchange for maintaining a somewhat higher capital level than the minimum, small banks that do not engage in nontraditional activities would be permitted to use much simpler risk-based capital requirements similar to those of Basel I, which required only elementary distinctions between assets according to risk. For example, in exchange for holding a higher capital level, small banks would not be subject to the Basel III requirements for CRE.[26] This proposal might significantly reduce record keeping and compliance costs without posing a significantly higher risk to safety and soundness. ■

NOTES

[1] Concern about the impact of regulatory costs on small banks has two main rationales. First, as shown in our third quarter 2015 issue of *Banking Trends*, small banks play an outsize role in small business lending in the U.S. Second, small bank failures do not pose the same risks to financial stability as do large bank failures.

[2] In this article, we do not address the effects of the new regulations on large banks.

[3] Bankers have also complained about overzealous and inconsistent examiners, but these costs have little to do with Dodd–Frank and are difficult to verify or quantify.

[4] See Jim Fuchs and Andrew Meyer's estimates.

[5] A bank can make a qualified mortgage by documenting certain facts about the borrower: income or assets, employment, credit history, monthly mortgage payment, other monthly payments associated with the property, other monthly obligations associated with the mortgage, and other debt. Also, a borrower's debt-to-income ratio must be 43 percent or less; the bank cannot charge more than 3 percent in points and fees; and the loan cannot have a special structure such as balloon payments, negative amortization, interest-only payments, or terms beyond 30 years. For more information on the qualified mortgage rule for small banks, see the Consumer Financial Protection Board's *Ability-to-Repay and Qualified Mortgage Rule Small Entity Compliance Guide*.

[6] Nonqualified loans are also significantly more costly to securitize — that is, to package along with other mortgages into a security that can be sold to investors. This cost is very important for large banks, less so for small banks, which generally retain more of their mortgage loans in their own portfolios.

[7] While 67 percent of respondents to the Fed's July 14, 2014, Senior Loan Officer Opinion Survey reported that the qualified mortgage requirements had no effect on their lending standards, those respondents reporting a decline in making nonqualified mortgages were more likely to be from smaller banks. Fannie Mae reported similar results, finding that most lenders had experienced or expected a rise in compliance costs.

[8] In fact, the numbers are similar for 2013 and 2014. It is possible that banks were adapting to the impending regulation ahead of its enactment. Furthermore, most observers agree that bank credit standards for mortgage loans have been quite tight even as the economy recovered, so we might expect the new regulations to bind more tightly in future years.

[9] We exclude home improvement loans because they would typically be below the conforming loan limit.

[10] We define a high-priced loan as one in which the annual percentage rate is more than 1.5 percent higher than the average prime offer rate for loans secured by first liens and 3.5 percent higher for loans secured by junior liens. Still, some high-priced loans by our measure may meet GSE standards.

[11] Consumer Financial Protection Bureau regulations reduce the reporting burden for banks with less than $2 billion in assets that made fewer than 2,000 mortgage loans in the previous year. This is a potentially large source of regulatory relief. We do not adjust our numbers to take this potential into account because the extent to which a bank actually has a legal safe harbor if it takes advantage of the less stringent requirements is not yet clear. Nonetheless, we think of our portfolio measure as an upper bound.

[12] The Bank for International Settlements concisely describes the Basel agenda, www.bis.org/bcbs/basel3.htm.

[13] See Ronel Elul's article for a description and discussion of capital regulation from pre-Basel to Basel III.

[14] High-volatility commercial real estate includes all acquisition, development, and construction (ADC) commercial real estate loans except one- to four-family residential ADC loans and commercial real estate ADC loans that meet regulatory requirements imposing a maximum loan-to-value ratio both at the outset and throughout the life of the loan.

[15] Joseph Rubin, Stephan Giczewski, and Matt Olson discuss the possible effects of the new CRE capital standards.

[16] Banks began reporting high-volatility CRE only in 2015.

[17] Unlike for the HMDA data, the Call Reports provide no information about the number of CRE loans, only their total outstanding dollar value.

[18] Bankers have also complained about the added complexity of the Basel III risk-weighted capital rules. This is difficult to quantify. Below, we briefly discuss a proposal to lessen this burden.

[19] For more on Regulation II, see www.federalreserve.gov/paymentsystems/regii-faqs.htm.

[20] We will focus on the ceiling on interchange fees because this has been the primary source of complaints from bankers. Durbin also mandates that merchants be permitted to route debit card transactions through whichever networks are least costly for them.

[21] Letter from Stephen Wilson to Sheila Bair.

[22] See the report from the Board of Governors and the paper by Benjamin Kay, Mark Manuszak, and Cindy Vojtech.

[23] See the report on interchange fees by the Board of Governors.

[24] The Call Report lumps together interchange fees from debit cards and credit cards, so the different responses for large and small banks might, in principle, be due to a change in credit card fees rather than the result of the imposition of ceilings for debit cards. Wang addresses this issue by dropping all monoline credit card banks and finds identical results.

[25] This is the historical return on assets for a de novo bank after five years.

[26] Note that this would not address the qualified mortgage rule. The American Bankers Association has proposed that loans kept on balance sheets be exempt from the rule. To evaluate this proposal, we would need to address concerns about consumer protection and financial stability that underlie the rule.

REFERENCES

Board of Governors of the Federal Reserve System. Senior Loan Officer Opinion Survey (July 2014), www.federalreserve.gov/boarddocs/snloansurvey/201408/fullreport.pdf.

Board of Governors of the Federal Reserve System. "2013 Interchange Fee Revenue, Covered Issuer Costs, and Covered Issuer and Merchant Fraud Losses Related to Debit Card Transactions," (September 18, 2014).

Consumer Financial Protection Bureau. *Ability-to-Repay and Qualified Mortgage Rule Small Entity Compliance Guide* (January 8, 2014). http://files.consumerfinance.gov/f/201401_cfpb_atr-qm_small-entity-compliance-guide.pdf.

DiSalvo, James, and Ryan Johnston. "Banking Trends: How Our Region Differs," Federal Reserve Bank of Philadelphia *Business Review* (Third Quarter 2015).

Elul, Ronel. "The Promise and Challenges of Bank Capital Reform," Federal Reserve Bank of Philadelphia *Business Review* (Third Quarter 2013).

Fannie Mae. Mortgage Lender Sentiment Survey, August 2014, www.fanniemae.com/portal/about-us/media/commentary/081414-huang.html?s_cid=mlssfmc0814.

Federal Deposit Insurance Corporation. "Community Banking Study, Appendix B," www.fdic.gov/regulations/resources/cbi/report/CBSI-B.pdf.

Feldman, Ron, Jason Schmidt, and Ken Heinecke. "Quantifying the Costs of Additional Regulation on Community Banks," Federal Reserve Bank of Minneapolis Economic Policy Papers (May 30, 2013), www.minneapolisfed.org/research/economic-policy-papers/quantifying-the-costs-of-additional-regulation-on-community-banks.

Fuchs, Jim, and Andrew Meyer. "Most Community Banks Will Pay Lower Premiums Under FDIC Assessment Rules," Federal Reserve Bank of St. Louis *Central Banker* (Summer 2011), www.stlouisfed.org/Publications/Central-Banker/Summer-2011/Most-Community-Banks-Will-Pay-Lower-Premiums-under-FDIC-Assessment-Rules.

Hoenig, Thomas. "A Conversation About Regulatory Relief and the Community Bank," speech to the 24th Annual Hyman P. Minsky Conference, National Press Club, Washington, D.C., April 15, 2015.

Kay, Benjamin, Mark Manuszak, and Cindy Vojtech. "Bank Profitability and Debit Card Interchange Regulation: Bank Responses to the Durbin Amendment," paper presented April 4, 2013, at the Economics of Payments VII Conference, Federal Reserve Bank of Boston, March 2014, www.bostonfed.org/payments2014/papers/Cindy_M_Vojtech.pdf.

Rubin, Joseph, Stephan Giczewski, and Matt Olson. "Basel III's Implications for Commercial Real Estate," Ernst & Young, L.L.P., August 2013, www.ey.com/Publication/vwLUAssets/Basel_III%E2%80%99s_implications_for_commercial_real_estate/$FILE/EY-Basel_IIIs_implications_for_commercial_real_estate.pdf).

Tarullo, Daniel. "A Tiered Approach to Supervision and Regulation of Community Banks," speech to the Community Bankers' Symposium, November 7, 2014.

Wang, Zhu. "Debit Card Interchange Fee Regulation: Some Assessments and Considerations," Federal Reserve Bank of Richmond *Economic Quarterly*, (Third Quarter 2012), pp. 159–183.

Wilson, Stephen P. Letter from the chairman of the American Bankers Association to Sheila Bair, chairperson of the Federal Deposit Insurance Corporation, March 21, 2010, www.aba.com/Advocacy/LetterstoCongress/Documents/ChairmanBairMar212011.pdf.

Yellen, Janet. "Some Thoughts on Community Banking: A Conversation with Chair Janet Yellen," Federal Reserve *Community Banking Connections* (Second Quarter 2015), www.cbcfrs.org/articles/2015/q2/conversation-with-yellen.

RESEARCH UPDATE

Visit our website for more abstracts and papers of interest to the professional researcher produced by economists and visiting scholars at the Philadelphia Fed.

FISCAL STIMULUS IN ECONOMIC UNIONS: WHAT ROLE FOR STATES?

The Great Recession and the subsequent passage of the American Recovery and Reinvestment Act returned fiscal policy, and particularly the importance of state and local governments, to the center stage of macroeconomic policymaking. This paper addresses three questions for the design of intergovernmental macroeconomic fiscal policies. First, are such policies necessary? An analysis of U.S. state fiscal policies shows state deficits (in particular from tax cuts) can stimulate state economies in the short run but that there are significant job spillovers to neighboring states. Central government fiscal policies can best internalize these spillovers. Second, what central government fiscal policies are most effective for stimulating income and job growth? A structural vector autoregression analysis for the U.S. aggregate economy from 1960 to 2010 shows that federal tax cuts and transfers to households and firms and intergovernmental transfers to states for lower income assistance are both effective, with one- and two-year multipliers greater than 2.0. Third, how are states, as politically independent agents, motivated to provide increased transfers to lower-income households? The answer is matching (price subsidy) assistance for such spending. The intergovernmental aid is spent immediately by the states and supports assistance to those most likely to spend new transfers.

Working Paper 15–41. Gerald Carlino, Federal Reserve Bank of Philadelphia; Robert P. Inman, Wharton School, University of Pennsylvania.

OUT OF SIGHT, OUT OF MIND: CONSUMER REACTION TO NEWS ON DATA BREACHES AND IDENTITY THEFT

The authors use the 2012 South Carolina Department of Revenue data breach to study how data breaches and news coverage about them affect consumers' take-up of fraud protections. In this instance, the authors find that a remarkably large share of consumers who were directly affected by the breach acquired fraud protection services immediately after the breach. In contrast, the response of consumers who were not directly exposed to the breach, but who were exposed to news about it, was negligible. Even among consumers directly exposed to the data breach, the incremental effect of additional news about the breach was small. The authors conclude that, in this instance, consumers primarily responded to clear and direct evidence of their own exposure to a breach. In the absence of a clear indication of their direct exposure, consumers did not appear to revise their beliefs about future expected losses associated with data breaches.

Working Paper 15–42. Vyacheslav Mikhed, Federal Reserve Bank of Philadelphia; Michael Vogan, Federal Reserve Bank of Philadelphia.

THE ECONOMICS OF DEBT COLLECTION: ENFORCEMENT OF CONSUMER CREDIT CONTRACTS

In the U.S., creditors often outsource the task of obtaining repayment from defaulting borrowers to third-party debt collection agencies. This paper argues that an important incentive for this is creditors' concerns about their reputations. Using a model along the lines of the common agency framework, the authors show that, under certain conditions, debt collection agencies use harsher debt collection practices than original creditors would use on their own. This appears to be consistent with empirical evidence. The model also fits several other empirical facts about the structure of the debt collection industry and its evolution over time. The authors show that the existence of third-party debt collectors may improve consumer welfare if credit markets contain a sufficiently large share of opportunistic borrowers who would not repay their debts unless faced with "harsh" debt collection practices. In other cases, the presence of third-party debt collectors can result in lower consumer welfare. The model provides insight into

which policy interventions may improve the functioning of the collections market.

Working Paper 15–43. Viktar Fedaseyeu, Bocconi University, Federal Reserve Bank of Philadelphia Visiting Scholar; Robert Hunt, Federal Reserve Bank of Philadelphia.

ON THE USE OF MARKET-BASED PROBABILITIES FOR POLICY DECISIONS

This paper seeks to delimit the conditions so that market-based probabilities provide all the information required by the policymaker to arrive at the best decision possible. While there are several practical considerations regarding how to derive market-based probabilities from financial prices, the discussion here is confined to a theoretical analysis that assumes no impediment to obtaining the market-based probabilities.

Working Paper 15–44. Roc Armenter, Federal Reserve Bank of Philadelphia.

OWNER OCCUPANCY FRAUD AND MORTGAGE PERFORMANCE

The authors use a matched credit bureau and mortgage data set to identify occupancy fraud in residential mortgage originations, that is, borrowers who misrepresented their occupancy status as owner occupants rather than residential real estate investors. In contrast to previous studies, the authors' data set allows them to show that such fraud was broad based, appearing in the government-sponsored enterprise market and in loans held on bank portfolios as well. Mortgage borrowers who misrepresented their occupancy status performed worse than otherwise similar owner-occupants and declared investors, defaulting at nearly twice the rate. In addition, these defaults are significantly more likely to be "strategic" in the sense that their bank card performance is better and utilization is lower.

Working Paper 15–45. Ronel Elul, Federal Reserve Bank of Philadelphia; Sebastian Tilson, Federal Reserve Bank of Philadelphia.

NATURAL AMENITIES, NEIGHBORHOOD DYNAMICS, AND PERSISTENCE IN THE SPATIAL DISTRIBUTION OF INCOME

The authors present theory and evidence highlighting the role of natural amenities in neighborhood dynamics, suburbanization, and variation across cities in the persistence of the spatial distribution of income. The authors' model generates three predictions that they confirm using a novel database of consistent-boundary neighborhoods in U.S. metropolitan areas, 1880–2010, and spatial data for natural features such as coastlines and hills. First, persistent natural amenities anchor neighborhoods to high incomes over time. Second, naturally heterogeneous cities exhibit persistent spatial distributions of income. Third, downtown neighborhoods in coastal cities were less susceptible to the widespread decentralization of income in the mid-20th century and increased in income more quickly after 1980.

Working Paper 15–46. Sanghoon Lee, University of British Columbia; Jeffrey Lin, Federal Reserve Bank of Philadelphia.

FINANCIAL CONTRACTING WITH ENFORCEMENT EXTERNALITIES

Contract enforceability in financial markets often depends on the aggregate actions of agents. For example, high default rates in credit markets can delay legal enforcement or reduce the value of collateral, incentivizing even more defaults and potentially affecting credit supply. The authors develop a theory of credit provision in which enforceability of individual contracts is linked to aggregate behavior. The central element behind this link is enforcement capacity, which is endogenously determined by investments in enforcement infrastructure. This paper sheds new light on the emergence of credit crunches and the relationship between enforcement infrastructure, economic growth, and political economy distortions.

Working Paper 16–01. Lukasz A. Drozd, Federal Reserve Bank of Philadelphia; Ricardo Serrano-Padial, Drexel University.

THE DYNAMICS OF SUBPRIME ADJUSTABLE-RATE MORTGAGE DEFAULT: A STRUCTURAL ESTIMATION

The authors present a dynamic structural model of subprime adjustable-rate mortgage (ARM) borrowers making payment decisions, taking into account possible consequences of different degrees of delinquency from their lenders. The authors empirically implement the model using unique data sets that contain information on borrowers' mortgage payment history, their broad balance sheets, and lender responses. The authors' investigation of the factors that drive borrowers' decisions reveals that subprime ARMs are not all alike. For loans originated in 2004 and 2005, the interest rate resets associated with ARMs as well as the housing and labor market conditions were not as important in borrowers' delinquency decisions as in their decisions to pay off their loans. For loans originated in 2006, interest rate resets, housing price declines, and worsening labor market conditions all contributed importantly to their high delinquency rates. Counterfactual policy simulations reveal

that even if the London Interbank Offered Rate (LIBOR) could be lowered to zero by aggressive traditional monetary policies, it would have a limited effect on reducing the delinquency rates. The authors find that automatic modification mortgages with cushions, under which the monthly payment or principal balance reductions are triggered only when housing price declines exceed a certain percentage, may result in a Pareto improvement, in that borrowers and lenders are both made better off than under the baseline, with lower delinquency and foreclosure rates. The authors' counterfactual analysis also suggests that limited commitment power on the part of the lenders regarding loan modification policies may be an important reason for the relatively low rate of modifications observed during the housing crisis.

Working Paper 16–02. Hanming Fang, University of Pennsylvania; You Suk Kim, Federal Reserve Board; Wenli Li, Federal Reserve Bank of Philadelphia.

WORKER FLOWS AND JOB FLOWS: A QUANTITATIVE INVESTIGATION

This paper studies quantitative properties of a multiple-worker firm search/matching model and investigates how worker transition rates and job flow rates are interrelated. The authors show that allowing for job-to-job transitions in the model is essential to simultaneously account for the cyclical features of worker transition rates and job flow rates. Important to this result are the distinctions between the job creation rate and the hiring rate and between the job destruction rate and the layoff rate. In the model without job-to-job transitions, these distinctions essentially disappear, thus making it impossible to simultaneously replicate the cyclical features of both labor market flows.

Working Paper 16–03. Supersedes Working Paper 13–9/R. Shigeru Fujita, Federal Reserve Bank of Philadelphia; Makoto Nakajima, Federal Reserve Bank of Philadelphia.

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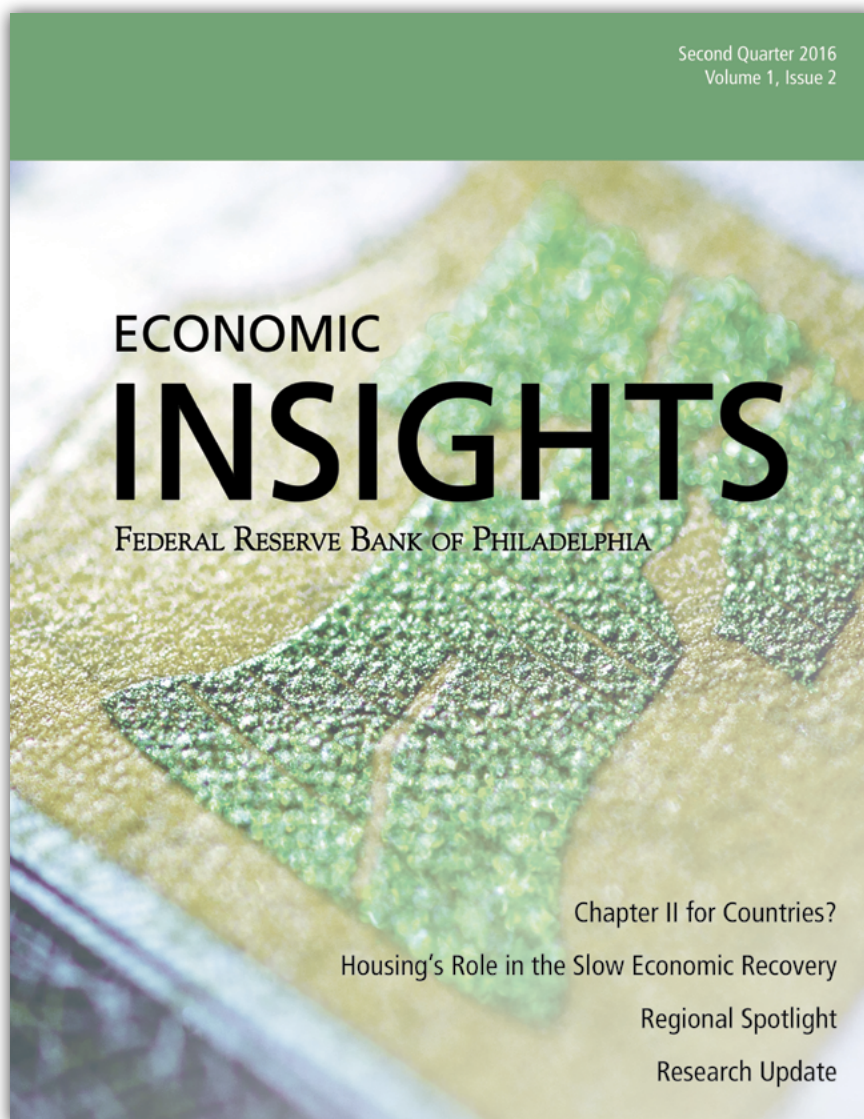
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