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

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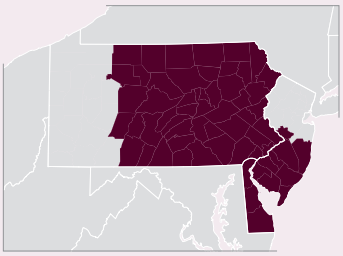

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Federal Reserve Bank of Philadelphia

The U.S. was racked by depressions in the decades after the dissolution of the Second Bank of the United States, prompting Congress to create the Federal Reserve in 1913. To address the debate over federal influence of the economy, Congress created a hybrid central bank: a Board of Governors in Washington plus 12 district banks. From 1935 to 1977, the Third District's headquarters was in the stone-clad building at Chestnut and 10th streets. Like other Classical Revival buildings of the New Deal era, this building features a streamlined classicism with minimal ornamentation—though the front entrance is flanked by bas relief sculptures conveying the Fed's role as advisor to the banking system. As construction of this building neared completion, Congress strengthened the Fed's ability to fight economic downturns. Despite some close calls, we have not experienced a depression since then—a testament to the Fed's successful guidance these past 90 years.

Illustration by Antonia Milas.

Q&A...

with Ronel Elul, a senior economic advisor and economist here at the Philadelphia Fed.

Ronel Elul

Senior economic advisor and economist Ronel Elul joined the Philadelphia Fed in 2003 after teaching at Brown, New York University, and the University of Pennsylvania. He has also been a member of the Federal Reserve System's Model Oversight Group, which oversees the development and applications of the models used for stress tests required under the 2010 Dodd–Frank Wall Street Reform and Consumer Protection Act. As a researcher, he's long been particularly interested in household finance, especially mortgages.

When did you first become interested in mortgage markets?

Not until grad school. I was studying math in college, but I felt that economics was more practical and helpful for society, so I went to graduate school to study economics. At Yale, I took a class with John Geanakoplos on incomplete markets, which has to do with how we can't insure ourselves against all risks, like the risk that we'll lose our job. When he became head of fixed income research at a Wall Street investment bank, I went there part time for a summer. That's when I really became interested in mortgages. It was the early 1990s, and there was a boom in mortgage-backed securities.

After your stint on Wall Street, you wrote an article for the *Journal of Economic Theory* where you argued that new financial products have the potential in certain cases to make everyone worse off. Were you thinking about mortgage-backed securities when you wrote that article?

I wish I had. What I did notice while writing that paper was that these markets are volatile. That was intriguing but scary. Mortgage-backed securities, because they allow banks or the GSEs [government-sponsored enterprises] to easily sell the mortgages that they make, allow for scaling up of the mortgage market very quickly, and they make the markets less subject to the constraints that banks face. But they also make the mortgage market subject to the whims of the financial market. And that's something we saw in both the housing bubble and the subsequent financial crisis.

That 1995 paper was fairly technical. It wasn't until later that I got interested in real-life aspects like defaults. If we didn't have the protection of bankruptcy, people might be too frightened to take out a mortgage. Bankruptcy gives you an ad hoc way to tailor financial markets, to make them more complete. Then I started to wonder, what information is conveyed to markets when someone defaults? When the financial crisis hit, we were just starting to get the data to help us understand why people were defaulting on their mortgages, and what policies might help us address defaults. But that wasn't the kind of research I could have done in 1995. The data wasn't available yet.

It sounds like your experiences with Wall Street made you wary of what was going on there but also more interested in the real-world effects of financial markets.

Yes. Now I do a lot of regulatory work, helping oversee the models for the Dodd-Frank bank stress tests. Models are important, as they help us use historical experience to inform our assessment of future risk. But COVID was so different, we had to adjust how we use some of those models. To give one example, there were disparities in how various lenders reported the status of loans in forbearance for borrowers who were not making payments. And of course, we know that in times like this there are inevitably questions about how risky such borrowers really are.

Some people would say, well, given such uncertainty, why use models at all? But with a financial system as complex as the one in the U.S., the alternative would be to just make things up. We need to understand the assumptions and limitations of the models, and then think about how to deal with them. Seeing this in practice really does help inform your research.

What are some of the things you hope to learn from your research?

How to make certain that models continue to capture the risks in the financial system as it evolves. During COVID, Congress said, let's not report people in forbearance as being delinquent, because we don't want to discourage them from taking forbearance, and perhaps also because we don't want their decisions constraining the recovery. But the people who receive forbearance are probably riskier than people who continue to pay, and we don't learn that if we suppress that information. So, we're throwing away information when we do this. We've never done that, so we don't know who's going to be helped or hurt by it. And we also don't know how the market is going to react. That's something I've begun studying.

Helping Struggling Homeowners During Two Crises

What the Great Recession Can Teach Us About Mortgage Troubles in the Wake of COVID-19.

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The views expressed in this article are not necessarily those of the Federal Reserve.

Early in the COVID-19 pandemic, the share of mortgage borrowers who had not paid for two or more months rose, exceeding 6 percent in June 2020, the highest level since the aftermath of the Great Recession (Figure 1).[1] Despite the high rates of nonpayment in these two crises, the outcomes for homeowners have thus far been very different. In 2011, roughly 2 percent of all mortgages terminated through a foreclosure or other distressed property sale.[2] By contrast, virtually no foreclosures were initiated in 2020. Instead, up to 9 percent of all loans were in some sort of forbearance program in which the lender agreed to temporarily defer payments.[3] Understanding how and why these two crises—and the policy responses—differ will help us design the best policies to deal with future crises. And to understand these differences and design better policies, we must first understand why borrowers might become delinquent on their mortgage obligations.

Economists have identified two key reasons why homeowners might fail to make their monthly mortgage payments. One is negative equity—that is, the house is worth less than the mortgage. This reduces the incentive for the homeowner

to keep making their monthly payments. It also makes it harder for the homeowner to sell their house to pay off their mortgage. The other is a liquidity shock–that is, the homeowner is unable to make a payment on their mortgage because of a drop in income (say, due to unemployment) or an unexpected expense.

Which is more responsible for the rise in nonpayment during these two episodes: negative equity or liquidity shocks?

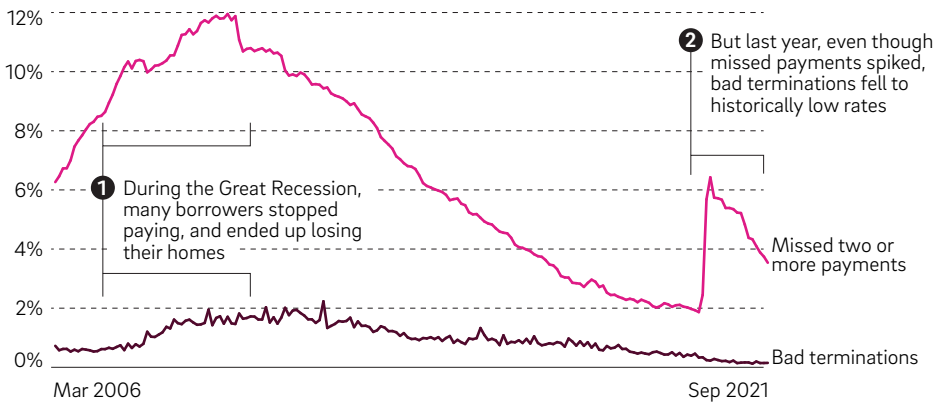
Mortgage Delinquency in the Great Recession

Given its high rates of mortgage default, the experience of the Great Recession has gone a long way in helping us understand why borrowers fail to make their mortgage

FIGURE 1

Until COVID, Missed Payments and Bad Mortgage Terminations Usually Rose and Fell Together

Share of mortgages that didn't make their last two mortgage payments; share of mortgages that terminated due to a foreclosure or distressed sale; annualized, March 2006 to September 2021



Source: Black Knight McDash data.

payments. In previous coauthored work, one of this article's coauthors showed that negative equity and liquidity shocks both matter, and that they interact—when the equity is very low (or has just turned negative), liquidity shocks become more critical in determining mortgage outcomes (Figure 2).[4] The importance of these two channels has also been confirmed by other authors.[5] Because researchers can't observe everything that affects a household, however, identifying liquidity shocks is not always easy.

Subsequent work has used different approaches and data that can better identify when homeowners have experienced liquidity shocks, and much of this work finds that liquidity shocks are the more important cause of a rise in delinquencies. For example, in their Becker Friedman Institute working paper, University of Chicago professors Peter Ganong and Pascal J. Noel argue that nearly all borrowers who defaulted experienced some sort of liquidity shock. Their evidence suggests that negative equity, on its own, does not lead many homeowners to default. Although they find that most defaults are indeed associated with both negative equity and liquidity shocks, which is consistent with the conclusions of the previous literature, they also identify some borrowers who default even in the absence of negative equity.

These insights into the determinants of default were uncovered by researchers who retrospectively examined the behavior of borrowers during the Great Recession. But how did lenders and policymakers respond at the time of the crisis, when homeowners started to show signs of distress? Do these efforts teach us anything about why homeowners defaulted, or which policies could best address borrower distress?

There were indeed efforts to try to modify mortgage terms to stave off foreclosures. However, mortgage modification programs in the Great Recession were not comprehensive and varied widely in their approach. In the initial stages of the crisis, there was a patchwork of programs by industry groups, individual lenders, and the government.

When New York Fed economists Andrew Haughwout, Ebiere Okah, and Joseph Tracy studied subprime mortgages that became delinquent early in the crisis and were subsequently modified under one of these programs, they found that lowering the monthly payment made it more likely that a modified loan would avoid falling back into default.[6] This is consistent with the idea that liquidity shocks are a more important cause of a rise in delinquencies. However, they also found that modifications that achieved this reduction by lowering the principal balance of the mortgage[7] were more effective than those that solely lowered interest rates, which also confirms the important role of negative equity.

The patchwork of programs was superseded in 2009 with the introduction of the federally sponsored Home Affordable Modification Program (HAMP). Under this program, servicers modified slightly less than 2 million mortgages, about half of which were backed by a government-sponsored enterprise (GSE) or government agency. HAMP provided financial incentives for servicers that successfully modified mortgages,[8] but it also set standards for what modifications were considered sustainable (and thus what modifications qualified for financial incentives). In particular, documentation of income was required, and unemployed homeowners were not eligible for this program.

As its name suggests, HAMP focused on making payments affordable, relative to the borrower's monthly income. In order to do so, it promoted a somewhat complicated mix of modifications: (i) a reduction in the interest rate, (ii) an extension of the mortgage term (because stretching payments over a longer period will lower the monthly payment), and, in some cases, (iii) a write-down of the mortgage principal. When Board of Governors economist Therese Scharlemann and Georgia State University economist Stephen Shore studied the effect of HAMP in 2016, they found that the impact of principal write-downs on reducing subsequent mortgage defaults was very modest. And another study looking at HAMP—the 2020 *American Economic Review* article by Ganong and Noel—found that principal reductions provided no benefit beyond the impact that they had on the size of mortgage payments.

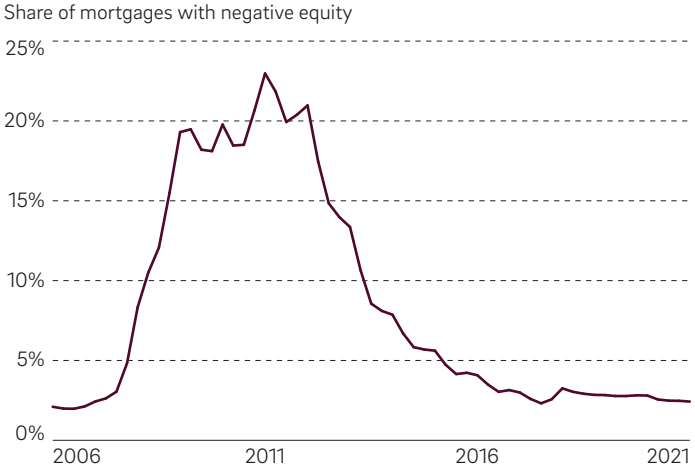
This work confirms the relative importance of liquidity shocks. Why do they arrive at a different conclusion than that of earlier work, such as by Elul and his coauthors and Haughwout and his? One reason may be the design of the HAMP program. On the one hand, HAMP was limited: It did not generally consider reductions in principal balances that would have taken borrowers out of negative equity. And these reductions are the ones that would be expected to have the greatest benefit. On the other hand, as the authors of these papers point out, the precise formulas used to determine the hierarchy of HAMP modifications allows for a more carefully crafted experiment that limits potentially confounding factors.

By studying mortgage modification plans in the Great Recession, researchers have learned which types of intervention were most successful. Their research also helps them better understand the determinants of default. However, even when taken together, the modification programs reached only a small fraction of the mortgages that became delinquent during the Great Recession. Why such a small fraction? Duke University professor Manuel Adelino and Fed economists Kristopher Gerardi and Paul Willen

FIGURE 2

Negative Equity Makes It Harder to Keep Troubled Borrowers in Their Homes

Borrowers and lenders had less incentive to modify mortgage terms in the Great Recession.



Source: Black Knight McDash data and CoreLogic Solutions Home Price Index.

attribute this small fraction to the lenders' reluctance to modify loans that they believed would either restart payment without a modification or end up in default irrespective of lender action. Other authors argue that it was financial market frictions that reduced the number of modified mortgages. For example, in their 2011 article, National University of Singapore economist Sumit Agarwal and his coauthors show that many mortgages were securitized in private mortgage-securitization pools that had unclear restrictions on modifying loans. Many borrowers also had a second mortgage, which made modifying or refinancing the first mortgage more difficult.[9] And finally, in a separate 2017 article, Agarwal and his coauthors demonstrate that a few large servicers had much lower HAMP modification rates than others. They suggest that these servicers had a preexisting organizational design that was less conducive to renegotiating loans.[10]

Mortgage Nonpayment in the COVID Crisis

The policy response to mortgage risk during the COVID-19 crisis was very different. Soon after the start of the COVID crisis, as unemployment rates rose dramatically, the Coronavirus Aid, Relief, and Economic Security (CARES) Act mandated that servicers of government-backed mortgages offer forbearance.[11] (When a mortgage is under forbearance, the borrower can delay or reduce payments for a limited period of time. If borrowers use this time to get their finances back in order, forbearance protects both borrower and lender from a default on the mortgage.)[12] No documentation of hardship was required, and, unlike HAMP in the Great Recession, eligibility did not depend on the homeowner's employment status.

Many lenders who held mortgages in their portfolios followed suit, so that even those homeowners who had not taken out government-backed mortgages benefitted from similar forbearance programs. This was encouraged by regulatory policies that gave lenders "broad discretion to implement prudent modification programs."[13] Policymakers also underscored that modified loans would not necessarily be treated as delinquent for the purposes of regulatory reporting or risk-based capital rules.

The net result of these broad and rapid policy responses was that although nonpayment rates rose, most of these borrowers were in forbearance. The delinquency rate for borrowers outside of forbearance fell dramatically, as did foreclosures.

Stanford economist Susan F. Cherry and her coauthors document several features of mortgage forbearance and its impact in the COVID-19 crisis. First, the policy response was rapid and widespread, in sharp contrast to the experience in the Great Recession. Up to 9 percent of all mortgage borrowers were in forbearance at some point from March to October 2020. About one-third of borrowers who entered into forbearance continued to make payments. They likely viewed forbearance as an option they could use if their finances worsened. However, at least 2 million borrowers chose to take advantage of the opportunity to defer their payments. And while forbearance rates were highest for government-backed mortgages, private lenders also provided substantial relief (both to mortgage borrowers whose "jumbo" loans were too large to qualify for government insurance, and to those with auto and credit-card loans). Their evidence also suggests that forbearance seems to have helped those who needed it most. For instance, counties with high rates of COVID cases and unemployment had more homeowners enter into forbearance. And although homeowners in forbearance were generally wealthier than the average consumer (since by definition they were homeowners), they were more financially constrained than homeowners not in forbearance.

Other research also supports the conclusion that although forbearance was offered broadly and with few conditions, it was primarily used by those who needed it most. Using data from JP Morgan Chase on customers with both a mortgage and a deposit account, JP Morgan's Diana Farrell, Fiona Greig, and Chen Zhao show that borrowers who used forbearance tended to have lower prepandemic income than other homeowners. They were also more likely to have lost income at the start at the pandemic and be collecting unemployment benefits. This was particularly true for borrowers who skipped payments in forbearance. Their liquid asset holdings (in particular, bank deposits) increased, suggesting that they used at least some of the savings from forbearance to build a buffer rather than spending all of it right away.

Also, the Philadelphia Fed's Lauren Lambie-Hanson, James Vickery, and Tom Akana find that three-quarters of those using forbearances reported experiencing a job disruption or income loss. In addition, the Philadelphia Fed's Xudong An, Larry Cordell, Liang Geng, and Keyoung Lee show that forbearances provided substantial relief to lower-income and minority borrowers. And finally, the Fed's You Suk Kim, Donghoon Lee, Tess Scharlemann, and James Vickery demonstrate that consumers who skipped payments in forbearance paid down high-rate credit card debt. (Borrowers with this high-rate debt tend to have fewer resources and thus need more assistance.)

Did the COVID Response Reflect Lessons Learned?

Having seen that the policy response in the COVID crisis was much more robust than during the Great Recession, can we conclude, as do Cherry and her coauthors, that the response reflected lessons learned from the Great Recession regarding the significant social costs of widespread defaults and foreclosures? They note that the response during the COVID crisis was much quicker, more coordinated, and more effective in preventing mortgage defaults. The response may also have reflected lessons learned regarding the importance of reducing mortgage payments to stave off defaults, as it focused on the deferral of payments through forbearance.

However, several key differences between the Great Recession and the COVID crisis likely made it easier to address the problems during the latter crisis. Most importantly, the Great Recession originated in the housing sector, and at its peak nearly one-quarter of all mortgages had negative equity. By contrast, a virus, not the housing sector, caused the COVID crisis. Fewer than 3 percent of mortgages at the start of 2020 had negative equity, and house prices continued to rise throughout 2020 and early 2021. The continued strength of the housing sector during the COVID crisis had four consequences. First, it increased the incentive for borrowers to remain in their homes and thus made forbearance

less risky for the lender. Second, even if the borrower did not resume making payments in the future, a foreclosure would likely lead to little or no loss for the lender. Third, robust housing values also made it feasible for borrowers to refinance at a lower interest rate (thus obviating the need for measures such as the Home Affordable Refinancing Program that were undertaken during the Great Recession). The availability of this refinancing option also likely encouraged borrowers to continue making payments even while in forbearance, so as to qualify for a new mortgage. And fourth, the fact that most borrowers had positive equity made it clearer to policymakers that their response should simply focus on mortgage payments, unlike the wide-ranging and sometimes complex approaches taken during the Great Recession.

Other differences also made the policy response easier during the COVID crisis. The fact that the disruption caused by the virus was expected to be temporary meant that the focus could be on the temporary postponement of these payments, without anyone having to worry about the sustainability of the modifications. In addition, at the start of 2020, nearly two-thirds of all mortgages were government backed (Figure 3), either by the GSEs or by the Federal Housing Administration and Veterans Administration.[14] This made a coordinated policy response much easier, as it meant that, from the start of the crisis, uniform policies applied to the preponderance of outstanding mortgages. Furthermore, since the government, as the insurer of these mortgages, bore the credit risk, servicers did not have much to lose by going along with the government guidance.[15] (By contrast, at the end of 2006, just before the start of the Great Recession, only about 40 percent of mortgages were government backed.) A final reason is that lenders tightened underwriting standards after 2009, so most mortgages were more sustainable during the COVID crisis than in the Great Recession.

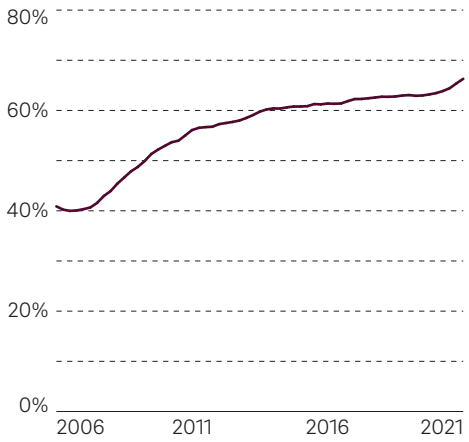
See ***The Role of Credit History.***

FIGURE 3

Large Share of Government-Backed Mortgages Eased Policymaking

It was easier to coordinate a policy response in 2020 than during the housing bust.

Percent of all mortgages insured by the Federal Housing Administration, Veterans Administration, Fannie Mae, or Freddie Mac, 2006–2021



Source: Financial Accounts of the United States.

Conclusion

The policy efforts devoted to stabilizing the mortgage market in the COVID crisis were much more robust and effective than those undertaken in the Great Recession. This improved response reflects important lessons learned from the previous episode, but the unique features of the COVID crisis may have also played a role. Given that any future crisis will almost certainly be unique, what broader lessons can we apply going forward? And while the robust policy responses were effective in staving off foreclosures, are there any hidden costs? Will borrowers be less prudent in their borrowing or less diligent in repaying, anticipating that they will receive assistance? And will suppressing from their credit records the payment record of those in forbearance allow well-meaning borrowers to get back on their feet, or will it make lenders more cautious about lending in the face of this murkier information? These questions are important topics for future research.

The Role of Credit History

Another important difference between the Great Recession and the COVID crisis is the way in which borrowers who missed payments were reported to credit bureaus. The CARES Act prohibits servicers from reporting to credit bureaus those payments skipped through a forbearance plan. This prohibition likely encourages borrowers to take up forbearance. Almost no borrowers reported that concern over damaging their credit history influenced their decision to seek a forbearance.[16] One result was that credit bureau scores rose during this period, even for those in forbearance.[17] This stands in sharp contrast to the Great Recession, when borrowers who defaulted on their mortgage saw their scores drop and also experienced difficulty in using credit to finance consumption.[18] The longer-term impact of this policy is uncertain, however, as lenders may respond to the COVID crisis by tightening lending standards or by using other information (such as employment records and information on bank deposits) to identify risky borrowers.[19] This may have unexpected effects on future access to credit, and economist Allen N. Berger and his coauthors show that this may have already begun: Safer borrowers received relatively less-favorable terms on credit cards during the COVID crisis.

Notes

1 A borrower who misses a mortgage payment may do so in violation of their mortgage contract, in which case the borrower is delinquent. A borrower who misses a set number of payments is in default. Usually, when a borrower misses four or more payments, the servicer may initiate a legal proceeding known as foreclosure to take possession of the property. (A servicer collects payments and communicates with the borrower on behalf of the lender. In some cases, the lender is also the servicer of the loan.) By contrast, if the borrower is in forbearance, these missed payments are contractually permitted and do not result in a delinquency per se.

2 Typically, a "distressed sale" means foreclosure, although it can also manifest as a short sale, in which the borrower sold the property and the lender agreed to take the proceeds and forego any outstanding additional liability. Short sales were also common in this period.

3 Calculations by the Risk Assessment, Data Analysis, and Research (RADAR) group at the Federal Reserve Bank of Philadelphia, using data from Black Knight Data & Analytics LLC.

4 See Elul et al. (2010).

5 See, for example, Gerardi et al. (2018).

6 A loan is subprime when it is made to a less creditworthy borrower.

7 Writing down the principal balance of a mortgage can reduce the monthly payments by lowering the amount to which interest payments are applied.

8 Borrowers received additional financial incentives (on top of their loan modification) for consistently making the required payments under their modification plan.

9 See, for example, Bond et al. (2017).

10 Mortgage modifications were not the only policy effort undertaken to reduce defaults by homeowners and support their consumption during the Great Recession. The federal government also devoted considerable effort to facilitating the refinancing of underwater mortgages through the Home Affordable Refinance Program (HARP). As we discuss below, the government did not make similar efforts during the COVID crisis.

11 We use "government-backed mortgages" to refer to loans that are guaranteed directly by the U.S. government (most notably those insured by the Federal Housing Administration and Veterans Administration) as well as those backed by the GSEs (Fannie Mae and Freddie Mac), which are currently under government administration.

12 Forbearance was also used for other types of consumer debt. Government-backed student loans were automatically placed into forbearance. Forbearance for other types of consumer debt varied. A large fraction of auto loans was also placed in forbearance, albeit for much shorter periods (typically just three months), whereas the forbearance rate for credit cards was very low, perhaps because borrowers already had the option to make only the minimum payment.

13 See Board of Governors (2020).

14 These figures are from the Financial Accounts of the United States and include single-family mortgages guaranteed by these agencies and enterprises, either in mortgage-backed securities or held directly in their portfolios.

15 Although in some cases the servicers were required to temporarily advance payments for securitized mortgages. See Kim et al. (2021).

16 See Lambie-Hanson et al. (2021).

17 See, for example, Cherry et al. (2021).

18 See Aruoba et al. (2019).

19 See Andriotis (2020).

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Make-up Strategies for Monetary Policy

How the Federal Reserve is addressing the challenge of the long-term decline in interest rates.

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The views expressed in this article are not necessarily those of the Federal Reserve.

The Federal Reserve has long fought recessions by wielding one of the most powerful tools in monetary policy: cuts to short-term interest rates. These aggressive interest rate cuts have stabilized output during recessions and inflation after recessions, so that inflation has averaged around 2 percent. This is why Board of Governors Vice Chair Richard Clarida argued earlier this year that the Federal Reserve has successfully pursued its dual mandate of price stability and maximum employment.[1]

But because interest rates have trended down over the past few recessions, policy has less scope to fight future recessions by cutting interest rates.

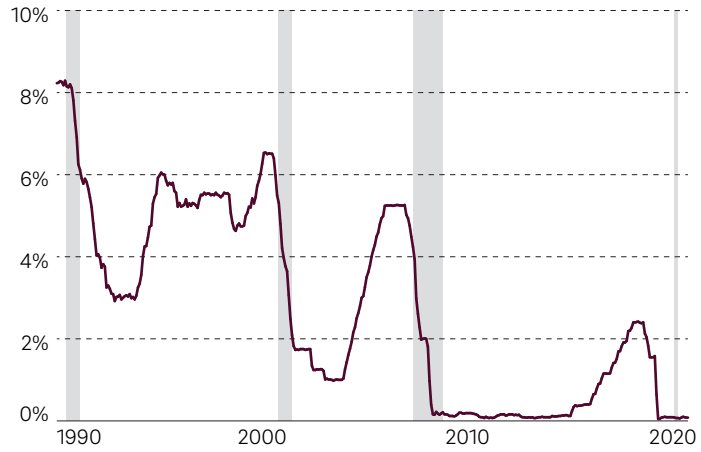
Within three years of the onset of the 1990 recession, the Federal Reserve cut the short-term interest rate (what it calls the federal funds rate target) from 8.25 to 3.0 percent. Within three years of the onset of the 2001 recession, it cut its target rate from 5.5 to 1.0 percent. And within three years of the onset of the 2007 recession, it cut it again from 4.25 to 0.25

FIGURE 1

The Federal Funds Effective Rate Has Trended Lower

When the rate is low, the Fed finds it harder to fight recessions.

Federal Funds Effective Rate, percent, not seasonally adjusted, 1990–2020



Source: Board of Governors of the Federal Reserve System (U.S.), Federal Funds Effective Rate [FEDFUNDS], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/FEDFUNDS.

Note: Shaded bands represent recessions as defined by National Bureau of Economic Research.

percent—hitting the effective lower bound (ELB) on interest rates, or the point at which legal and practical considerations rule out further interest rate cuts (Figure 1).

Since the last crisis, the long-term decline in interest rates has continued, posing a challenge for policymakers: Among members of the Federal Reserve's Federal Open Market Committee (FOMC), which sets these rates, the median expectation is that the Federal Funds Rate will average 2.5 percent over the long term, compared with 4.2 percent in early 2012, leaving the FOMC even less room to cut interest rates when the next recession hits.[2] Indeed, at the onset of the COVID-19 pandemic, the target rate was a mere 1.75 percent, allowing for only a small cut in short-term rates before hitting the ELB. Because the ELB and the long-run decline in interest rates have left little room to cut short-term interest rates, the FOMC might no longer be able to effectively cushion drops in inflation and output during downturns.[3]

The problem of the inability to lower interest rates is compounded by what Federal Reserve economists Thomas M. Mertens and John C. Williams have dubbed the deflationary bias: When average interest rates were high enough, policymakers could raise inflation toward its 2 percent target through rate cuts in downturns and dampen inflation through rate hikes in expansions. Because of the ELB and the long-run decline in interest rates, the FOMC cannot stimulate inflation in downturns as much as before. If policymakers do not change how they set interest rates during expansions, inflation should thus decline in the long run because inflation would hold steady during upswings but decline during downturns, pulling down the overall average. This deflationary bias would go against the stated 2 percent inflation target. What's more, the deflationary bias would also exacerbate the challenges posed by the ELB. Rather than let that happen, the FOMC has decided to adopt policies that make up for past inflation shortfalls during expansions.[4]

In this article, I discuss how these make-up strategies differ from the Fed's previous monetary strategy, I describe different possible make-up strategies, I use a simple New Keynesian model to identify the advantages of make-up strategies, and I discuss possible disadvantages of these strategies. I conclude by discussing how the make-up strategies may guide the FOMC's decisions.[5]

What's New About Make-up Strategies

Congress has assigned three specific goals to the Federal Reserve: maximum employment, price stability, and moderate long-term interest rates. But Congress left open which strategy the Federal Reserve should use to accomplish these goals.

Until recently, outside observers have characterized U.S. monetary policy as reacting to two current economic conditions:[6] economic activity's deviations from its potential, and year-over-year inflation's deviations from its 2 percent target.[7]

But the FOMC now also monitors a third economic condition: deviations of past inflation from 2 percent. As the FOMC wrote in its August 2020 statement on long-run goals: "... following periods when inflation has been running persistently below 2 percent, appropriate monetary policy will likely aim to achieve inflation moderately above 2 percent for some time." In other words, if inflation has been too low, the FOMC will now aim to make up for this shortfall.

Types of Make-up Strategies

Different make-up strategies are distinguished by what they're making up for. Since the Federal Reserve has the target of price stability and maximum employment, making up for misses of one or both objectives is a natural approach. Indeed, Federal Reserve economists David Reifschneider and John C. Williams proposed a make-up strategy that would, indirectly, respond to a summary measure of misses on both targets.[8] But because the FOMC decided to make up for past inflation only, I focus on inflation-based make-up strategies.

Make-up strategies differ not only in their target measure, but also along two other dimensions.

First, is the strategy symmetric or asymmetric? Under a symmetric strategy, monetary policy responds equally to past excesses and past shortfalls of inflation. However, downturns tend to be abrupt whereas upswings tend to be gradual, so policymakers usually face asymmetric challenges that require an asymmetric strategy. This is especially true when interest rates are low (as they are now) because interest rates have a lower bound but no upper bound. Consequently, it is more important for the FOMC to respond to inflation shortfalls rather than misses of inflation in both directions.[9]

*See **Missing the Goal of Stable Prices**.* →

Second, is the strategy permanent or temporary? Under a permanent make-up strategy, policymakers always correct for past misses (regardless of whether the strategy is symmetric or asymmetric). Make-up strategies are only successful if firms and households adjust their decisions in accordance with them. Because they would be observing a permanent policy regime

at all times, households and firms would likely understand the consequences of inflation misses for monetary policy and act accordingly.

Under a temporary make-up strategy, in contrast, policymakers only correct for past misses in special circumstances—for example, when the ELB constrains monetary policy. It may take households and firms some time to understand this policy and behave accordingly. But a temporary make-up strategy gives policymakers flexibility when the ELB does not constrain policy. And such a strategy may be easier to communicate to the public because it allows policymakers to focus only on current conditions in normal times.

Advantages of Make-up Strategies

According to standard analyses, monetary policy reacts only to current economic conditions.[10] But policy can actually improve current outcomes by looking backward—as long as households or firms understand how policy works. Consequently, by promising to make up for past misses, policymakers can improve current outcomes and limit the size of these misses.[11] A standard model of business cycle fluctuations explains why.

The simplest (yet widely used) model for understanding monetary policy is the workhorse New Keynesian model.[12] The model describes the interaction of households, firms, and the policymakers setting interest rates. Household and firm behavior gives rise to the model's two key relationships. Both relationships describe the interplay between current and future economic activity and inflation in the model.

The so-called Phillips curve relates current inflation to current economic activity and expected future inflation. It summarizes firm behavior and household labor supply. Firms in the model hire workers from households to produce consumption goods and have market power to set prices for these goods. Since large price changes are costly for these firms, they prefer to adjust prices gradually in every period, partly in anticipation of future inflation. And because firms require more workers when they expand production, they need to bid up wages when economic activity rises relative to its potential level.[13] Consequently, current inflation rises with current economic activity and expected inflation.[14]

The second relationship between economic activity and inflation reflects households' consumption-savings decisions. Households demand more consumption goods today when the return on savings is lower—that is, when the real interest rate is lower. The real interest rate is the difference between the nominal interest rate set by policymakers and expected inflation—because future inflation erodes the value of nominal (current dollar denominated) savings. Households also demand more consumption today if they feel wealthier, that is, when they expect to consume more in the future.

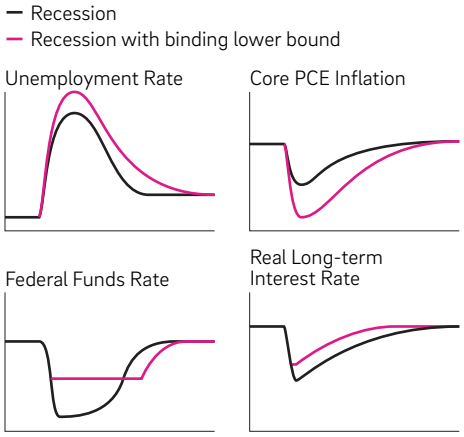
To see the advantages of make-up strategies in this model, it is useful to first analyze the challenges that the lower bound on nominal interest rates poses for monetary policy. In this model, the ELB clearly worsens severe downturns. Interest rates may hit the ELB, for example, if a persistent downward shock to demand causes a severe downturn. The drop in demand persistently lowers employment. Via the Phillips curve, this persistently pulls inflation down as wages drop and firms lower prices. The persistent drop in inflation in turn lowers demand even further by raising real interest rates[15]—unless the central bank offsets the drop in inflation by reducing nominal interest rates even more to stimulate households' demand. But the central bank's ability to do so is limited by the ELB. The ELB may thus prevent the central bank from

FIGURE 2

A Recession's Vicious Cycle

The Effective Lower Bound Can Amplify a Recession
Because the ELB may limit the size of interest rate cuts, households and firms face higher real interest rates, both because nominal rates are higher and future inflation is lower. This lowers demand and employment, reinforcing the initial recession.

Because the fall in inflation and the rise in the unemployment rate are bigger, the federal funds rate remains low longer than it does in the absence of the lower bound.



Missing the Goal of Stable Prices

There is an additional, technical question: How do we measure misses on the goal of stable prices? Should we measure past misses as the difference between the change in the price level relative to some benchmark, also known as price-level targeting (PLT)? Or as the average inflation rate over a number of years? And if it's the latter, how many years? Mechanically, the change in the price level over several years is just the sum of the annual inflation rates. It thus makes intuitive sense that, as Sveriges Riksbank economists Marianne Nessén and David Vestin showed in a 2005 article, the economic effect of PLT is very similar to the effect of average inflation targeting over a sufficiently long horizon. There may thus be little difference between the two strategies over the long term. Regardless, both are temporary, asymmetric make-up strategies when applied after recessions with a binding ELB on interest rates.[23]

In measuring average inflation, policymakers may also want to look ahead. One example of such a forward-looking measure of inflation was given by Vice Chair Clarida last year. Clarida said that he, personally, would opt for lower interest rates not only if past inflation averaged less than the 2 percent target, but also if expectations of future inflation were below the target.

effectively fighting a recession with its tool of short-term interest rate cuts. The result is a vicious cycle of low demand pulling inflation down, which further lowers demand (Figure 2).[16]

In this vicious cycle, the negative demand shock, made worse by the ELB, keeps inflation and employment below policymakers' targets. What's more, if policymakers do not offset during expansions the extra drop in inflation caused by the ELB, the deflationary bias described by Mertens and Williams arises. Once firms and households update their inflation expectations in light of this bias, their changed behavior will keep the economy closer to the ELB as the lower inflation expectations force policymakers to raise interest rates by less during expansions or to accept demand shortfalls.

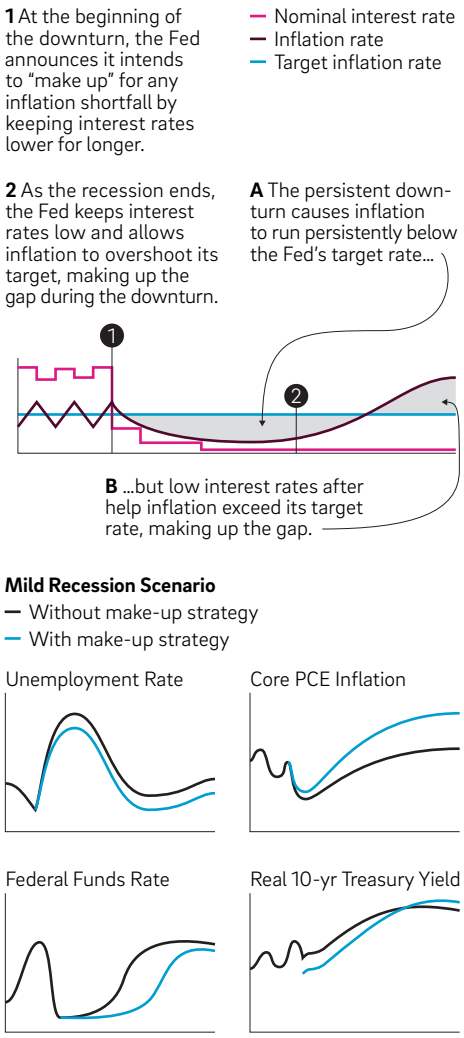
In contrast, make-up strategies induce a virtuous cycle. When policymakers say that, once a recession ends, they will make up for misses by keeping interest rates lower than they otherwise would, thus letting inflation rise above their target, they can reduce the size of those misses in the first place. Here's why: If households expect lower interest rates in the future, they will expect to consume more in the future, too. And because households prefer to smooth their consumption over time, that leads them to consume more today. What's more, the promise of higher future inflation leads firms to limit their price cuts today, since they want to reduce the need for future price changes. Thus, households and firms act to reduce the initial shock to the economy during a recession, and the drop in demand and the resulting drop in inflation are both mitigated. The smaller inflation shortfall in turn boosts demand even further. It's a virtuous cycle, triggered by the central bank's promise to let future inflation overshoot its target so it can make up for current shortfalls (Figure 3).

This is admittedly a simple model of how households act. Perhaps households aren't so sophisticated in the complex real world. But even in a more detailed and realistic model of the U.S. economy, Federal Reserve economists James Hebden and his colleagues found that households acted in much the same way. They analyzed make-up strategies in the FRB-US model, a large-scale model employed by the Federal Reserve Board of Governors. When they ran the model, they made a more realistic assumption: that only financial markets trust policymakers to make up for inflation shortfalls. They found that financial markets passed on those expected lower short-term interest rates by cutting long-term interest rates, such as mortgage rates and rates on car loans, right away. This fall in long-term interest rates again stimulates demand, just like in the simpler model discussed above.

So even when policymakers are only making up for inflation shortfalls, their credible and well-understood promise to make up for current inflation shortfalls can lead to a virtuous cycle that reduces current shortfalls in other economic activity, such as employment.

FIGURE 3

A Make-up Strategy's Virtuous Cycle



Source: Figure 1 in Arias et al. (2020).

Disadvantages of Make-up Strategies

However, economic models suggest that there are challenges for policymakers who wish to pursue makeup strategies.

Within the simple New Keynesian model we've been discussing, a rapid drop in demand after a prolonged boom with above-average inflation can pose a problem. If the make-up strategy is symmetric, the promise to make up for past excess inflation would constrain monetary policy when policymakers need to act quickly. To make up for excessively high past inflation, policymakers would have implicitly promised higher interest rates than warranted by current conditions. Policymakers would then have to either break their promise to make up for past excesses or delay their response to the unfolding downturn. However, an asymmetric make-up strategy that only makes up for inflation shortfalls would prevent this problem.

But even an asymmetric make-up strategy can cause problems. Sometimes, the economy faces a cost-pull shock, which may lower inflation while raising demand above potential output, yielding a positive output gap. During a cost-pull shock, blindly following an inflation-based make-up strategy would lead the central bank to commit to making up for

the inflation shortfall, stimulating demand further and possibly overheating the economy.[17] In this example, the makeup strategy still prompts mistakes by policymakers—even though the asymmetry of the strategy would still allow it to effectively address the opposite problem of a cost-push shock that raises inflation and lowers demand.[18]

What's more, the virtuous cycle induced by make-up strategies may not be very strong in reality. Federal Reserve economists Marco Del Negro, Marc Giannoni, and Christina Patterson show that when some consumers are able to trade in financial markets only with a delay, it diminishes the effect of news about future inflation. This weakens the virtuous cycle induced by adopting make-up strategies.[19]

The same problem may arise from realistic models of how households form expectations. For example, it has been argued by Columbia University economist Michael Woodford that agents have limited planning horizons. Even sophisticated computer programs designed to play games such as chess only plan a certain number of steps ahead, and individuals and firms may be expected to suffer from a similar limitation. This limits the current economic effects of expectations about the distant future. Similarly, Harvard University economist Xavier Gabaix has argued that households' rationality is bounded (that is, they choose adequate rather than optimal solutions to their problems), so they discount—that is, downplay—news about future inflation.

Even within the model we've been discussing, the virtuous cycle is weakened when inflation is unresponsive to current output or employment—what economists call a flat Phillips curve. When inflation barely responds to economic activity, policy is less potent. Policymakers can do little to stimulate inflation by stimulating current demand, but must instead patiently wait for policy changes to work their way through inflation expectations.[20]

Make-up strategies may pose additional challenges. Policymakers may find it difficult to explain to the public why they are tolerating inflation in excess of their stated target.[21] Also, persistently low interest rates may cause financial instability by encouraging excessive risk taking and debt accumulation in the economy.[22]

Practical Implications

The FOMC has not adopted make-up strategies unconditionally. Rather, as its statement on longer-run objectives implies, it has adopted an asymmetric make-up strategy only for inflation shortfalls.

In November 2020, Vice Chair Clarida summarized the new strategy as "temporary price-level targeting (TPLT, at the ELB) that reverts to flexible inflation targeting." Since the strategy is triggered only by a severe downturn, the asymmetry avoids the disadvantages of a symmetric rule. And triggering the make-up strategy only at the ELB safeguards against the challenges of the cost-pull scenario discussed above: Interest rates are unlikely to be constrained by the ELB when cost-pull shocks cause employment to overshoot and inflation to undershoot the Fed's targets.

Although policymakers can avoid some of these disadvantages, the fact that a make-up strategy is temporary might make it less effective. Households, firms, and financial markets may not have enough time to understand the implication of this new strategy. This drawback may, however, appear less of a concern now that the FOMC has been forced to use the make-up strategy right away. But in the (fortunate) case that the economy could escape the ELB soon and stay away from it for some time, it may diminish the make-up strategy's effectiveness during the next crisis.

What does this strategy mean for the practice of monetary policy? Although policymakers do not strictly follow any one monetary policy rule—allowing them to use their judgment when addressing specific economic challenges—rules can provide useful benchmarks. As Vice Chair Clarida explained in his speeches, he personally feels that a rule that characterizes monetary policy as a function of only current economic conditions, and that allows for gradual adjustment in interest rates, is a useful benchmark, even when the Federal Reserve is pursuing a make-up strategy. The make-up strategy injects more inertia, or persistence, into the currently low interest rates, with rates rising more slowly than otherwise, and this allows inflation to average 2 percent during a certain window of time. Vice Chair Clarida's interpretation thus suggests that the adoption of this temporary and asymmetric make-up strategy represents an evolution of policymaking, not a revolution overturning past practices. EI

Notes

1 See Clarida (2021).

2 See https://www.federalreserve.gov/monetarypolicy/fomc_historical_year.htm for links to historical FOMC materials, including the December 2020 and January 2021 Summaries of Economic Projections (SEPs). In addition to the decline in the SEP interest rate forecast, Del Negro et al. (2017) provide detailed evidence of the decline in interest rates. They attribute the decline to lower risk and liquidity premiums and slower economic growth.

3 This is overly simplistic in that it focuses only on so-called "conventional" monetary policy. See Caldara et al. (2020) for a discussion of "unconventional" monetary policy, such as asset purchases and guidance about future interest rates ("forward guidance"). Although unconventional policies mitigate the challenge posed by the secular (that is, long term and persistent) decline in interest rates, they are unlikely to fully offset them.

4 Although several measures of inflation have risen to around 4 percent in 2021, as Governor Randall Quarles summarized in his 2021 speech, forecasts see inflation falling back near 2 percent within a year.

5 This article builds on my work with Jonas Arias and three economists at the Board of Governors (Arias et al., 2020), which in turn summarizes a large academic literature.

6 See Taylor (1993) and Clarida et al. (2000) for studies that characterize monetary policy as reacting to current inflation and output gaps. These characterizations of policy sometimes include past interest rates but not past shortfalls. Past interest rates reflect the desire of policymakers to avoid wild swings in inflation. Besides reacting to these gaps, interest rates are typically also thought of as centered around the so-called natural rate of interest that ensures that actual economic activity equals, on average, its potential, which is defined by technology and labor supply. See Williams (2003).

7 There are multiple inflation rates and measures of economic activity. In its "Statement on Longer Run Goals and Monetary Policy Strategy," the FOMC stated that its measure of inflation is the annual change in the price index for personal consumption expenditures. Although there is no single measure for maximum employment, observers often use gross domestic product (GDP). This is because GDP growth is closely associated with falling unemployment, a statistical relationship known as Okun's Law.

8 See Reifschneider and Williams (2000).

9 A study I co-wrote described a concrete example of the benefits of an asymmetric make-up strategy. We considered what might happen following a period of above-average inflation. A rule based on symmetric average inflation targeting would call for inertia in short-term interest rates. This inertia would delay interest rate cuts that would combat a recession. See Arias et al. (2020).

10 See Taylor (1993) and Clarida et al. (2000) for early references and Galí, chapter 3 (2015) for a textbook treatment.

11 More radically, policymakers could commit to history-dependent policy paths. In models of the economy, this commitment can be very powerful—see Galí, chapter 5 (2015). Although useful, it may be impractical because it requires current policymakers to commit not just themselves but also future policymakers to future actions.

12 The workhorse New Keynesian model can be summarized by two equations describing the behavior of firms and households, and one equation describing monetary policy. See Galí, chapter 3 (2015).

13 That is, when the so-called output gap rises. The output gap is the difference between the actual and the potential levels of economic activity. The potential level of economic activity reflects production technology and how readily households supply labor.

14 Cost-push shocks are the exception to this rule. A negative cost-push shock, perhaps better called a cost-pull shock, pulls costs down, lowering inflation even as output rises.

15 Saving in dollar-denominated bonds is less worthwhile when inflation is expected to erode the value of these dollar savings.

16 The vicious cycle has an extra feedback loop: If firms expect low inflation to persist, they are motivated to lower prices today so as to avoid needing to lower prices in the near future.

17 In the simple New Keynesian model, overheating the economy means that the economy is producing more than it can produce efficiently, and employment thus becomes too high. In reality, an overly high level of employment may not be a direct source of concern to policymakers, but it can be seen as a stand-in for concerns about financial stability stemming from keeping interest rates too low.

18 The global supply chain problems encountered in the economic recovery from COVID-19 are an example of such a cost-push shock.

19 In standard macroeconomic models, households are modeled as family dynasties that live forever. These family dynasties then react immediately even to future real interest rates by adjusting their consumption and savings decisions. In such a model economy, a rise in expected inflation pushes all households toward more present-day consumption in anticipation of the diminished compound real return on their savings. In the model that Del Negro et al. (2012) use, however, households are expected to live finite lives—and households do not take the decisions of the cohorts that come after them into account. The inability of these still unborn cohorts to adjust their decisions weakens the effect of expectations—and more so the further in the future, because yet-to-be-born cohorts become more important farther in the future.

20 Hebden and his coauthors review these challenges and conclude that, in practice, they are likely to weaken but not overturn the argument in favor of make-up strategies.

21 In fall of 2021, policymakers faced this situation. Governor Randal Quarles's 2021 speech addressed the fact that the observed inflation of more than 4 percent could not be considered a moderate overshoot of the target, but it could be tolerated because it was not expected to last and employment was still lagging.

22 See, for example, Becker and Ivashina (2013) and Haltom (2013) and the references therein.

23 PLT is temporary because it is triggered only while interest rates are at the ELB. It is asymmetric because it only makes up for the price-level shortfall. Bernanke et al. (2019) refer to this as temporary price-level targeting (TPLT).

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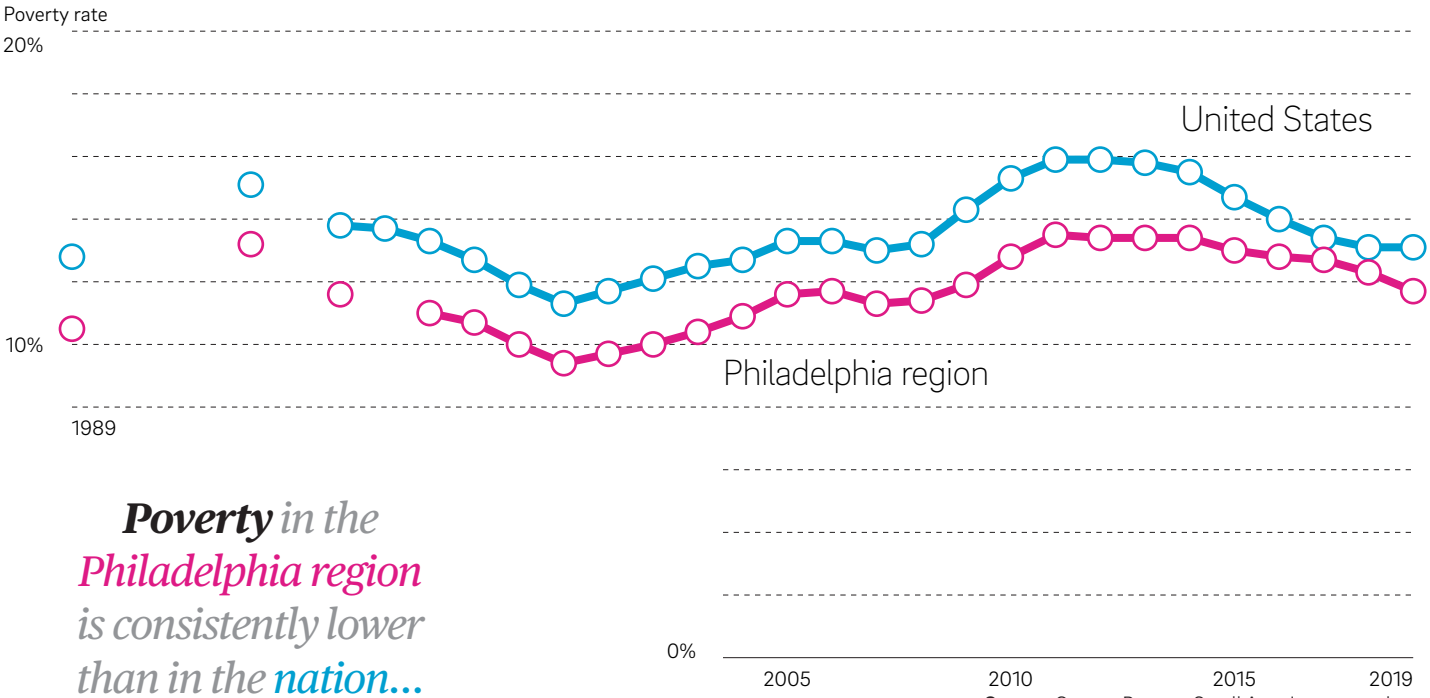

***Poverty** in the Philadelphia region is consistently lower than in the nation…*

Source: Census Bureau, Small Area Income and Poverty Estimates (SAIPE) program, 1989–2019.

Regional Spotlight

Poverty in Philadelphia, and Beyond

The focus on poverty within the city of Philadelphia misses the bigger picture—and the state's role.

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The author thanks Annette Gailliot and Peter Psathas, who computed the city/suburb poverty ratios for all 384 MSAs.

The views expressed in this article are not necessarily those of the Federal Reserve.

Most stories on Philadelphia's poverty rate bury the lede, if they report it at all: Poverty in the Philadelphia region is consistently lower than in the nation and lower than in most other metropolitan areas.[1] Moreover, the state shares responsibility for the city's poverty problem.

It is true that the city of Philadelphia has a greater concentration of the region's poor than other comparable cities. However, this is true for all Pennsylvania cities. An analysis of the relative poverty rates for city-suburb pairs across all metro areas in the U.S. shows that Pennsylvania cities are disadvantaged relative to cities in nearly all other states even though regional poverty rates in Pennsylvania are lower.

The oft-repeated factoid that Philadelphia is the nation's poorest large city is also true (as narrowly defined).[2] This is important, as poverty creates fiscal stress for the city, negative neighborhood effects for its residents, and upward tax pressure on residents and local businesses.

However, this factoid unnecessarily draws attention away from the important relationship between the region's economy and its poverty rate and from the crucial role that state government plays in local governance and intermunicipal relations.[3]

Most people likely support a more inclusive economy that will lower unemployment, raise income, and thereby reduce poverty. However, to reduce and alleviate poverty in the city of Philadelphia, we need to reframe our understanding of poverty by taking a regional perspective. At a minimum, Pennsylvania could incentivize regional cooperation so that local governments would work together more effectively to improve a region's economy.

Philadelphia's Regional Poverty Rate

Over the past 30 years, the poverty rate in the Philadelphia region has fluctuated between 9.4 percent and 13.5 percent, in rhythm with the business cycle (Figure 1). This is about 2 percentage points lower than the national poverty rate, which has swung between 11.3 percent and 15.9 percent.[4]

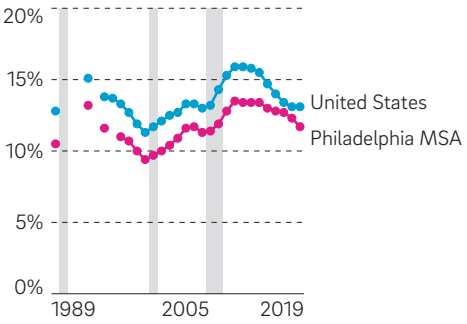
In 2019, the Philadelphia region had more than 730,000 people in poverty—12.4 percent of the region's nearly 6 million residents.[5] Still, Philadelphia's regional poverty rate was lower than the nation's rate of 13.4 percent and lower than the median rate among other regions.[6] In fact, the Philadelphia region's 2019 poverty rate was lower than in two-thirds of all metro areas (Figure 2). The McAllen, TX, region (2019 population: 844,950) had the highest rate, at 29.7 percent.[7]

FIGURE 1

Philly Region Outperforms the U.S.

Local and national poverty rates both respond to the business cycle, but national poverty is consistently higher.

Poverty rates, 1989–2019, U.S. and Philadelphia MSA



Source: Census Bureau, Small Area Income and Poverty Estimates (SAIPE) program,1989–2019.

Note: Data for Philadelphia MSA missing for years 1990–1992, 1994, and 1996.

However, several peer regions had much lower poverty rates. How many people would be lifted from poverty if regional policymakers could strengthen the region's economy and attain the lowest poverty rate evident among other major metro areas?

To answer this question, I analyzed poverty in the 15 most populous U.S. metro areas. Seven of these metro areas had larger populations than Philadelphia's; seven were smaller. Similarly, seven had higher poverty rates and seven had lower rates. Riverside, CA (14.8 percent), and Miami (14.6 percent) had substantially higher regional poverty rates. If the Philadelphia region's economy generated poverty rates as high as Miami's or Riverside's, then our region would be home to an additional 120,000 to 140,000 people living in poverty.

Conversely, four of the 15 largest metro areas—Washington, D.C., San Francisco, Seattle, and Boston (which I call the Fab Four)—had substantially lower poverty rates.[8] With a 7.8 percent regional poverty rate, Washington, D.C., represents a potential lower bound (as of 2019) for large metro areas. If the Philadelphia region's economy improved enough to reduce poverty to 8.0 percent, we would reduce the number of poor people by over a quarter million, to near 450,000.

Concentration of Poverty by Neighborhood

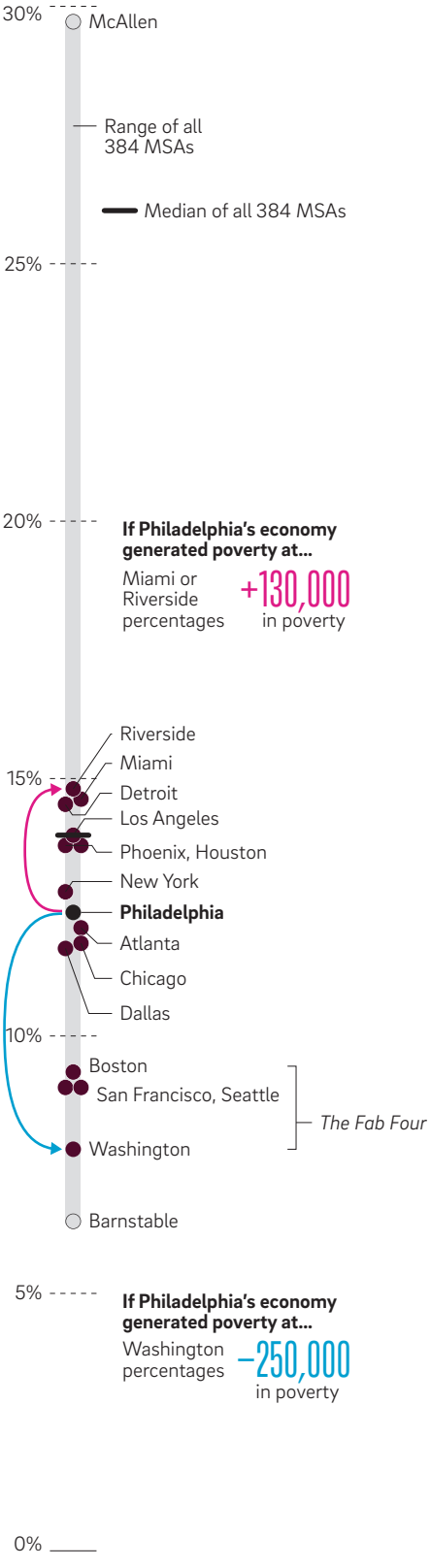
Economic and sociologic research on the plight of poor populations shows that poverty's problems are exacerbated when concentrated. In their recent synthesis of this research, Wayne State University economist George Galster and Princeton sociologist Patrick Sharkey note that economic segregation has joined racial and ethnic segregation as a critical dimension of one's neighborhood environment (home and school) and is associated with negative economic outcomes because of increased exposure to crime, violence, and environmental hazards.

Reviewing work by Galster and other researchers, Elizabeth Kneebone and Natalie Holmes of the Brookings Institution assert that "residents of poor neighborhoods face higher crime rates, and exhibit poorer physical and mental health

FIGURE 2

Among U.S. Metro Areas, Philly's Poverty Rate Is Below the Median

Poverty rate, 384 MSAs, 2019



Source: Census Bureau, American Community Survey (ACS) 5-year estimates, 2019.

outcomes. They tend to go to poor-performing neighborhood schools with higher dropout rates. Their job-seeking networks tend to be weaker and they face higher levels of financial insecurity."

To assess the extent of concentrated poverty among the 100 most populous U.S. metro areas, Kneebone and Holmes computed the share of the poor population in census tracts with a poverty rate of 40 percent or higher using five-year estimates for 2010-2014. This provides a comprehensive and comparable measure of the degree to which concentrated poverty is a problem for an entire region, thereby avoiding the problem of comparing poverty rates and concentration of poverty based solely on jurisdictional boundaries, which can obscure substantial pockets of poverty in suburban areas beyond the city limits.

In the Philadelphia region, Kneebone and Holmes found, 21 percent of the poor population lived in tracts with a poverty rate of at least 40 percent—above the mean (15 percent) and median (13 percent) of all 100 metros. Among those 100 metros, the concentration of poverty ranged from 52 percent in the McAllen region to zero percent in the California regions of Oxnard and San Jose.

Of the 15 largest metros, only the Phoenix region (26 percent) and the Detroit region (32 percent) had higher concentrations than the Philadelphia region, while the Fab Four ranged from 3 percent to 6 percent.

In 2016, Harvard economist Raj Chetty and his coauthors demonstrated that upward mobility is significantly enhanced for individuals when they spend more time in a low-poverty community. The younger they are when they spend time in that community, and the longer they spend there, the better. However, these gains take a generation or more to be fully realized. Moreover, their analysis focuses on the individual, not the region. It is unclear whether the region also makes long-term progress toward a lower poverty rate when individuals spend more time in a low-poverty community.

Concentration of Poverty in Core Cities

Whether these tracts with concentrated poverty are themselves concentrated in a region's core cities or are spread about the region affects the fiscal stability of municipalities. Kneebone and Holmes' analysis also examined concentrations of poverty for the principal central (core) city and the remaining area of each region (including other central cities). They found that regions with a low overall poverty rate tend to exhibit a lower concentration of poverty, and the poverty rate is lower in all parts of the region. Among the 15 most populous metro areas, the Fab Four had the lowest percentages of concentrated poverty at the regional level, within their core cities, and in their respective outlying areas.

In contrast, Philadelphia is grouped tightly with Atlanta, Dallas, Houston, Miami, and Riverside, with poverty concentrations that ranged from 78 percent to 82 percent in their core cities. But beyond their core cities, only the Fab Four have lower concentrations of poverty than in Philadelphia's outlying areas, at 30 percent. Poverty is more concentrated in the outlying areas of the other 10 regions.

Thus, a relatively high concentration of poverty emerges in the city of Philadelphia and a low concentration in its suburbs, despite a better-than-average regional poverty rate. What prevents the city of Philadelphia from sharing its region's lower poverty rate?

*See **Impact of the Pandemic.***

A Pennsylvania Problem

Although the poverty rate in the Philadelphia region is lower than in other regions, Philadelphia is frequently described as "America's poorest big city."[9] However, all Pennsylvania cities are disadvantaged compared to cities in other states, even though their respective metro area poverty rates are lower.

At 11.9 percent, Pennsylvania's poverty rate across all of its metro areas is lower than the mean of 12.5 percent (across all 50 states plus Washington, D.C.). It is considerably lower than in New Mexico, which had an average poverty rate of 17.9 percent. New Mexico is the only state whose MSAs exhibited higher poverty rates in its suburbs than in its cities.

It is true that the city of Philadelphia's poverty rate was 24.3 percent in 2019, higher than in the other nine largest U.S. cities. Rarely noted is that the poverty rates were higher still in the region's other two principal cities: Wilmington (26.0 percent) and Camden (36.4 percent).[10]

With less than 30 percent of the region's population, these three cities are home to nearly 60 percent of the region's poor

Impact of the Pandemic and Stimulus Programs on Poverty

The pandemic has wreaked havoc on many lives—disrupting households with job losses, illness, and death. No amount of money will compensate for some of these losses. However, the stimulus programs have measurably helped with household budgets.

Local poverty estimates are not yet available for 2020 and 2021. However, estimates for the nation indicate that although the poverty rate rose during the pandemic, the federal stimulus packages lifted people out of poverty when measured by the supplemental poverty rate.

The Census Bureau's official poverty rate for the nation rose to 11.4 percent in 2020 from 10.5 percent in 2019, with 3.3 million more people in poverty.[18] However, the Census Bureau's Supplemental Poverty Measure (SPM), which accounts for assistance—such as Social Security, unemployment insurance, and the stimulus payments from the COVID-19 relief packages—fell to 9.1 percent in 2020 from 11.8 percent in 2019.[19]

One measure of the success of the stimulus packages for pandemic relief is that this is the first year in which the SPM rate of poverty was lower than the official rate. Still, the burden grows on those who remain in poverty and on those who have lost jobs as living costs rise. As the *Washington Post* has reported, one measure of the gap in aid and of the financial toll of job loss is the recent sales growth at dollar stores around the country.

(417,509 people). The combined poverty rate for the three cities was 24.9 percent. When compared to the 7.4 percent poverty rate in the remaining, mostly suburban portion of the region, one can derive a city/suburb poverty ratio of 3.4 for the Philadelphia region.

My analysis of all U.S. MSAs shows that a 3.4 ratio is very high, but in Pennsylvania, the Philadelphia region is not unusual in this regard (Figure 3). At 5.1, the Reading region has the highest ratio in the country. The York, State College, and Johnstown regions have ratios ranging from 3.4 to 4.1. The lowest city/suburb poverty ratio for any Pennsylvania metro area is 1.6 in the East Stroudsburg region, which is just below the mean and median ratios across all MSAs.[11]

Combining the city/suburb poverty ratio for all Pennsylvania metro areas produces a ratio of 3.0.[12] Wisconsin has the same ratio. New Hampshire's is slightly higher, but New Hampshire has only one metro area. New Mexico has the lowest ratio at 0.9. The mean and median for all states is 1.8 and 1.7, respectively.

States with city/suburb poverty ratios above the mean are primarily rust-belt states with an older governance structure and a more mature economy. However, Pennsylvania's ratios are highest even among the rust-belt states, which share a similar economic history and industrial structure. This is likely because the state's de facto barriers against annexation, or consolidation of a city and its suburbs, have been in place for nearly one hundred years.[13] Therefore, Pennsylvania cities find it difficult to unilaterally maintain a sound, self-reliant fiscal footprint.

In a 1966 law review article, Boston city planner David Harrison summarized Pennsylvania's "annexation problem": "... for reasons which should be clear by now, municipalities of any size or importance are in scant danger of losing their political integrity by way of annexation. The courts evidently are most anxious to follow the legislature in such matters and the legislature, bound as it is by public opinion, is faced with the public's efforts to make the law of annexation in Pennsylvania the law against annexation."[14]

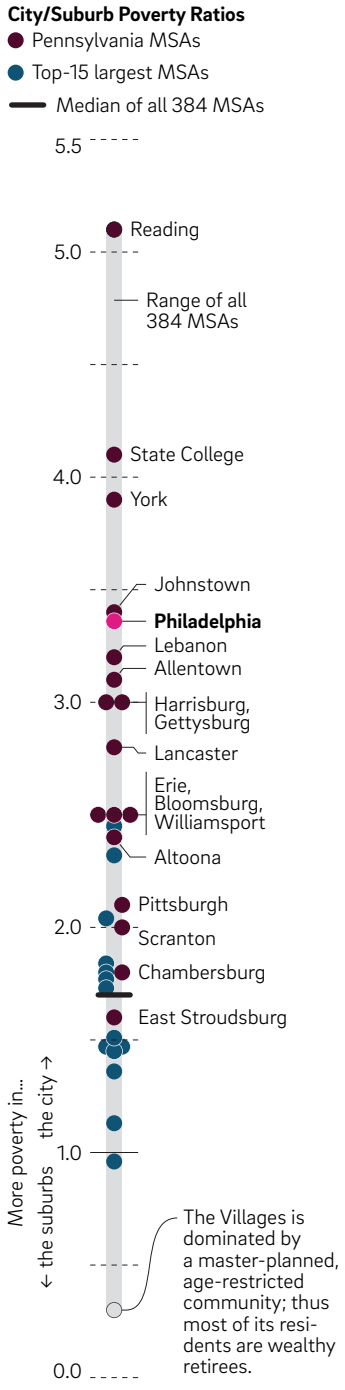
Pennsylvania state government holds absolute authority to change municipal boundaries, and it has not significantly changed its antiannexation policy stance in the 55 years since Harrison's article—despite increasing urban problems and deepening fiscal distress in most of the state's cities. While Columbus, OH, was annexing significant territory and Indianapolis was consolidating with Marion County, many residents of Reading, PA, were moving to one of the other 63 municipalities in Berks County, and many residents of Pittsburgh were moving to one of Allegheny County's other 129 municipalities.

FIGURE 3

Pennsylvania Cities Experience More Concentrated Poverty

In large MSAs outside of Pennsylvania, there's less of a gap between suburban and urban poverty.

Poverty rate in an MSA's principal city/cities divided by poverty rate in the rest of the MSA, all Pennsylvania MSAs and 15 largest U.S. MSAs, 2019



Source: Census Bureau, ACS 5-Year estimates, 2019.

What Local Government Can and Can't Do

*See **Transit Access for the Poor.***

Although poverty has a local face, it is primarily a national and state issue to resolve. Local poverty rates tend to move in unison in response to the national business cycle. Moreover, local governments have limited influence over the market economy's distributive characteristics and state and federal governments' redistributive characteristics, including school funding formulas.

Moreover, since state governments determine how local governments are delineated and organized, a state's choices can affect local economic health and help or hinder the success of local-government poverty programs. Cities may pursue efforts to expand access to affordable housing, child care, transit, and health care for the poor; and to improve schools, reduce crime, and attract suburbanites back to the city. However, a city has limited options when it can't capture sufficient fiscal resources from the regional economy it helped spawn, as is the case in Philadelphia and in Pennsylvania's other cities. Local efforts alone may drive more high-income residents away—creating greater concentrations of poverty in the housing stock that is left behind.

Even if it lacks the political will to legislate positive change, the state government can still create incentives for local governments to increase intergovernmental cooperation, if not consolidate. Just as the federal government requires metropolitan planning organizations to develop regional transportation infrastructure plans, Pennsylvania could require metropolitan governance to manage economic development, labor market initiatives, education, courts, prisons, and social services. All of these local functions address issues with spillover benefits among localities throughout a region. The benefits of this functional consolidation would be better aligned with the reality of poverty throughout the entire region than is the current status quo.

Transit Access for the Poor

Prior to the pandemic, a *New York Times* Neediest Cases Fund article profiled a young man who had struggled with problems stemming from rising debt. Part of the assistance that put him back on his feet was a monthly MetroCard paid for by the fund. He described the card as "a golden ticket in the city."

Fortunately, the city of Philadelphia has one of the most robust transit systems in the nation as measured by connectivity, frequency of service, access to households and jobs, and percentage of commuters using transit (Figure 4).

Philadelphia is one of just eight cities (among 301 places with a population greater than 100,000) that scored a 9.0 or better on a 2019 AllTransit performance score—a comprehensive measure of job accessibility via transit.[15] Among other statistics, Philadelphia's AllTransit fact sheet notes: 667,440 jobs (98.4 percent) are located within a half-mile of transit, 378,628 jobs are accessible within a 30-minute transit ride (a weighted average across all households), 342,478 low-income households (99.9 percent) are within a half-mile of transit, and 295,876 low-income households (86.3 percent) are within a half-mile of high-frequency, full-day transit.[16]

The cities of Camden and Wilmington also had relatively high scores of 8.0 and 7.7, respectively.[17] Thus, more than 60 percent of the region's poor have good access to many of the region's jobs.

However, scores for the suburban counties in our region were much lower: Bucks (2.6), Chester (2.3), Delaware (6.7), and Montgomery (4.5) in Pennsylvania; Burlington (2.7), Camden (5.2), Gloucester (2.8), and Salem (1.8) in New Jersey; New Castle (4.4) in Delaware; and Cecil (1.0) in Maryland.

So, while the region's transit systems provide robust access for city residents and to city jobs (and may be a factor that concentrates poverty in the cities), many poor residents in outlying counties lack easy access, and some far-flung job centers may be inaccessible from the city. Still, Philadelphia's robust transit system offers an advantage that could be leveraged to further benefit poor residents throughout the region.

Transit-oriented development at stations in outlying counties would help. Apartments near these stations would ease access to city jobs for county residents, and the stations themselves could attract businesses from more far-flung suburban locations, thus increasing job access for city residents. Increasing affordability of transit fares for low-income workers and students would also increase access.

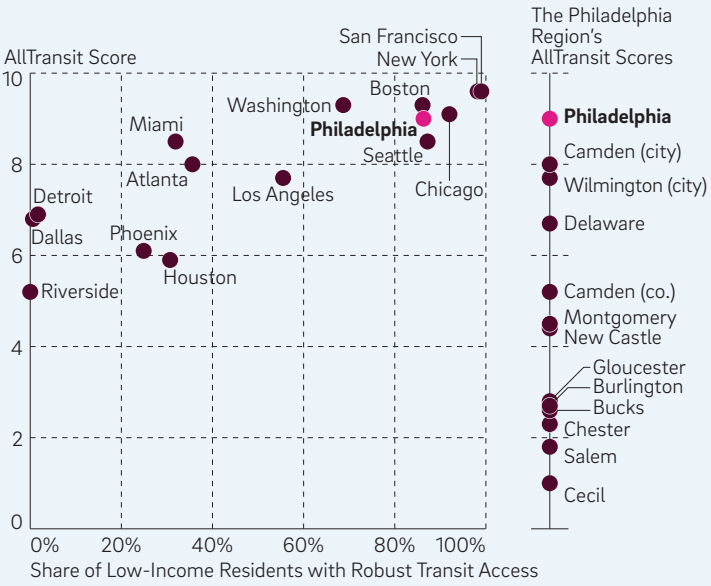
Past fare-free experiments, including in Austin, TX, and Denver, were deemed a failure because they did not tempt enough drivers from their cars (and thus enough cars from the highways). However, the idea is getting a second look because, during these experiments, transit ridership dramatically increased among poor people who did not own a car.[20] Prior to the pandemic, several U.S. cities, including Kansas City, MO, Lawrence, MA, and Olympia, WA, were preparing to launch free public transit. Since the pandemic, other cities have begun to offer free fares as an inducement to attract riders back to their transit systems.

FIGURE 4

Compared With Other Large Cities, Philadelphia Provides Robust Transit Access

However, the region's suburban counties score lower.

AllTransit Performance Score and share of low-income households within a half-mile of high-frequency, full-day transit, 15 largest cities, principal cities and all counties in Philadelphia MSA



Source: Center for Neighborhood Technology 2019, AllTransit™, alltransit.cnt.org.

Note: AllTransit bases its scores on connectivity, access to land area and jobs, frequency of service, and the percent of commuters who use transit to commute to work.

Notes

1 Unless otherwise noted, "region" and "metro area" refer to official metropolitan statistical area (MSA). Analysis in this article is based on data for each MSA as delineated in the Office of Management and Budget Bulletin 18-04, issued September 14, 2018. This article truncates each official name to the name of its largest principal city.

2 The city of Philadelphia does have the highest rate of deep poverty among the 10 largest U.S. cities. But if you include all cities, regardless of size, many sizeable ones, including Cleveland, Detroit, Fresno, CA, Memphis, TN, and New Orleans, have higher rates. Also, the rates of deep poverty within the municipal boundaries of Camden, NJ, Chester, PA, and Wilmington, DE, are higher than in Philadelphia.

3 It is long established by law that local governments are creatures of the state. Thus, states bear significant responsibility for the outcomes of local governance.

4 To capture the cyclical patterns of poverty over three decades, data from the Census Bureau's Small Area Income and Poverty Estimates (SAIPE) program were used. The SAIPE model uses the American Community Survey (ACS) 1-year estimates of poverty as its primary input.

5 The poverty statistics in this section are drawn from the ACS 5-year estimates.

6 This fact is reported in an excellent 2017 article by the Pew Charitable Trusts, but that article focuses on residents of the city.

7 If the Philadelphia region's poverty rate were as high as McAllen's, our region's population below the poverty threshold would rise by more than 1 million persons.

8 Regional differences in the cost of living can add to or detract from the general well-being of people whether they are above or below the poverty line. The next Regional Spotlight article will explore these relationships and the implications for local poverty programs.

9 Using annual Census Bureau estimates, the *Philadelphia Inquirer's* Alfred Lubrano has reported over many years on Philadelphia's "distinction of having the highest poverty rate among the 10 largest U.S. cities" and on the hardships faced by local families living in poverty.

10 Another municipal pocket of high poverty is the city of Chester, at 31.4 percent. Chester is not officially a principal city of the Philadelphia MSA.

11 Liberally scattered among the MSAs with high city/suburb ratios are smallish towns with large universities, such as Ithaca, NY, Ames, IA, Lawrence, KS, Lincoln, NE, Corvallis, OR, and State College, PA. Poverty rates are significantly higher in these towns because graduate and undergraduate students living off campus (typically on limited incomes) can be counted among the poor. Students living in dorms are excluded.

12 To compare states, I constructed a weighted average city/suburb poverty ratio by assigning each MSA to a state on the basis of its largest principal city. For example, the Philadelphia–Wilmington–Camden MSA is assigned to Pennsylvania.

13 State legislation in 1854 extended the boundaries of the city of Philadelphia to include all of Philadelphia County. Final functional consolidation would not occur until passage of a state constitutional amendment in 1951. Since the 1854 consolidation in Philadelphia, the only significant municipal merger in Pennsylvania was the 1907 annexation of the City of Allegheny into the City of Pittsburgh.

14 Harrison (1966).

15 The AllTransit Performance Score is a comprehensive score that looks at connectivity, access to land area and jobs, frequency of service, and the percentage of commuters who use transit to travel to work.

16 These statistics are not based on an official poverty measure. Rather, they are based on a definition of poverty as simply any and all households earning under $50,000.

17 The AllTransit score for the City of Chester was 7.8.

18 Shrider et al. (2021).

19 Fox and Burns (2021).

20 Bergal (2021).

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Research Update

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

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

Rational Inattention via Ignorance Equivalence

We introduce the concept of the ignorance equivalent to effectively summarize the payoff possibilities in a finite Rational Inattention problem. The ignorance equivalent is a unique fictitious action that is weakly preferable to all existing learning strategies and yet generates no new profitable learning opportunities when added to the menu of choices. We fully characterize the relationship between the ignorance equivalent and the optimal learning strategies. Agents with heterogeneous priors self-select their own ignorance equivalent, which gives rise to an expected-utility analogue of the Rational Inattention problem. The approach provides new insights for menu expansion, the formation of consideration sets, the value of information, and belief elicitation. In a strategic game of contract choice, the ignorance equivalent emerges naturally in equilibrium.

WP 21-29. Michèle Müller-Itten, University of Notre Dame; Roc Armenter, Federal Reserve Bank of Philadelphia Research Department; Zachary R. Stangebye, University of Notre Dame.

Geometric Methods for Finite Rational Inattention

We present a geometric approach to the finite Rational Inattention (RI) model, recasting it as a convex optimization problem with reduced dimensionality that is well-suited to numerical methods. We provide an algorithm that outperforms existing RI computation techniques in terms of both speed and accuracy. We also introduce methods to quantify the impact of numerical inaccuracy on the behavioral predictions and to produce robust predictions regarding the most frequently implemented actions.

WP 21-30. Roc Armenter, Federal Reserve Bank of Philadelphia Research Department; Michèle Müller-Itten, University of Notre Dame; Zachary R. Stangebye; University of Notre Dame.

Refining Set-Identification in VARs Through Independence

Identification in VARs has traditionally mainly relied on second moments. Some researchers have considered using higher moments as well, but there are concerns about the strength of the identification obtained in this way. In this paper, we propose refining existing identification schemes by augmenting sign restrictions with a requirement that rules out shocks whose higher moments significantly depart from independence. This approach does not assume that higher moments help with identification; it is robust to weak identification. In simulations we show that it controls coverage well, in contrast to approaches that assume that the higher moments deliver point-identification. However, it requires large sample sizes and/or considerable non-normality to reduce the width of confidence intervals by much. We consider some empirical applications. We find that it can reject many possible rotations. The resulting confidence sets for impulse responses may be non-convex, corresponding to disjoint parts of the space of rotation matrices. We show that in this case, augmenting sign and magnitude restrictions with an independence requirement can yield bigger gains.

WP 21-31. Thorsten Drautzburg, Federal Reserve Bank of Philadelphia Research Department; Jonathan H. Wright, Johns Hopkins University.

Commuting, Labor, and Housing Market Effects of Mass Transportation: Welfare and Identification

I study Los Angeles Metro Rail's effects using panel data on bilateral commuting flows, a quantitative spatial model, and historically motivated quasi-experimental research designs. The model separates transit's commuting effects from local productivity or amenity effects, and spatial shift-share instruments identify inelastic labor and housing supply. Metro Rail connections increase commuting by 16% but do not have large effects on local productivity or amenities. Metro Rail generates $94 million in annual benefits by 2000, or 12%–25% of annualized costs. Accounting for reduced congestion and slow transit adoption adds, at most, $200 million in annual benefits.

WP 18-14 Revised. Christopher Severen, Federal Reserve Bank of Philadelphia Research Department.

A Tale of Two Bailouts: Effects of TARP and PPP on Subprime Consumer Debt

High levels of subprime consumer debt can create social problems. We test the effects of the Troubled Asset Relief Program (TARP) and Paycheck Protection Program (PPP) bailouts during the Global Financial Crisis and COVID-19 crisis, respectively, on this debt. We use over 11 million credit bureau observations of individual consumer debt combined with banking, bailout, and local market data. We find that subprime consumers with more TARP institutions in their markets had significantly increased debt burdens following these bailouts. In contrast, PPP bailouts were associated with reduced subprime consumer debt. Findings are robust to addressing identification concerns, and yield policy implications regarding bailout structures and strings attached to bailout funds.

WP 21-32. Allen N. Berger, University of South Carolina, Wharton Financial Institutions Center, European Banking Center; Onesime Epouhe, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department; Raluca A. Roman, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department.

Are We Overdiagnosing Mental Illnesses? Evidence from Randomly Assigned Doctors

Almost two in 10 adults in the U.S. and Europe are, at any moment in time, diagnosed with a mental illness. This paper asks whether mental illness is over- (or under-) diagnosed, by looking at its causal effect on individuals at the margin of diagnosis. We follow all Swedish men born between 1971 and 1983 matched to administrative panel data on health, labor market, wealth and family outcomes to estimate the impact of a mental illness diagnosis on subsequent outcomes. Exploiting the random assignment of 18-year-old men to doctors during military conscription, we find that a mental illness diagnosis for people at the margin increases the future likelihood of death, hospital admittance, being sick from work, and unemployment, while lowering the probability of being married. Using a separate identification strategy, we measure the effect of military service on the same set of outcomes to rule out that the effect of diagnosis in our setting is primarily mediated by altering the probability of serving. Our findings are consistent with the potential over-diagnosis of mental illness.

WP 21-33. Andrew Hertzberg, Federal Reserve Bank of Philadelphia Research Department; Marieke Bos, The Swedish House of Finance at the Stockholm School of Economics; Andres Lieberman, Betterfly.

Heterogeneity in Decentralized Asset Markets

We study a canonical model of decentralized exchange for a durable good or asset, where agents are assumed to have time-varying, heterogeneous utility types. Whereas the existing literature has focused on the special case of two types, we allow agents' utility to be drawn from an arbitrary distribution. Our main contribution is methodological: We provide a solution technique that delivers a complete characterization of the equilibrium, in closed form, both in and out of the steady state. This characterization offers a richer framework for confronting data from real-world markets and reveals a number of new economic insights. In particular, we show that heterogeneity magnifies the impact of frictions on equilibrium outcomes and that this impact is more pronounced on price levels than on price dispersion and welfare.

WP 19-44 Revised. Julien Hugonnier, EPFL, Swiss Finance Institute, and CEPR; Benjamin Lester, Federal Reserve Bank of Philadelphia Research Department; Pierre-Olivier Weill, UCLA, NBER, and CEPR, and Visiting Scholar, Federal Reserve Bank of Philadelphia Research Department.

The Heterogeneous Impact of Referrals on Labor Market Outcomes

We document a new set of facts regarding the impact of referrals on labor market outcomes. Our results highlight the importance of distinguishing between different types of referrals — those from family and friends and those from business contacts — and different occupations. Then we develop an on-the-job search model that incorporates referrals and calibrate the model to key moments in the data. The calibrated model yields new insights into the roles played by different types of referrals in the match formation process and provides quantitative estimates of the effects of referrals on employment, earnings, output, and inequality.

WP 21-34. Benjamin Lester, Federal Reserve Bank of Philadelphia Research Department; David A. Rivers, University of Western Ontario; Giorgio Topa, Federal Reserve Bank of New York and IZA.

Missouri's Medicaid Contraction and Consumer Financial Outcomes

In July 2005, a set of cuts to Medicaid eligibility and coverage went into effect in the state of Missouri. These cuts resulted in the elimination of the Medical Assistance for Workers with Disabilities program, more stringent eligibility requirements, and less generous Medicaid coverage for those who retained their eligibility. Overall, these cuts removed about 100,000 Missourians from the program and reduced the value of the insurance for the remaining enrollees. Using data from the Medical Expenditure Panel Survey, we show how these cuts increased out-of-pocket medical spending for individuals living in Missouri. Using data from the Federal Reserve Bank of New York/Equifax Consumer Credit Panel (CCP) and employing a border discontinuity differences-in-differences empirical strategy, we show that the Medicaid reform led to increases in both credit card borrowing and debt in third-party collections. When comparing our results with the broader literature on Medicaid and consumer finance, which has generally measured the effects of Medicaid expansions rather than cuts, our results suggest there are important asymmetries in the financial effects of shrinking a public health insurance program when compared with a public health insurance expansion.

WP 20-42 Revised. James Bailey, Providence College and Federal Reserve Bank of Philadelphia Consumer Finance Institute Visiting Scholar; Nathan Blascak, Federal Reserve Bank of Philadelphia Consumer Finance Institute; Vyacheslav Mikhed, Federal Reserve Bank of Philadelphia Consumer Finance Institute.

Decomposing Gender Differences in Bankcard Credit Limits

In this paper, we examine if there are gender differences in total bankcard limits by utilizing a data set that links mortgage applicant information with individual-level credit bureau data from 2006 to 2016. We document that after controlling for credit score, income, and demographic characteristics, male borrowers on average have higher total bankcard limits than female borrowers. Using a standard Kitagawa-Oaxaca-Blinder decomposition, we find that 87 percent of the gap is explained by differences in the effect of observed characteristics between male and female borrowers, while approximately 10 percent of the difference can be explained by differences in the levels of observed characteristics. Using a quantile decomposition strategy to analyze the gender gap along the entire bankcard credit limit distribution, we show that gender differences in bankcard limits favor female borrowers at smaller limits and favor male borrowers at larger limits. The primary factors that drive this gap have changed over time and vary across the distribution of credit limits.

WP 21-35. Nathan Blascak, Federal Reserve Bank of Philadelphia Consumer Finance Institute; Anna Tranfaglia, Federal Reserve Board.

Identification Through Sparsity in Factor Models: The ℓ_1-Rotation Criterion

We show that sparsity in the loading matrix can solve the rotational indeterminacy in factor models, allowing a researcher to recover how individual factors relate to the observed variables. The key insight is that any rotation of a sparse loading vector will be less sparse. While a rotation criterion based on the ℓ_0-norm of the loading matrix is infeasible, we prove that a rotation criterion based on the ℓ_1-norm will consistently recover the individual loading vectors under sparsity in the loading matrix. Existing rotation criteria (e.g., the Varimax rotation, Kaiser [1958]) lack such theoretical guarantees. We further show that the assumption of sparsity in the loading matrix is testable and develop such a test. In our simulations, the ℓ_1-rotation performs better than existing rotation criteria, and we find strong evidence for the presence of local factors in two economic applications.

WP 20-25 Revised. Simon Freyaldenhoven, Federal Reserve Bank of Philadelphia Research Department.

Reducing Strategic Default in a Financial Crisis

We document that increasing penalties for default reduces strategic default in financial crises by exploiting the 2009 changes to Canadian consumer insolvency regulations. Our novelty is that the incentives from increasing penalties for default operate in the opposite direction from incentives in more typical financial crisis policy interventions, which increase the liquidity of debtors. We can identify strategic default because our policy intervention is independent of debtors' liquidity and initial selection into long-term debt contracts. Our results imply that even insolvent debtors can be incentivized to reduce default during financial crises without the typical interventions, which increase debtors' liquidity.

WP 21-36. Vyacheslav Mikhed, Federal Reserve Bank of Philadelphia Consumer Finance Institute; Sumit Agarwal, National University of Singapore; Barry Scholnick, University of Alberta and Federal Reserve Bank of Philadelphia Consumer Finance Institute Visiting Scholar; Man Zhang, University of Sydney.

Should Central Banks Issue Digital Currency?

We study how the introduction of central bank digital currency affects interest rates, the level of economic activity, and welfare in an environment where both central bank money and private bank deposits are used in exchange. We highlight an important policy tradeoff: While a digital currency tends to promote efficiency in exchange, it may also crowd out bank deposits, raise banks' funding costs, and decrease investment. We derive conditions under which targeted digital currencies, which compete only with physical currency or only with bank deposits, raise welfare. If such targeted currencies are infeasible, we illustrate the policy tradeoffs that arise when issuing a single, universal digital currency.

WP 21-37. Daniel Sanches, Federal Reserve Bank of Philadelphia Research Department; Todd Keister, Rutgers University and Visiting Scholar, Federal Reserve Bank of Philadelphia Research Department

CLO Performance

We study the performance of collateralized loan obligations (CLOs) to understand the market imperfections giving rise to these vehicles and their corresponding economic costs. CLO equity tranches earn positive abnormal returns from the risk-adjusted price differential between leveraged loans and CLO debt tranches. Debt tranches offer higher returns than similarly rated corporate bonds, making them attractive to banks and insurers that face risk-based capital requirements. Temporal variation in equity performance highlights the resilience of CLOs to market volatility due to their closed-end structure, long-term funding, and embedded options to reinvest principal proceeds.

WP 20-48 Revised. Larry Cordell, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department; Michael R. Roberts, University of Pennsylvania and the National Bureau of Economic Research; Michael Schwert, University of Pennsylvania

Data in Focus

Nonmanufacturing Business Outlook Survey

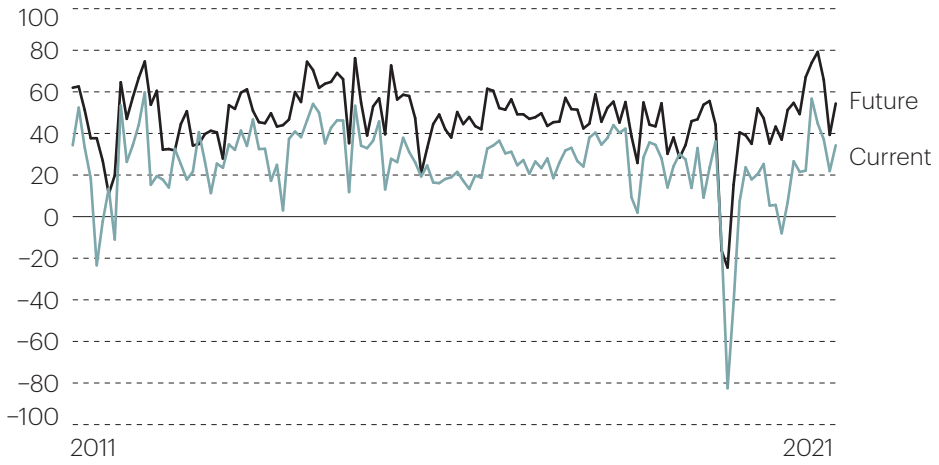
The Philadelphia Fed collects, analyzes, and shares useful data about the Third District and beyond. Here's one example.

In 1910, Trenton, NJ, adopted as its official motto, "Trenton Makes, the World Takes." This motto reflected the importance of manufacturing to Trenton. And it wasn't just Trenton. Back then, manufacturers dominated the Third District. A half-century later, the district was still known for its manufacturing, prompting the Philadelphia Fed to launch its Manufacturing Business Outlook Survey (MBOS).[1] Surveying local manufacturers was (and still is) a good way to sense how the economy is doing while we wait for official numbers on employment and gross domestic product.

But the economy of the Third District (and the rest of the country) has been shifting to nonmanufacturing, especially services. If we're to keep abreast of the latest economic developments, we need to survey nonmanufactures as well. So, in 2014, the Philadelphia Fed launched its Nonmanufacturing Business Outlook Survey (NBOS). This issue's Data in Focus features the NBOS' General Activity Index. Every month, we ask nonmanufacturers, "What is your evaluation of the level of general business activity," both currently and in six months? We then compute an index by subtracting the percentage of respondents who indicate a decrease from the percentage who indicate an increase. As Philadelphia Fed senior economic analyst Elif Sen has written, nonmanufacturing indexes are highly correlated with national economic data, and "since activity can vary from region to region, it is also important to develop a regional nonmanufacturing survey to better capture a significant portion of the Third District's economy."[2] EI

Nonmanufacturing Business Outlook Survey

Current and Future General Activity Indexes for Firms, Diffusion Index, Mar 2011–Oct 2021



Source: Federal Reserve Bank of Philadelphia Nonmanufacturing Business Outlook Survey.

Notes

1 See Michael Trebing and Caroline Beetz Fenske, "The Philly Fed Index Turns 50 with Steadfast Success," Philadelphia Fed *Economic Insights*, fourth quarter 2018, available at https://www.philadelphiafed.org/the-economy/regional-economics/the-philly-fed-index-turns-50-with-steadfast-success.

2 Elif Sen, "Introducing the Philadelphia Fed Nonmanufacturing Survey," Philadelphia Fed *Business Review*, third quarter 2014, available at https://www.philadelphiafed.org/the-economy/regional-economics/introducing-the-philadelphia-fed-nonmanufacturing-survey.

Learn More

Online: https://www.philadelphiafed.org/surveys-and-data/regional-economic-analysis/nonmanufacturing-business-outlook-survey

For questions about the Nonmanufacturing Business Outlook Survey, contact Public Affairs at 215-574-6113.

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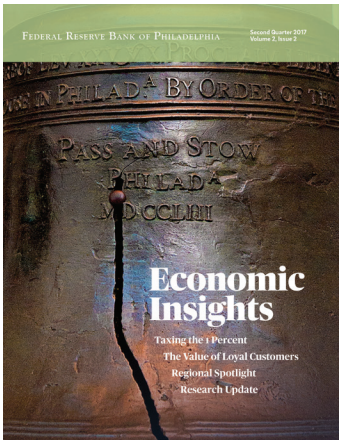
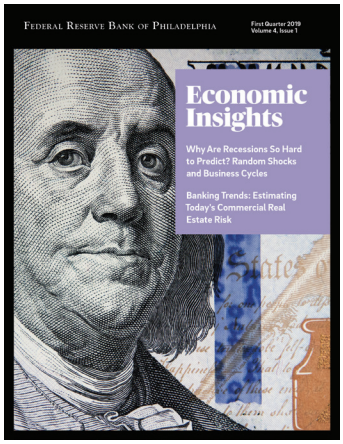


2017 Q2

2018 Q1



2019 Q1

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2020 Q1

2020 Q2

2020 Q3

2020 Q4