

Economic Insights

Fall & Winter
Double Issue

Third & Fourth Quarters 2022
Volume 7, Issue 3

Inequality Research Review

The Labor Market Recovery
Following COVID

Banking Trends

The Pandemic Mortgage Boom

Regional Spotlight

Q&A

Research Update

Data in Focus



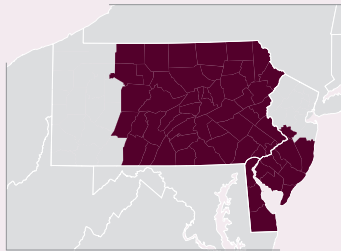
Economic Insights

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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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About the Cover

Philadelphia from the Art Museum

The cover photo of Philadelphia encompasses almost every stage of the city's development. In the midground, partially obscured by the statue, is Logan Square, one of the five squares city founder William Penn and his surveyor, Thomas Holme, included in their 1687 city plan. In the distance looms City Hall, a testament to the post-Civil War boom; it was the tallest building in the world upon its completion in 1894. In the near distance is Rudolf Siemering's 1897 Washington Monument. The monument and City Hall are connected by the Benjamin Franklin Parkway, the City's post-World War I attempt to tame the unruly, industrial metropolis with open vistas, museums, and classical architecture. Starting in the 1970s, a downtown building boom led to the construction of numerous skyscrapers, visible to the right. Few images so fully convey Philadelphia's complex and varied history, culture, and economy.

Photograph by Brendan Barry.

Q&A...

with Bryan Stuart, a senior economist here at the Philadelphia Fed.



Bryan Stuart

Bryan Stuart grew up in suburban Indianapolis. After graduating from Indiana University with dual degrees in business and math, he headed to the University of Michigan to pursue his doctorate in economics. Bryan is particularly interested in labor and urban economics, with an emphasis on how economic opportunity is shaped by recessions, migration, and government policy. This issue of Economic Insights features the first of his annual special reports on inequality and mobility.

How did you come to study business and math at Indiana University?

I spent the first two years of college studying to be a classical guitar major, but I developed an orthopedic issue with my elbow that could lead to arthritis in the future. I didn't want to take the risk of pursuing a career as a guitarist and losing fine motor control, so I had to figure out what to do next. There was a business economics and public policy major at IU that seemed pretty interesting, and some of my friends were in the business school, so I decided to go that route. After a few semesters, I decided I wanted to pursue a doctorate in economics, but I hadn't taken any of the math classes needed to get into graduate school, so I stayed at IU a little bit longer and tacked on the math degree.

What led you to specialize in labor economics at the University of Michigan?

In the first year of grad school, I sat in a lot of seminars, because they were more interesting than the coursework and they helped me figure out what kind of research I wanted to do. I was really excited by the questions that people were asking in labor economics and how they were trying to use rigorous empirical methods to answer those questions. I was lucky to be in a department where there were a lot of faculty and grad students focused on this field.

How has your experience growing up in the Midwest influenced your research?

When I was in grad school, the conventional wisdom at the time was that local areas recover pretty quickly from economic shocks, so if a bad thing happens to an area, people and employers adjust, such that there aren't that many lasting consequences for them. Growing up in Indiana and then going to grad school in Michigan, I found that view hard to square with what I saw. There are parts of Indiana and Michigan where you can see the scars of the deindustrialization of the 1980s. That was certainly on my mind as I was thinking about how the economy affected individuals' opportunities and how local areas responded to shocks.

Would you say that the conventional wisdom—namely, that local areas bounce back quickly from economic shocks—has fallen out of favor? What does that mean for policymakers?

I do think there is increasing awareness that people oftentimes have trouble changing their career or their place of residence when economic conditions shift. There's also increasing awareness that this incomplete adjustment has long-lasting consequences for places. One of the big questions that remains is what policymakers should do about these results. Should we provide financial incentives for people to move to areas with more jobs? That could be helpful if the main challenge people face is coming up with enough money to move to a new location. But people also care about access to affordable housing and social connections in the community, so people might rather stay put even if they have fewer employment opportunities. Then, should we just invest in these lagging areas to promote job creation? That kind of spending could help local areas and the people living there, but it also might lead to jobs being created in inefficient locations. There are real tradeoffs here, which is why I think this is such an interesting and important topic to study.

Tell us about your new yearly special report. Why is inequality and mobility so important to the Philadelphia Fed? What do you hope to accomplish with these reports?

Inequality and economic mobility are central economic issues today. Building up our research capabilities in this area can help the bank leadership, who regularly are asked to comment on inequality and mobility. Studying inequality and mobility also provides a valuable lens for understanding the state of the economy, which I see as a longstanding objective of the bank. For example, if you see that the unemployment rate of Black individuals is rising, that might tell you something about where the economy is heading. I think it's also valuable to understand whether monetary policy has different effects on different groups of individuals. ■



Photo: searagen/iStock

Inequality Research Review

Local Labor Markets

Aggregate statistics don't capture the local conditions that directly affect families and communities.

Bryan A. Stuart

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

Policymakers, researchers, and journalists often focus on the nationwide economy—for example, by talking about the overall unemployment rate. Aggregate economic conditions are important, but they do not capture the local economic conditions that directly impact families and communities. In this article, I discuss labor market outcomes from the standpoint of local areas. How much do labor market outcomes vary across local areas? What are the causes and consequences of this inequality? And does this inequality increase or decrease after a recession?

Measuring Local Labor Market Inequality

To understand what the prepandemic economy looked like, I use data from the 2018 and 2019 American Community Surveys, focusing on individuals ages 25–64 who were not serving in the armed forces or living in group quarters (such as a nursing home).¹ I define a local labor

market as a metro area, which consists of counties that include a large population center and highly integrated adjacent areas. There are 22 metro areas in the Third District and 357 metro areas in the rest of the contiguous U.S. I summarize local labor market conditions using two measures: a metro area's median hourly wage and the share of that area's individuals who are employed. (This share is often called the employment rate.) Stronger local labor markets tend to have a higher median wage and a higher employment rate.

How much do labor market outcomes vary across areas? Quite a lot. The lowest median hourly wage is in McAllen–Edinburg–Mission, TX, at \$13 (in 2019 dollars), and the highest is in San Jose–Sunnyvale–Santa Clara, CA, at \$34 (Figure 1). In the Third District, the median hourly wage ranges from \$18 in Altoona, PA, to \$26 in Trenton, NJ. The second-highest wage, at \$24, is in Philadelphia–Camden–Wilmington.

The employment rate also varies considerably across metro areas, from 56 percent in

Homosassa Springs, FL, to 87 percent in Fargo, ND. In the Third District, the employment rate ranges from 72 percent in East Stroudsburg, PA, to 81 percent in Harrisburg-Carlisle, PA. Median wages and employment rates in the Third District are high relative to the rest of the country.

What explains this local labor market inequality, and does this inequality translate into differences in individuals' well-being? I draw on empirical and theoretical research in economics to address these questions.

The Causes and Consequences of Inequality

What are the causes of local labor market inequality? For simplicity's sake, I focus here on the median hourly wage, and why it might be higher in some areas. This discussion helps us understand the three reasons why labor market opportunities are stronger in some places: employers' productivity, individuals' productivity and characteristics, and local policies.

First, wages may be higher because local employers are more productive. More-productive employers—that is, employers that generate more revenue per worker—typically face economic and social pressures to pay higher wages. There are many reasons why an area's employers might be more productive. They could benefit from a metro area's natural advantages, such as proximity to mineral deposits, or transportation infrastructure that facilitates exports, such as ports. These unique local advantages may make local employers more productive, and this in turn can lead to higher local wages. Or, employers could be more productive because of a metro area's historical advantages—that is, factors that increased productivity in the past but no longer matter directly today. One example of historical advantage is Philadelphia's role as a center of commerce and government in the 18th century. Historical advantages can have long-lasting effects because of path dependence: Once economic activity is concentrated in a particular location, employers and individuals tend to be attracted to this location as a place to live and work.² Even if there are no natural or historical advantages, employers can still become more productive by joining other

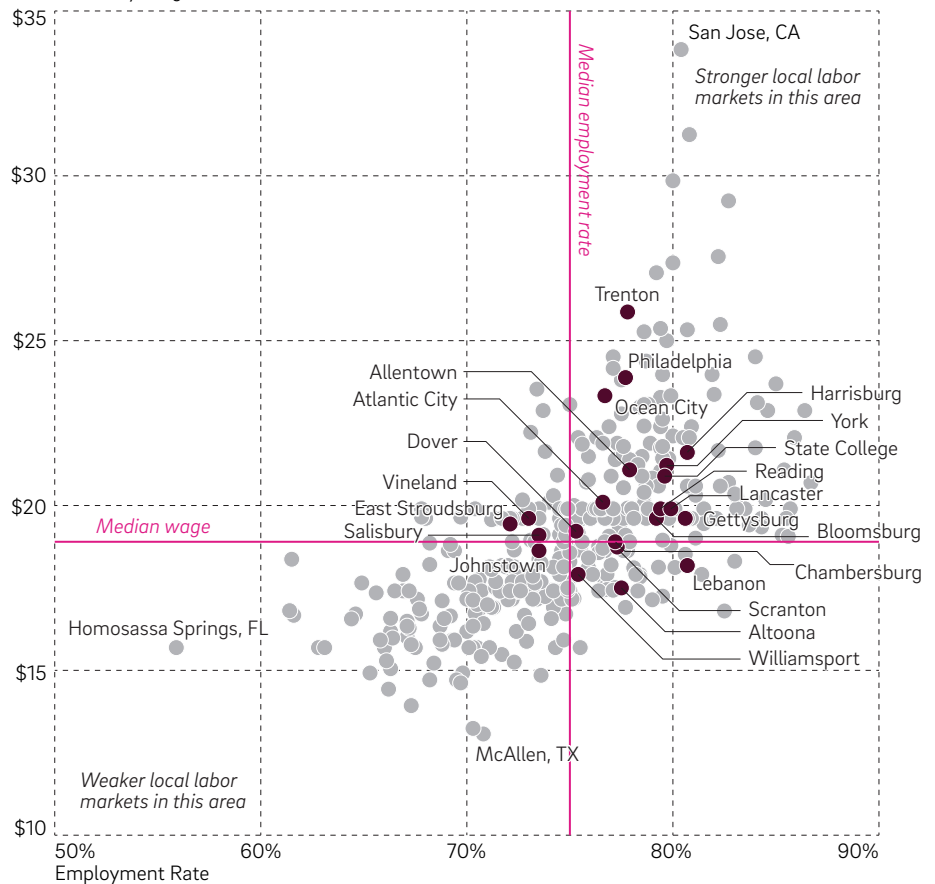
FIGURE 1

Wages and Employment Vary Greatly Across U.S. Metro Areas

Third District metros tend to have higher wages and higher employment rates.

Median hourly wage and employment rate by metropolitan statistical area, 2018–2019

Median Hourly Wage



Source: Author's calculations using data from Ruggles et al. (2021).

Notes: The sample contains individuals aged 25–64 who are not in the armed forces or living in group quarters in the 2018 and 2019 American Community Surveys. Wages are expressed in 2019 dollars using the Consumer Price Index for All Urban Consumers (CPI-U). The employment rate is defined as the share of individuals employed. Third District and outlier metro areas are labeled.

employers in an agglomeration, or densely built-up area of human settlement, because an agglomeration provides a greater supply of potential workers, nonlabor inputs, and creative ideas, all of which aid productivity.³ Finally, the nationwide economy experiences secular changes, such as the decline in manufacturing employment and the rise of information technology, and cyclical changes due to the business cycle. These changes affect areas differently based on the types of goods and services they produce. So local businesses may become more productive and thus pay higher wages simply because nationwide events and trends favor that area's local industries.

But an area might also have higher wages because of its residents, not its employers. For example, individuals with a higher level of education are more likely to work in knowledge-based jobs, and these jobs tend to concentrate in certain areas. And higher-income individuals might be willing to pay more for local amenities, such as warm weather, fine dining, and live entertainment, and these amenities may attract still more higher-income individuals who raise the median wage. In either case, a high median wage would reflect the characteristics of individuals, not employers.

Finally, wages can differ across places because of policies. For example, wages

could be higher in areas with a higher minimum wage, tax policies that encourage the creation of higher-paying jobs, or strong local colleges. Land use and housing construction regulations could also affect labor market outcomes, because they affect the cost of housing and the subsequent decisions of individuals about where to live.

In practice, the decisions of both employers and individuals interact with each other and with local policies. For example, employers that need to hire highly educated workers might locate in areas where workers seem to want to live, and policies that restrict the supply of housing in these areas could cause lower-income individuals to move away from the resulting higher housing prices.

What are the consequences of local labor market inequality? For a long time, many economists have argued that the average level of well-being attained by the individuals living in an area depends on that area's employment opportunities, cost of living, and quality of life. ("Quality of life" captures everything else, such as amenities and the value of local government services.) Because individuals consider all three factors when deciding where to live, these three factors are interrelated: The cost of living tends to be higher in places with better employment opportunities and a better quality of life.⁴ As a result, higher local prices offset at least some of the benefits associated with better employment opportunities. This suggests that local labor market inequality likely overstates the differences in well-being that any one individual would experience by living in a different area.⁵ Ultimately, it is challenging to measure inequality in well-being across areas.

A related issue is whether local labor market inequality translates into lower efficiency or equity for the nationwide economy. This need not be the case. For example, in a simple model where housing costs completely offset differences in employment opportunities and quality of life, any given person would be equally happy living in any given area. In a more realistic model, however, inequality between local labor markets could underlie inefficient and unequal outcomes. If it is difficult or costly for individuals to move, they might not move to better opportunities, leaving residents of weaker local labor markets worse off and their potential underutilized. Moreover, if local labor market conditions affect future generations, then a future generation could suffer because their parents or grandparents lived in a weak local labor market. That, too, would reduce efficiency and equity in the economy. To understand the relevance of these concerns, let's look at how recessions shape local labor markets and people.

Recessions and Local Labor Market Inequality

It helps to understand whether recessions affect local labor market inequality. The Federal Reserve, along with many policymakers, analysts, and the public, is keenly interested in the evolution of economic activity during and after recessions, and a local labor market focus complements standard analyses of the nationwide economy. Also, recessions shed light on fundamental features of local labor markets by creating sharp changes in local economic conditions, as we will see.

During each recession, some areas experience more severe employment losses than others. For example, Philadelphia-Camden-Wilmington lost 3.6 percent of its employment during the Great Recession (2007-2009), while State College (home to the Pennsylvania State University) saw an employment increase of 1.2 percent. These differences arise in part from each area's industrial specialization and shocks to specific local firms.

Do metro areas recover from employment declines that occur during recessions? The evolution of total employment depends on a range of factors, such as population growth, so it's not enough to simply look at the time series of employment for a single area. To isolate how recessions affect local labor markets, W.E. Upjohn Institute for Employment Research senior economist Brad J. Hershbein and I have compared changes in employment between areas where each recession is more versus less severe.⁶ To simply illustrate this approach, I plot average log employment for metro areas where the Great Recession was more vs. less severe (Figure 2). Before 2007, these two groups of metro areas saw similar employment growth. In other words, areas that lost a higher share of jobs during the recession were not on a downward trend beforehand. By definition, there is a larger employment loss during the recession in more severely impacted areas. But worryingly, the relative employment decline persisted through 2019, 10 years after the end of the nationwide recession. Moreover, the Great Recession is not unique: We found a similar pattern for every recession between 1973 and 2009. (We don't yet have the data to tell if a similar pattern will follow the COVID-19 recession.)

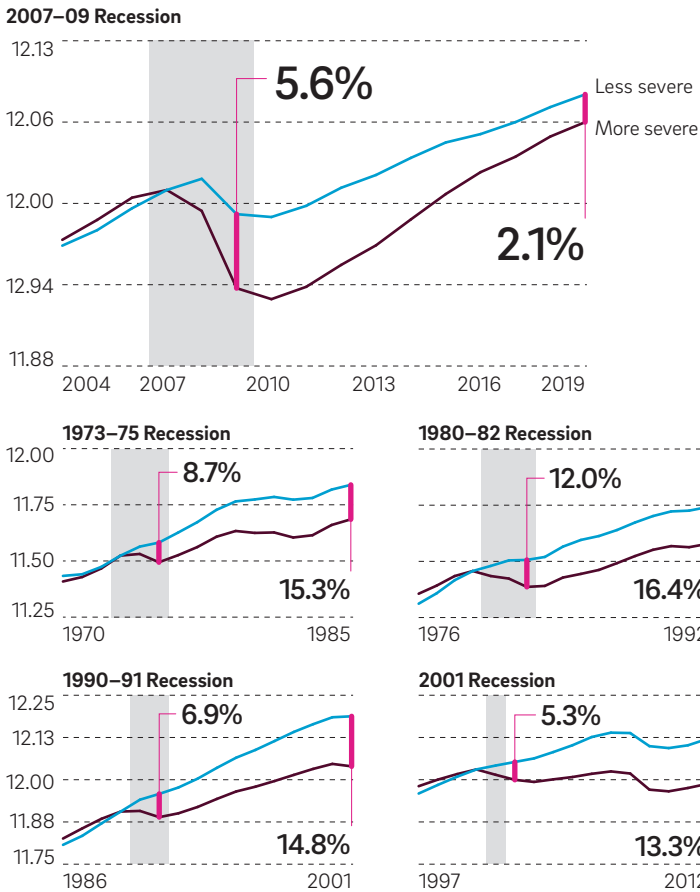
A persistent, postrecession decline in employment isn't necessarily a problem. The economy is dynamic, and creative destruction can be a powerful force for raising productivity and the standard of living. But for this to be the case, households must respond to shifts in employment opportunities by moving between areas. And, indeed, following each recession, more severely impacted areas do see a decrease in population. However, a hard-hit area's employment typically declines more than its population, and very little of the population decline is attributable to people moving away. Instead, there is a decrease in the number of people moving into an area where a recession was more severe. These results suggest that individuals face significant moving costs, as has been found in other work. Moreover, the employment-to-population ratio and per capita earnings both persistently decline in areas where recessions are more severe, which suggests that economic opportunities in these areas remain depressed.

Even more concerning, the decline in local economic activity that emerges during a recession leaves permanent scars on children and adolescents. Individuals who were born in places where the 1980-1982 recession was more severe, and who were children at the time of the recession, were less likely to get a college degree and, as adults, earned less income and faced a greater risk of living in poverty.⁷ Researchers have yet to study whether these long-run effects on children followed other recessions, but the similar effects of recessions on local economic conditions makes it likely. The simple explanation is that these children spent their childhood in an area where local economic opportunities were diminished, which can have

FIGURE 2

Where a Recession Is More Severe, Employment Declines Persistently in Relative Terms

Mean log employment level in metro areas where a recession was more severe or less severe, as measured by whether the log employment change during the recession was above or below the nationwide median



Source: Author’s calculations using data from the Bureau of Economic Analysis Regional Economic Accounts.

Notes: To keep the focus on changes over time, the less-severe recession line is adjusted to equal the more-severe recession line at the start of each recession.

wide-ranging consequences for parents, families, and communities. Overall, these results indicate that the local labor market inequality emerging from recessions is persistent and harmful for the economy’s productive capacity.

Lessons for Policymakers

Policymakers seeking to boost a metro area’s fortunes can do so by attracting jobs or people. Well-targeted policies should consider both sides of the labor market: An employer can’t fill jobs unless people are willing to live within a reasonable distance of those jobs, and individuals are unlikely to move somewhere lacking in adequate employment opportunities. Seen this way, the local economic development toolkit includes not only traditional instruments like business assistance and employment subsidies, but also investments in schools, public safety, and outdoor spaces that make areas more attractive places to live. Expanding the availability of affordable housing is also critically important. Otherwise, improvements in employment opportunities and quality of life might be offset by higher housing costs.

Also, it is possible to lower inequality and increase the economy’s productive capacity by providing adequate opportunities for children irrespective of where they are born. In the U.S., children born to lower-income families have access to fewer quality primary and secondary schools, and they struggle to pay for and navigate a college education. The fact that some children don’t get a college degree simply because they were unlucky enough to be born in an area hit harder by a recession is one manifestation of how an individual’s economic opportunities depend on the lottery of birth.

Finally, policymakers should understand that the consequences of recessions for metro areas last decades. Monetary policy is not well suited for helping specific areas or addressing the fundamental issues that lead to a lasting decline in local economic activity. However, the severity of a recession’s consequences for metro areas underscores the value of supporting maximum employment and economic stability. There is greater scope for fiscal policy to provide transfers to specific individuals and places, provide subsidized loans to help businesses and individuals pursue new opportunities, or make long-term investments in education to increase opportunity for all. These policies must be implemented with care and could be expensive, but the potential benefits to individuals and communities are enormous. **E**

Notes

1 See Ruggles et al. (2021).

2 Another example of historical advantage and path dependence: Economic activity in the modern era remains concentrated in locations where geological features encouraged overland transport of cargo between waterways in the 18th century. See Bleakley and Lin (2012).

3 Brinkman et al. (2015) studied a dynamic model with agglomeration forces and show that these forces influence firm entry, exit, and growth trajectories.

4 Albouy and Stuart (2020) developed a model that yields estimates of quality of life and productivity in local areas using data on population, wages, and housing prices. In this model, housing prices are higher in places with a better quality of life and higher productivity. The quality of life in an area could also depend on local transportation infrastructure and individuals' attachment to their homes. See Severen (2021) and Coate and Mangum (2021).

5 The cost of housing in the Third District is high relative to metro areas in the rest of the country. As a result, median hourly wages adjusted for the cost of housing in the Third District are not particularly high compared to the rest of the country.

6 See Hershbein and Stuart (2022).

7 See Stuart (2022).

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Photo: Colleen Michaels/Stock

The Labor Market Recovery Following COVID

By the time the Fed raised interest rates, employment was back to normal—but not for everyone.

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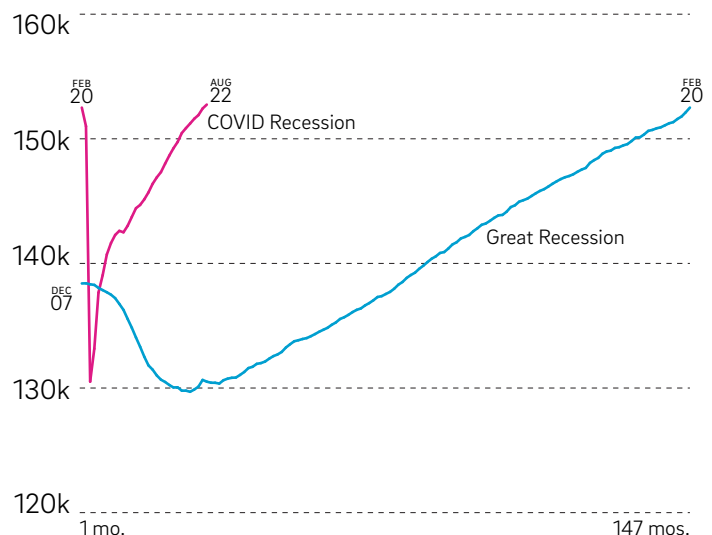
The COVID-19 pandemic was the largest adverse shock to hit the U.S. economy since the Great Depression (1929–1939). Total payroll employment decreased by 14 percent when the pandemic hit. In contrast, during the Great Recession (2007–2009), from peak to trough, employment declined only 6 percent, although even that smaller decline had a long-lasting effect on the labor market. Given how long it took for the labor market to recover after the Great Recession, many economists worried that the COVID shock, which was more than twice as strong, would have adverse, long-lingering effects on the labor market.

But the recovery from the COVID shock has been

FIGURE 1

The Labor Market Took Much Longer to Recover from the Great Recession

Total nonfarm employment, in thousands of persons, seasonally adjusted, from the beginning of the Great Recession to the beginning of the COVID recession, and from the beginning of the COVID recession to the most recently available monthly data

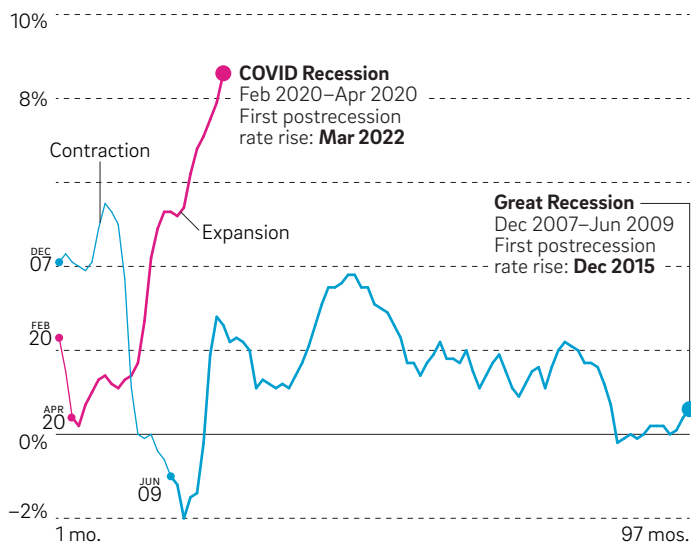


Source: U.S. Bureau of Labor Statistics; Federal Reserve Bank of St. Louis (FRED).

FIGURE 2

Inflation Increased Rapidly After the COVID Recession, Triggering Early Rate Hike

The inflation rate from the onset of the recession to the FOMC's first increase in interest rates, the Great Recession and the COVID recession



Source: U.S. Bureau of Labor Statistics; Federal Reserve Bank of St. Louis (FRED).

Note: Inflation rate refers to the Consumer Price Index for All Urban Consumers: All Items in U.S. City Average (CPIAUCSL).

surprisingly strong, much stronger than many economists expected (Figure 1). This might be due to the strong fiscal and monetary support provided to the economy, which prevented large-scale defaults and helped maintain strong demand.

However, this strong support and the fast recovery, along with COVID supply chain disruptions, spurred inflation in the second half of 2021. Because of the increase in inflation, it took the Federal Reserve just two years after the COVID shock to tighten monetary policy, starting in March 2022. In contrast, after the Great Recession it took nine years before conditions warranted monetary policy tightening (Figure 2).

A central bank raises interest rates to dampen economic demand and thus relieve inflationary pressure, but higher rates might also slow the growth of employment in the labor market. Had employment fully recovered by the time the Federal Reserve began to tighten monetary policy earlier this year? Or was the labor market still lagging relative to the prepandemic? In this article, I address these questions.

As is well known, this recession was unique, with nonstandard effects on different demographic groups, so I divided the population into demographic groups and then analyzed how each group's employment recovered following the pandemic, relative to previous expansions. I find that although the recession is over for most demographic groups, the recovery of women without a college degree and of older workers is lagging.

For this analysis, I used employment-to-population ratios. However, the comparison of employment-to-population ratios through time is complicated by the fact that U.S. demographics have changed. The share of the population 55 years and older, which was 20 percent in 1990, had increased to 29 percent by 2020.

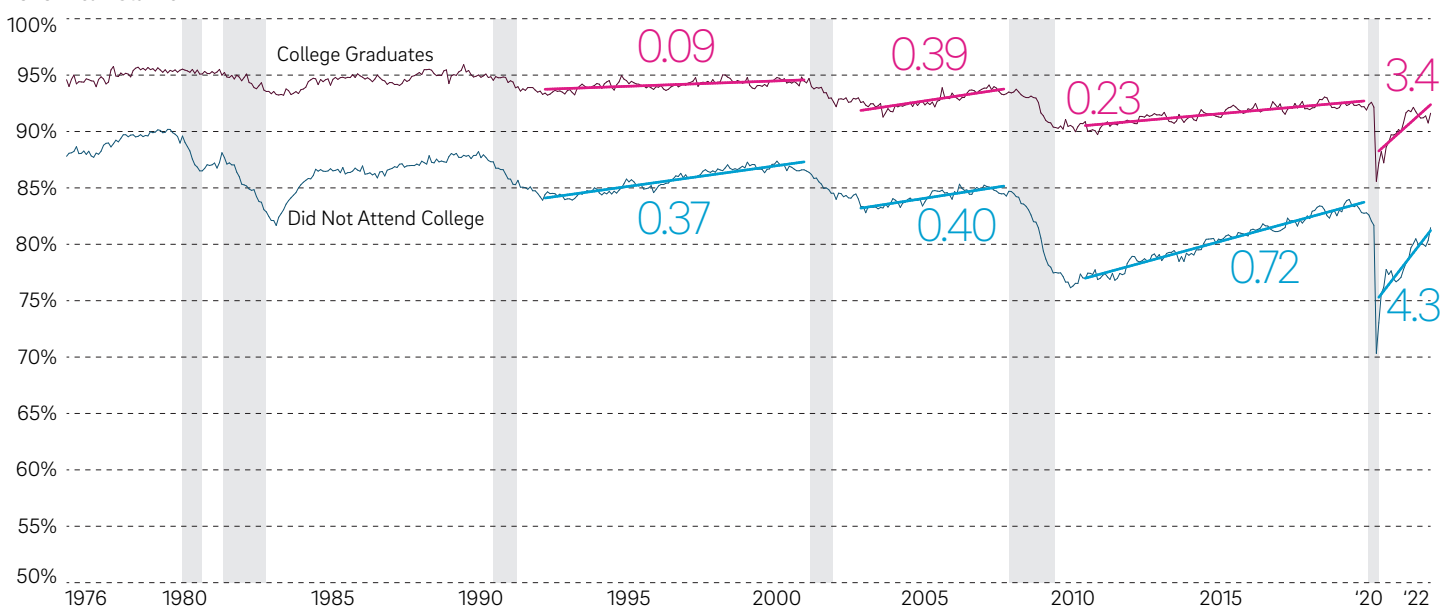
FIGURE 3

During Recessions, Men Without a College Degree Are More Likely to Lose Their Jobs

But during recoveries, they tend to find jobs faster.

Employment-to-population ratio, men 25–54 years old, with and without a college degree, 1976–2022

25–54 Year-Old Men



Source: Flood et al. (2021).

Note: The figure also plots linear trend lines for some of the expansions, highlighting the average percentage point increase in the employment rate per year during each expansion.

Given that prime-age people are more attached to the labor market than older people, aging might affect the evolution of the employment-to-population ratio on its own. To overcome this effect, I focused on the prime-age population. I also looked at men and women separately, as women substantially increased their labor force participation in the 1980s, whereas men did not.

Prepandemic Recoveries Followed a Predictable Pattern

Comparing Men With and Without a College Degree

Employment of men without a college degree drops more than it does for college-educated men during recessions (Figure 3).¹ In turn, during recoveries, men without a college degree typically see their employment grow faster than do college-educated men. For example, following the 1990 recession, the employment rate grew 0.4 percentage point per year for men without a college degree, whereas it barely grew for the college educated.

This pattern was even more stark during the Great Recession, when the employment rate declined a whopping 9 percentage points for men without a college degree but only 3 percentage points for college-educated men. And then, during the recovery, the employment rate grew 0.7 percentage point per year for men without a college degree but only 0.2 percentage point per year for college-educated men.

This suggests that long recoveries are especially important for the increase in the employment rate of men without a college degree.² Another thing to notice is that the employment rate increased steadily in some of these expansions for men without

a college degree, especially during the more recent ones—that is, the employment rate was on a linear upward-sloping trend line throughout the expansion. In most macroeconomic models, the natural employment rate is below 100 percent, because there is always some necessary churning in the economy, with firms exiting and entering and people switching to preferable jobs. In addition, some people might exit the labor force because, for example, they develop health problems or need to take care of family. As an expansion continues, the economy gets closer to this natural employment rate, and the yearly increase in the employment rate should slow down. It's important to have a sense of where this natural employment rate is because, as the economy approaches that point, the Federal Reserve might need to tighten monetary policy to relieve inflationary pressure. However, for recent expansions, it has been hard to pin down the point at which the growth of the employment rate slowed down for men without a college degree. For example, in the post-Great Recession expansion, the employment rate for men without a college degree increased steadily on the same linear trend for the full 12-year expansion with no slowdown. This shows how challenging it is to estimate the natural rate for men without a college degree.

Many economists suggest that the natural employment rate for men without a college degree has drifted downward, but the data raise doubts about this conclusion. Assuming there are limits to how fast employment can recover, the U.S. economy's expansion after the Great Recession might have been too brief for this group's employment to climb back to its natural rate; their employment rate might have climbed even higher but for the pandemic.

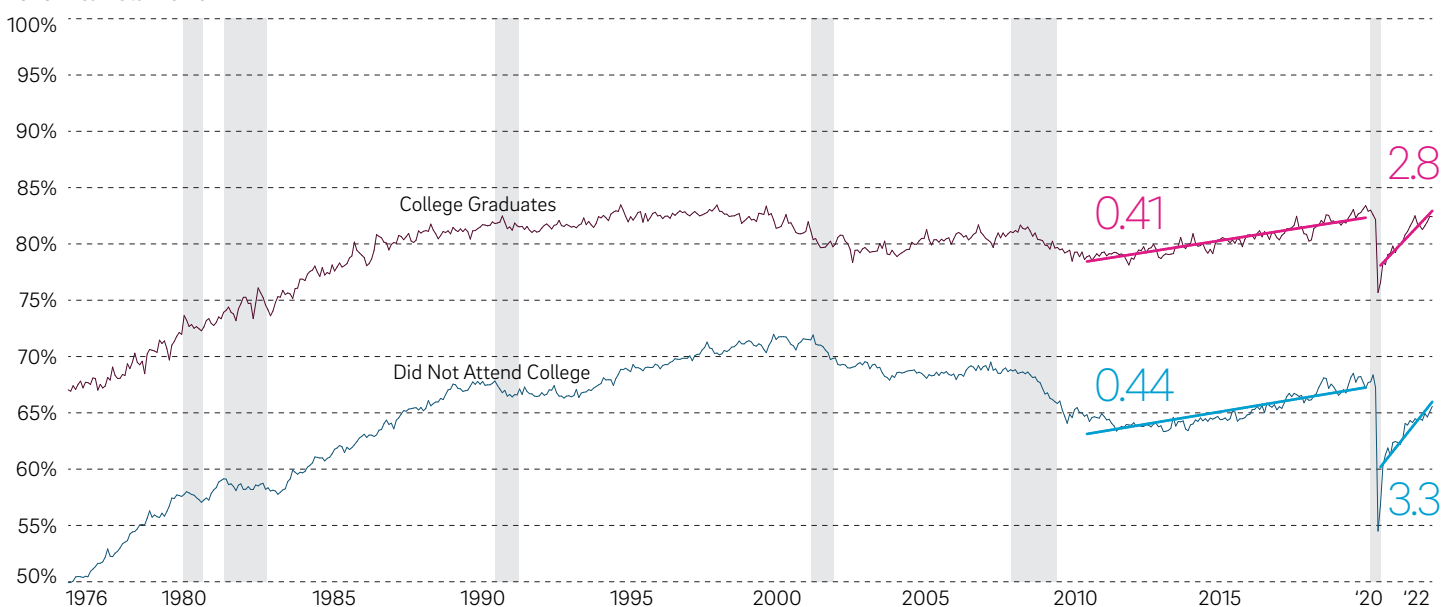
FIGURE 4

Strong Growth in Women's Employment Makes It Hard to See How Pre-2000 Recessions Affected Them

But it seems that for women without a college degree, the employment rate grows faster at the end of an expansion.

Employment-to-population ratio, women 25–54 years old, 1976–2022

25–54 Year-Old Women



Source: Flood et al. (2021).

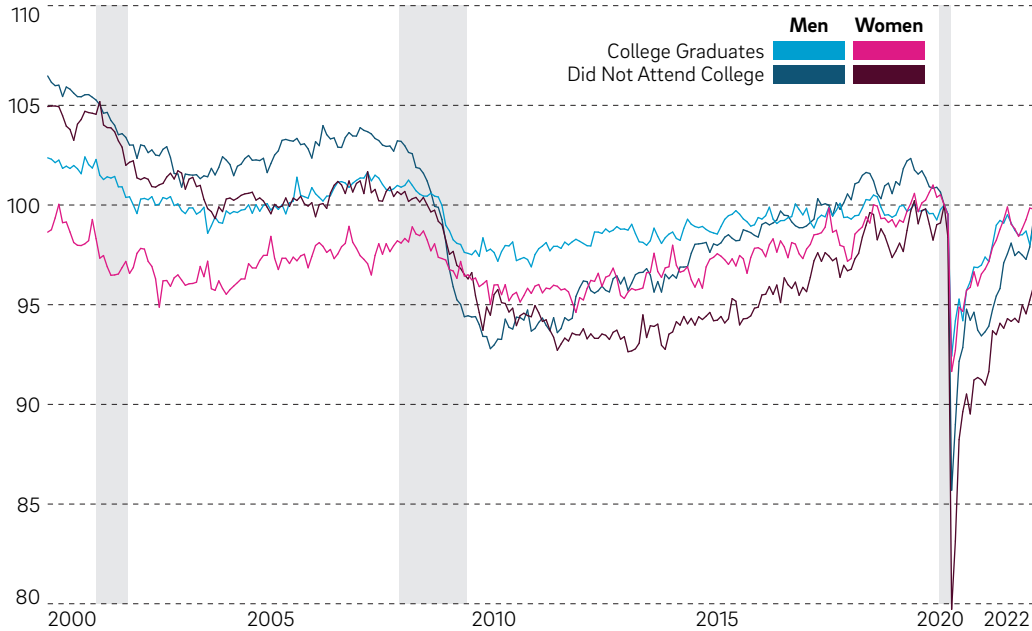
Note: The figure also plots linear trend lines for some of the expansions, highlighting the average percentage point increase in the employment rate per year during each expansion.

FIGURE 5

The Pandemic Recession Was Extremely Severe for All Groups

But women without a college degree suffered more during the recovery.

The employment-to-population ratio, normalized to 100 as of February 2020, for four demographic groups, 2000–2022



Source: Flood et al. (2021), author's calculations.

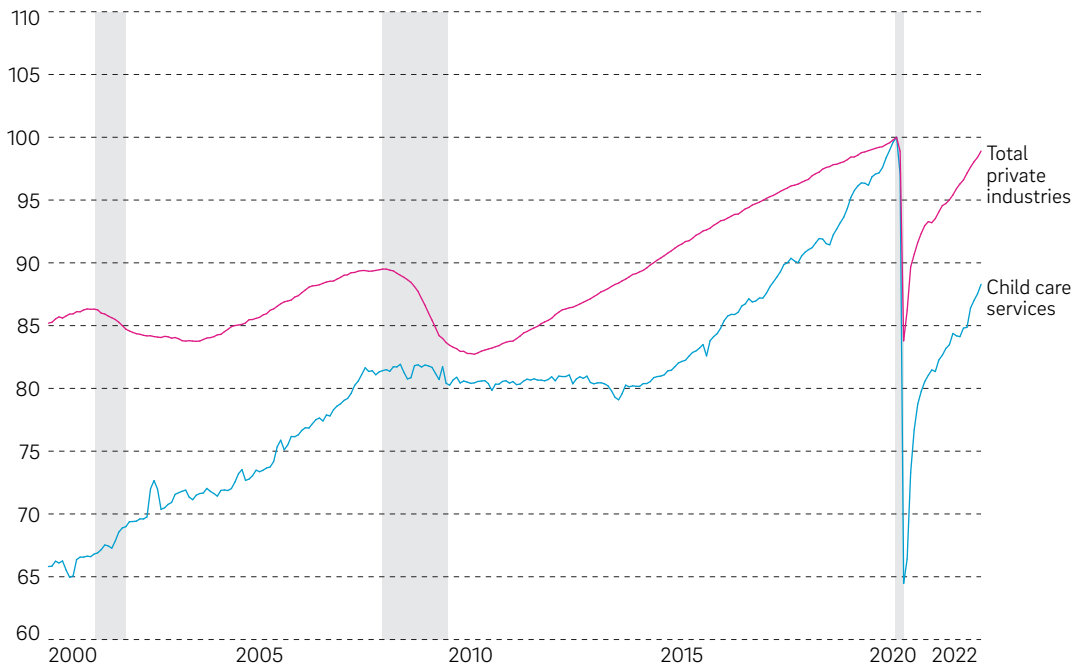
FIGURE 6

The Recovery in Child Care Services Employment Lags the Recovery in Other Sectors

This lag may be holding back the labor market recovery of women without a college degree.

Total employment in all private industries and in child care services, normalized to 100 as of February 2020

Employment in Child Care Services



Source: Haver Analytics, U.S. Bureau of Labor Statistics' Current Employment Statistics, author's calculations.

Comparing Women With & Without a College Degree

The employment rate for women increased strongly until the 2000s, which makes it hard to discern how recessions affected women before then (Figure 4). Similar to the case for men without a college degree, the expansion following the Great Recession improved the employment rate of both college-educated and less-than-college-educated prime-age women quite steadily. The employment rate increased around 0.4 percentage point a year for both groups during the expansion, without an apparent slowdown.

Indeed, for women without a college degree, the employment rate seems to have grown faster at the end of the expansion. Keep in mind that inflation was still lower than the Federal Reserve's target at the end of this expansion. These facts make it difficult to estimate where the natural employment rate lies for both college-educated and less-than-college-educated women.

A Remarkably Fast COVID Recovery, but Not for Everyone

To find out how different groups fared in the expansion following the pandemic shock, I normalized the employment-to-population ratio of each group to 100 as of February 2020, just before the recession hit. I then compare the recovery to these normalized employment rates.

The pandemic recession was extremely severe, surpassing the severity of the Great Recession (Figure 5). And, as in previous recessions, men without a college degree suffered a bigger decline in employment than did college-educated men. However, the

subsequent recovery has been remarkably fast. For college-educated men and women, the recession is over, and both groups are very close to their prepandemic employment-to-population ratio. For men without a college degree, the recovery started slowly but then sped up. By February 2022, their employment rate was only 1 percentage point below its prerecession level.

An outlier relative to previous recessions is the employment losses of women without a college degree. In the Great Recession, the decline in their employment rate was around half of the decline for men without a college degree, while in the COVID recession, their normalized employment rate declined 5 percentage points more. Two years into the pandemic, as of February 2022, their normalized employment rate was still 4 percentage points below its prerecession level.

The Role of Child Care in the Labor Market Recovery

School closures and the decline in child care availability may be depressing the labor market recovery of women without a college degree.³ As of February 2022, total private employment was back to its prepandemic level, but child care services employment was still 12 percentage points below its prepandemic level (Figure 6).

Why is this industry still lagging? Perhaps because many child care providers went out of business when demand collapsed—and given their typically low profit margin and the recent wage and rent inflation, it is difficult to bring them back. Although child care services employment is not a huge share of aggregate

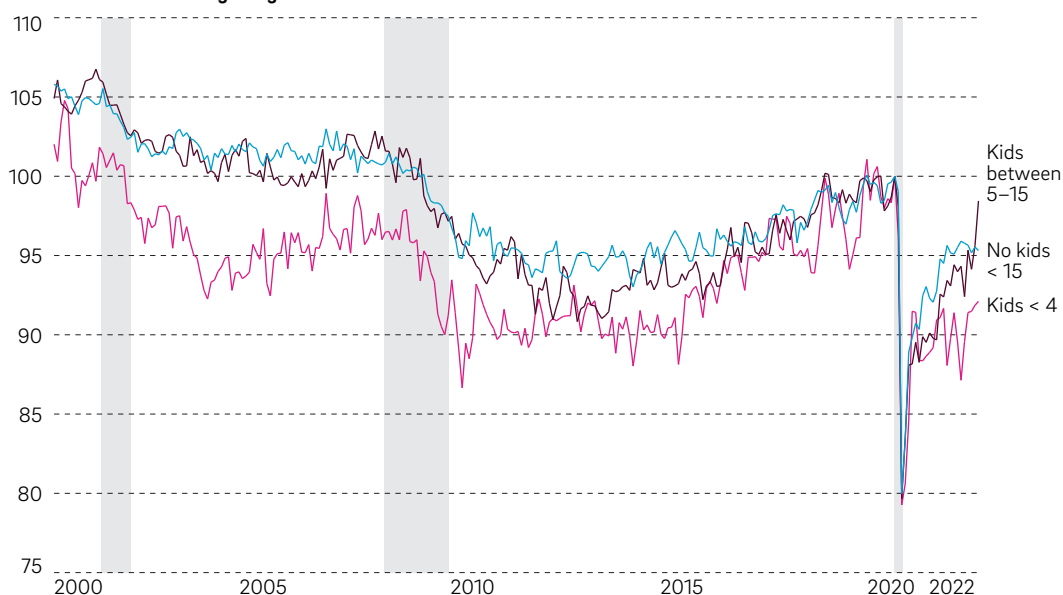
FIGURE 7

Employment of Women with Kids Spiked After Pandemic's Nadir

But employment of women with preschool children has lagged.

Number of prime-age women without a college degree and with or without dependent children, in millions, 2000–2022

Women Without a College Degree



Source: Flood et al. (2021), author's calculations.

employment, one would expect its decline to disproportionately affect the employment of women.

To isolate the differing effects of school closures and the lack of child care services, I divided prime-age women without a college degree into three groups: women whose youngest child is less than 5 years old (that is, preschool children); women whose youngest child is from 5 to less than 15 years old (that is, school-age children); and women with no children younger than 15 years old. I found that employment of women with school-age children has quickly increased since October 2021 (Figure 7). This makes sense, as almost all U.S. schools opened fully in-person in the 2021–2022 academic year: According to surveys conducted by the Institute of Education Sciences, on the last day of the 2020–2021 school year, 62 percent of schools offered full-time in-person education; that share increased to 100 percent in September 2021. This suggests that school closures were indeed depressing employment for this group.

On the other hand, for women without a college degree and with preschool children, the employment rate was stalled at 8 percentage points below its prepandemic level two years into the pandemic. This is consistent with the fact that finding affordable child care is a continuing challenge for this group.

The Effect of COVID on Older Workers

Next, I compared the employment rate for the population 55 and over with the rate for the population 25–54 years old, again normalizing the employment rate in February 2020 to 100. So as not to overwhelm the reader, I do not distinguish with respect to gender.

What effect do recessions have on the employment rate of older workers? Before the Great Recession, it's hard to say, because their employment rate was on an upward trend in the early 2000s. But we can see that the Great Recession's impact on the employment rate was milder for the older group (Figure 8). During the Great Recession, the employment rate for the 25–54 population declined 6 percentage points, whereas it declined only 2 percentage points for the 55+ population. It is well known that older people might have a harder time finding a job once they become unemployed. On the other hand, they are less likely than younger workers to lose their jobs, perhaps because of their longer tenure in their jobs. For these older workers, a longer tenure outweighs the greater difficulty in finding a job, leading to a smaller decline in employment for older people during recessions.⁴

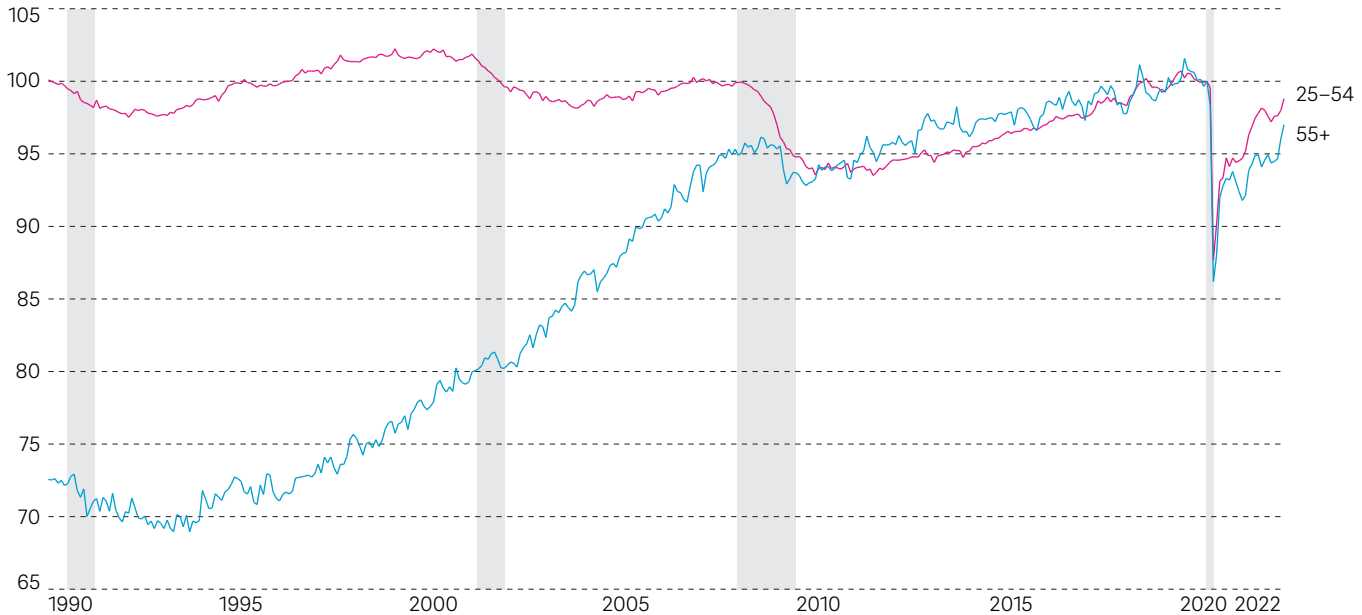
This contrasts with what happened during the COVID recession. In 2020, the employment rate of older people declined more than for younger people. This difference persisted throughout the expansion: In February 2022,

FIGURE 8

Older Workers Suffered Less During the Great Recession and More During COVID

The employment-to-population ratio, normalized to 100 as of February 2020, for people 55 and older, and for people 25–54 years old, 1990–2022

Employment Rate for Old vs. Young



Source: Flood et al. (2021), author's calculations.

the employment rate for the prime-age population was 1 percentage point below its prepandemic level, whereas for the older group it was 3 percentage points lower. It might be particularly difficult to absorb older people back into the labor force, given that COVID risks continue, and older people, once they become unemployed, are more likely to retire.⁵

Conclusion

The U.S. labor market quickly recovered from the COVID shock, but the recovery was uneven. For some groups, such as prime-age men and college-educated, prime-age women, the recovery is almost complete, and their employment is back at its prepandemic level. The employment rate of prime-age women without a college degree, however, is still low relative to before the pandemic. Older people also suffered more in this recession.

On the other hand, the COVID shock has revolutionized the labor market by making work-from-home more acceptable. A question not addressed in this article is whether this revolution is increasing the employment of groups averse to long commutes or being away from home, and whether some of the fast recovery can be attributed to this revolution. On the other hand, this revolution affects groups differently. Surveys conducted by the Bureau of Labor Statistics show that during the pandemic, 70 percent of college-educated workers could telework, while only 30 percent of high school graduates without a college degree could.⁶ A more prevalent work-from-home option might exacerbate inequities in the labor market and explain the employment lag of women without a college degree. **■**

Notes

1 Employment rates apply only to the noninstitutional population and exclude people not working because they are in school or training. The underlying data are micro IPUMS-CPS, and all series are deseasonalized. Except for the COVID recovery, I start the trend recovery line at one year after the trough of the NBER recession, because the labor market starts recovering a bit later than GDP. I end the trend line three months before the peak (that is, before the recession begins), because in some cases the labor market slows down just before a recession. For the COVID recovery, given the short range of the data, I start the trend line in May 2020.

2 Aaronson et al. (2019) similarly argue that when the labor market is already strong, a further increment of time during which the economy grows provides extra benefits to some disadvantaged groups, relative to earlier in the labor-market cycle.

3 Because of this, the popular press sometimes refers to the COVID recession as a “shecession” (she-recession). Ippei Shibata also explores the effect of women’s occupational and sectoral employment on their higher job losses during the COVID recession.

4 See Richard Johnson's in-depth analysis of how older workers were affected during the Great Recession.

5 Sewin Chan and Ann Stevens show that the lower earnings potential of older people after a job loss leads them to retire early.

6 See Dey, Frazis, and Loewenstein (2020).

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Banking Trends

Regulatory Changes and Community Banks During COVID

Small banks that received capital relief appear to have been more resilient.

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

In the first quarter of 2020, while the economy was being shocked by an unprecedented pandemic, a new banking regulation—the Community Bank Leverage Ratio (CBLR)—coincidentally took effect. This regulation, which was formulated long before COVID, permitted community banks to elect to use a single, simplified capital requirement in exchange for a higher minimum capital level. This article contrasts the subsequent behavior of those banks that elected to use the CBLR with those that didn't. The results show that in 2020 and 2021, asset and loan growth at CBLR-compliant banks caught up to growth at banks that did not participate, and they also reported more consistent dividend payments.

What Is the CBLR?

To understand the CBLR, we must define capital ratios, a key component of bank regulation. Regulators care about capital ratios because they demonstrate a bank's ability to weather an economic downturn. The simplest capital ratio is the leverage ratio, or bank capital divided by the dollar value of bank assets. Currently, the minimum leverage ratio in the U.S. is 5 percent. Banks that fail to maintain this minimum ratio face regulatory action such as restrictions on paying dividends or limitations on permitted activities.

A second capital ratio, the risk-weighted asset ratio, accounts for the riskiness of the bank's assets. For example, consider two different types of bank assets: home loans and business loans. Home loans

such as residential mortgages have a moderate risk and receive a 50 percent risk weight. Business loans are riskier and often receive a risk weight of 100 percent.¹ Once we determine risk-weighted assets, we can calculate a capital ratio by dividing capital by risk-weighted assets.² Consider a bank that has \$200 in assets, \$100 in Treasury securities (weighted 0 percent), and \$100 in residential mortgages (weighted 50 percent). If this bank holds \$20 in capital, then its leverage ratio would be 10 percent ($\$20/(\$100+\$100)$) and its risk-weighted capital ratio would be 20 percent ($\$20/(\$0 + \$100)$). In the U.S., the standard minimum risk-weighted capital ratio is 8 percent.³

To reduce the regulatory burden on community banks (defined as banks with less than \$10 billion in assets), Congress introduced the CBLR as part of the Economic Growth, Regulatory Relief, and Consumer Protection Act of 2018. Community banks may opt into this framework as long as they have a low-risk profile.⁴ Under the CBLR, they need only satisfy a minimum leverage ratio to be considered well capitalized, and they no longer need to satisfy the risk-weighted capital ratio regulations. Risk weighting can be time consuming because accurately assessing the risk of different assets is a complex process.⁵ Although community banks have to comply with many regulations beyond asset weighting, removing this component could allow staff to spend time and resources elsewhere. However, the CBLR does present a trade-off for banks, because the CBLR leverage requirement was set at 9 percent, well above the standard 5 percent. In other words, banks that opt in have a higher minimum leverage ratio, but that becomes their only regulatory capital requirement.

Although all banks with less than \$10 billion in assets and relatively low-risk portfolios were eligible to adopt the CBLR framework, only some eligible banks chose to adopt the framework. (I call these “CBLR banks.”) Others chose not to. (I call these “non-CBLR banks.”) Out of approximately 3,600 community banks that met qualifying criteria at the end of 2020, about 50 percent of them elected to use the CBLR framework.

The CBLR was finalized and officially implemented in the first quarter of 2020, the same quarter that the COVID-19 pandemic began. Though the CBLR minimum was set at 9 percent, the Coronavirus Aid, Relief, and Economic Security (CARES) Act provided a form of capital relief for CBLR banks, lowering the capital minimum requirement to 8 percent in 2020 and 8.5 percent in 2021 before returning to the standard 9 percent in 2022.⁶ Unfortunately, the concurrent timing of the CBLR and the CARES Act makes it impossible to disentangle their effects, so the following analysis likely reflects both regulatory changes.

CBLR Banks and Non-CBLR Banks Prior to the Pandemic

Banks that adopted the CBLR tended to be smaller than those that did not. From 2015 through 2019, CBLR banks held an average of \$294 million in assets. Over this same period, non-CBLR banks held an average of \$620 million in assets, more than twice that of CBLR banks.

This difference might be due in part to the nature of the CBLR framework. Congress created the CBLR to reduce the regulatory burden for community banks, and this burden may have been more onerous for smaller community banks, making the CBLR more attractive for those banks. To understand why, we need to understand capital buffers. Banks typically choose to hold capital above the minimum required level—that is, they hold a capital buffer—to ensure that a temporary or unexpected negative shock doesn’t lead to a breach of the capital requirement. The larger the capital buffer, the higher that bank’s capital ratio will be, so a bank that already holds capital well above the minimum requirement will find it easier to voluntarily raise that minimum. In general, we expect small banks to hold a large buffer because a downturn in the local economy could lead to substantial losses for a very small bank’s loan portfolio, which would normally be dominated by loans to local borrowers. A larger bank can more easily diversify its portfolio across many localities, protecting itself against a downturn in any one locality.

In the five-year period preceding the pandemic, CBLR banks had an average leverage ratio of 12.4 percent, and non-CBLR banks had an average leverage ratio of 11.7 percent. That is, the smaller CBLR banks maintained a higher capital buffer than the larger non-CBLR banks. As a result, increasing the minimum leverage ratio from 5 percent to 9 percent might pose less of a burden for the smaller banks, especially if their leverage ratio is normally well above 10 percent. Also, smaller banks may find it harder to bear the costs of calculating their risk-based capital ratio. For example, to pay an accountant to manage the risk-weighting calculations, a small bank may need to restrict the staff hours of branch tellers.

If a bank finds itself with excess capital, it may choose to pay a portion of that out in dividends, and CBLR and non-CBLR banks do indeed exhibit different dividend behavior. As a fraction of assets, non-CBLR banks paid dividends above 0.6 percent of assets each year from 2015 through 2019; in two of those years, they paid dividends above 0.7 percent. Over the same period, CBLR banks always paid dividends of only around 0.6 percent and never exceeded 0.63 percent of assets in any year.

CBLR

\$294^{mn}
Average assets
2015–2019

12.4%
Average leverage ratio
2015–2019

~0.6%
Paid dividends
% of assets, 2015–2019

Non-CBLR

\$620^{mn}
Average assets
2015–2019

11.7%
Average leverage ratio
2015–2019

>0.7%
Paid dividends
% of assets, 2015–2019

Source: Federal Financial Institutions Examination Council (FFIEC) Reports of Condition and Income (Call Reports).

CBLR and Non-CBLR Banks During the Pandemic

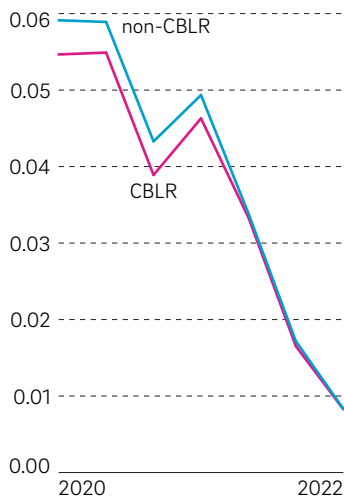
In the five years prior to the pandemic, CBLR banks grew more slowly than non-CBLR banks. This was a relatively stable period of good economic growth, after the adoption of new, post-Great Recession regulations. Non-CBLR banks tend to be larger than CBLR banks, so they are likely to be more efficient and experience better financial performance. In a 2016 paper examining community bank performance based on size, Rutgers University economics professor Joseph P. Hughes and his coauthors “find that better financial performance is associated with larger asset size.”⁷ This is consistent with my findings, as CBLR banks grew 2 percentage points slower before the pandemic than their non-CBLR counterparts as estimated from their asset growth (Figure 1).⁸

But early in the pandemic—in the second quarter of 2020—the growth of assets and loans at CBLR banks caught up to the growth at non-CBLR banks. Both groups saw a high level of loan growth in 2020, reaching more than 10 percent annual growth, well above loan growth during

FIGURE 2

PPP Loan Growth at CBLR Banks Was Not Larger Than at Non-CBLR Banks

CBLR bank asset growth was not due to more PPP lending going to CBLR banks. Total PPP loans outstanding over total assets, CBLR and non-CBLR banks, 2020–2021



Source: Federal Financial Institutions Examination Council (FFIEC) Reports of Condition and Income (Call Reports).

the preceding five years at CBLR banks. After the onset of the pandemic, CBLR and non-CBLR banks had nearly identical growth rates in subsequent quarters in both asset and loan growth. This catching up is true for all categories of loans (consumer, commercial, and real estate), and was not due to the Paycheck Protection Program (PPP).⁹ Indeed, non-CBLR banks made more PPP loans (as a share of assets) than CBLR banks (Figure 2).

From 2015 through the second quarter of 2020, the average leverage ratios for CBLR and non-CBLR banks tended to move in tandem, with CBLR banks holding a leverage ratio consistently about 0.5 percentage point higher than the leverage ratio at non-CBLR banks. During the pandemic, banks in both groups lowered their leverage ratios closer to (but still well above) their minimum requirements. However, CBLR banks continued to lower their leverage ratios throughout 2021 (Figure 3). This may be evidence that CBLR banks took advantage of the capital relief provided through the CARES Act.

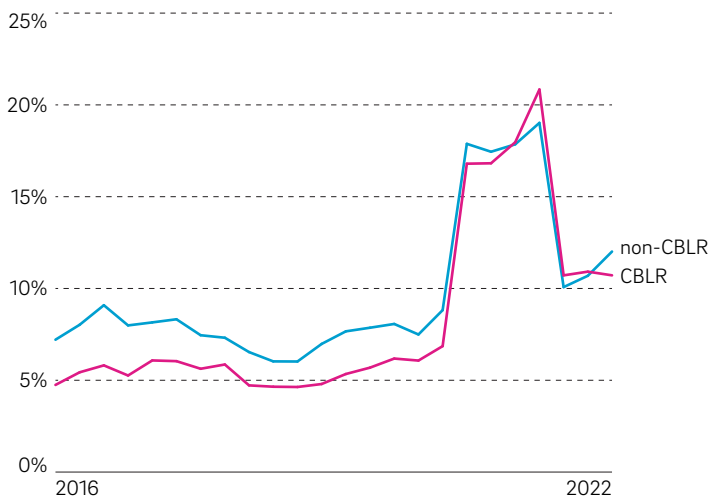
In 2020 and 2021, non-CBLR banks’ dividend payments fell to a level just above that of CBLR banks (Figure 4). Non-CBLR

FIGURE 1

Total Asset Growth at CBLR Banks Lagged Before COVID

Assets at CBLR banks grew as fast as assets at non-CBLR banks during the pandemic.

Total asset growth, CBLR and non-CBLR banks, 2016–2021



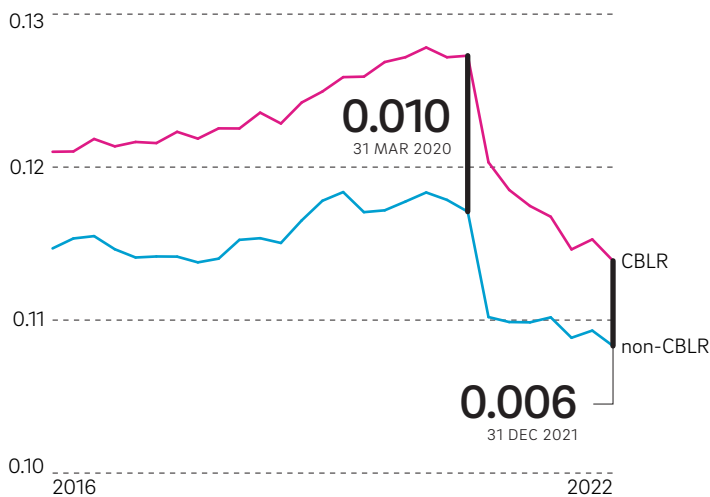
Source: Federal Financial Institutions Examination Council (FFIEC) Reports of Condition and Income (Call Reports).

FIGURE 3

Leverage Ratios at CBLR Banks Fell by More in 2021

This may be partially explained by the capital relief provided through the CARES Act.

Aggregate leverage ratio, CBLR and non-CBLR banks, 2016–2021



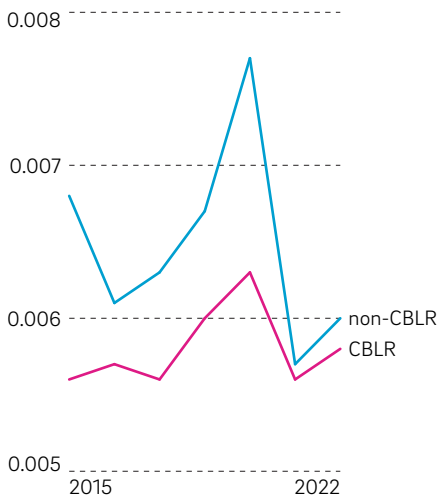
Source: Federal Financial Institutions Examination Council (FFIEC) Reports of Condition and Income (Call Reports).

FIGURE 4

Dividends Fell by More at Non-CBLR Banks

Dividend payments at CBLR banks were consistent during the downturn.

Total dividends over total assets, CBLR and non-CBLR banks, 2015–2021



Source: Federal Financial Institutions Examination Council (FFIEC) Reports of Condition and Income (Call Reports).

banks, which did not receive any capital relief, may have needed to retain more earnings in order to keep their capital at a desired level. Unlike non-CBLR banks, CBLR banks continued to pay dividends comparable to the prepandemic level. CBLR banks had more flexibility in their capital requirements, thanks to the 1-percentage-point reduction in their anticipated minimum capital requirement of 9 percent. Thus, CBLR banks may have been able to use that capital to pay additional dividends to their shareholders.

These comparisons do not prove that the regulatory change caused the subsequent behavior. Since the program was voluntary, we can't rule out the possibility that banks that intended (or expected) to grow faster and reduce their required capital, even without the CBLR option, incidentally chose to become CBLR banks.¹⁰ Although the evidence is suggestive, we can't conclusively demonstrate causality without a more careful analysis.

Conclusion

Before the 2020 recession, assets and loans at CBLR banks tended to grow slower than at non-CBLR banks, but during the downturn, CBLR and non-CBLR banks grew at a similar rate. This is unexpected: In a difficult economic environment, we would not normally expect the smaller, slower-growing CBLR banks to grow at the same rate as the non-CBLR banks. CBLR banks also reduced their leverage ratios significantly more than non-CBLR banks during the downturn, although both remained well capitalized. The declining leverage ratio suggests that CBLR banks may have had an advantage in the form of capital relief, which initially lowered their capital requirement by 1 percentage point. At the same time, CBLR banks maintained their dividend payments, even as other small banks reduced their dividend payments and regulators imposed limits on payouts to stockholders by large banks.

Overall, it appears that CBLR banks were more resilient than non-CBLR banks during the pandemic, and my evidence supports the view that this was due to the new capital regime and capital relief. ■

Notes

1 This example draws on the first iteration of the Basel Accords, Basel I, which uses a simpler version than the current risk-weighting asset groups.

2 Tier 1 capital, or core capital, is mostly made up of retained earnings and common stock on a bank's balance sheet.

3 See D'Erasmus (2018) for a more in-depth discussion of risk-weighted capital ratios.

4 A low-risk profile requires that the banks have low off-balance-sheet exposure (less than 25 percent of assets) and trading assets and liabilities are de minimis (less than 5 percent of assets). All requirements for the CBLR are ongoing, although banks can take a two-quarter grace period if they fall out of compliance.

5 In a 2012 survey by the Federal Deposit Insurance Corporation (FDIC), community bankers shared that "they have increased staff over the past ten years to support the enhanced responsibility associated with regulatory compliance."

6 According to the Congressional Research Service, "Section 4012 of the CARES Act temporarily lowers the CBLR to give qualifying banks using this capital measure more leeway to continue lending and stay above the threshold as the pandemic's economic effects unfold."

7 Hughes et al. (2019).

8 Growth of the loan portfolio is similar. Loan growth at CBLR banks was 1.5 percentage points slower.

9 The PPP was a part of the CARES Act. The program allowed banks to make loans to small businesses directly; eligible loans then qualified for government loan forgiveness. The program expanded bank lending during this period.

10 Figures 1, 3, and 4, show that the changes in the behavior of CBLR banks were not a continuation of some prior trend—that is, the data obey parallel trends, a necessary condition for establishing causality.

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Photo: FG Trade/iStock

The Pandemic Mortgage Boom

We learn a lot about the mortgage market by understanding why it defied expectations during the pandemic.

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The U.S. mortgage market experienced a surprising boom in 2020 and 2021, with new lending reaching an all-time high in excess of \$4 trillion per year. The boom is particularly striking in light of the challenges the mortgage market faced as the COVID-19 pandemic took hold in the U.S. in March 2020. The emergence of the virus led to financial market disruptions and a short but deep recession, prompting concerns about a potential spike in mortgage defaults and foreclosures and the possible failure of mortgage lenders and servicers. Understanding the mortgage boom is important because mortgages are by far the largest component of household debt and because mortgage market conditions significantly affect the housing market, household spending, and financial stability.

In this article, we present facts about the pandemic mortgage boom and discuss the reasons why the mortgage market was able to prosper during a period of such economic uncertainty. We find that record-low interest rates, a relatively rapid economic recovery, and surging home prices all contributed in important ways to the lending boom. Underlying these outcomes, government policy actions, including expansionary monetary and fiscal policy and policies to stabilize mortgage intermediaries, played a significant role in supporting the mortgage and housing markets.

We also highlight some important limits of the boom. First, the mortgage industry faced significant capacity constraints as originators scrambled to expand lending in a challenging operating environment. As a result, only part of the decline in financial market yields was passed along to mortgage borrowers in the form of lower interest rates. (Yield in this context refers to the rate of return over the life of a fixed-income security such as a Treasury bond or mortgage-backed security.) In other words, although fixed mortgage rates fell to record lows below 3 percent in 2020 and 2021, rates could have been even lower if the credit supply had been more elastic.

Second, the low-rate environment did not benefit all mortgage borrowers equally. Mortgage rates did not fall as much for certain types of loans, such as those for large “jumbo” mortgages not eligible for government-backed credit guarantees. And Black, Latino, and Asian borrowers were less likely to refinance and thereby benefit from lower mortgage rates. This inequality in refinancing opportunities highlights the potential benefits of alternative mortgage contracts designed to allow mortgage rates to decline automatically along with market rates, sparing the borrower from needing to refinance.

The Boom in Context

Lenders originated \$4.1 trillion in new mortgage loans in 2020—a new record, and much higher than nominal lending volume in any year since 2003 (Figure 1). The torrid pace of lending continued in 2021, with an even higher \$4.4 trillion of originations.¹

This surge in lending was closely connected to lower mortgage interest rates. The Freddie Mac benchmark 30-year fixed mortgage rate fell below 3 percent for the first time in July 2020 and remained at or close to its all-time low through the rest of 2020 and 2021 (Figure 2).²

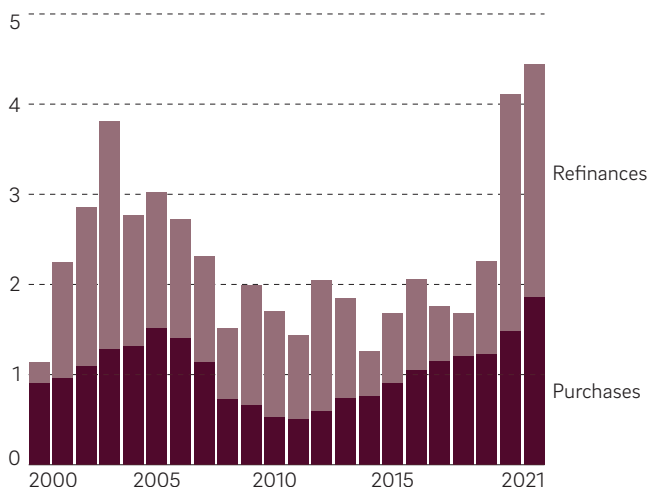
A drop in mortgage rates boosts lending through two main channels. First, it incentivizes borrowers to refinance their existing mortgages at the new, lower market interest rates. Reflecting this incentive, refinancing more than doubled from 2019 to 2020, from \$1.0 trillion to \$2.6 trillion, accounting for the majority of the total rise in mortgage lending.³ Second, lower interest rates increase homebuyers’ purchasing power, likely providing a tailwind for the housing market, particularly as the economy started to show signs of recovery.⁴ This was reflected in a smaller but still significant increase in the volume of “purchase mortgage” lending—that is, lending used to finance a home purchase.

Subsequently, the path of mortgage interest rates abruptly changed course in 2022—the benchmark 30-year fixed mortgage interest rate rose from 3.1 percent at the end of 2021 to 6.9 percent in October 2022, a level of rates not seen since 2002. Recent

FIGURE 1

Mortgage Lending Surged to Record Levels in 2020 and 2021

First-lien mortgage originations on single-family homes, purchase mortgages, and refinances, trillions of dollars, 2000–2021



Source: Mortgage Bankers Association via Haver Analytics.

FIGURE 2

The Lending Boom Was Linked to a Drop in Mortgage Rates

The same thing happened during the earlier refinancing wave of 2002–2003.

Benchmark market interest rate on 30-year fixed-rate conforming residential mortgages, 2000–2022



Source: Freddie Mac Primary Mortgage Market Survey.

data suggest this sharp rise in borrowing costs has significantly curtailed mortgage lending activity, particularly for refinancing. Mortgage Bankers Association data indicate that applications for mortgage refinances in September 2022 were 84 percent lower than in the same month of 2021, while purchase applications were 30 percent lower. Similarly, total mortgage lending in the second quarter of 2022 was down by 42 percent relative to the second quarter of 2021. In short, it seems clear that the mortgage boom of 2020–2021 has now come to an end.

Initial Fears About the Mortgage Market

With the benefit of hindsight, 2020–2021 was a banner period for the mortgage market, but at the onset of the COVID-19 pandemic in March 2020 the mortgage outlook seemed highly uncertain, with the market apparently facing significant headwinds.

One concern was that the pandemic seemed to presage a challenging period for the housing market. Who would buy homes in such an uncertain environment? How would lenders conduct appraisals, inspections, and closings during a period of lockdowns and social distancing?

Financial markets were also extremely volatile in March 2020, making it difficult for mortgage lenders to manage risk. In particular, lenders faced large margin calls on “to-be-announced” (TBA) forward contracts, a type of financial derivative used by lenders to hedge the mortgages held in inventory while awaiting sale.⁵ This means that lenders were forced to front up additional cash as security to their counterparties after the value of their forward positions declined. These margin calls resulted in liquidity outflows of up to \$5 billion.⁶

The sharp economic downturn and spike in unemployment also raised the prospect of a surge in mortgage defaults and foreclosures similar to what was seen around the Great Recession in 2007–2009. Responding to the deteriorating economic situation, the federal government quickly stepped in to provide homeowner relief in the form of mortgage forbearance for borrowers facing financial difficulties, as part of the Coronavirus Aid, Relief, and Economic Security (CARES) Act signed into law on March 27, 2020.⁷ By May, 4.7 million borrowers were in forbearance, amounting to 9 percent of all borrowers.⁸ But while forbearance was a lifeline for many homeowners, it created problems for some of the financial institutions servicing their loans. Mortgage servicers are typically required, at least temporarily, to forward scheduled payments to investors and other parties even if the borrower is no longer making their mortgage payments. Forbearance was therefore a drain on the liquidity of these intermediaries.

There were particular concerns about the financial stability of nonbank mortgage

companies, which today play a critical role in the mortgage market, accounting for well over half of mortgage lending as well as the majority of mortgage servicing. These firms are more exposed to liquidity risk than banks or credit unions because they rely on short-term loans (known as “warehouse lines of credit”) from financial institutions rather than deposits, and because they do not have access to the Federal Reserve discount window or other liquidity backstops.⁹ Reflecting the risks at the time, the rating agency Moody’s switched its outlook for nonbank mortgage companies to negative at the start of April 2020, writing, “Our baseline scenario is that over the next several quarters non-bank mortgage firms will face ongoing liquidity stress, weaker profitability, as well as declines in capitalisation and asset quality.”¹⁰

The ultimate concern was the possibility of a liquidity crunch leading to a wave of nonbank mortgage company failures, similar to what occurred just prior to the Great Recession.¹¹ Widespread nonbank financial distress could reduce the mortgage credit supply, with negative repercussions for the housing market and real economy. Such an event could also reduce the quality of mortgage servicing (for example, by increasing the frequency of errors or reducing servicers’ capacity to work with borrowers to modify their loans), potentially resulting in excessive foreclosures or other adverse outcomes for borrowers in distress. In 2022, Darren Aiello found evidence of such effects among financially constrained mortgage servicers during and after the Great Recession.

See **Securitization and the Mortgage Finance System.**

What Caused the Boom?

Ultimately, however, the mortgage market shook off these challenges and enjoyed a period of rapid lending growth as well as record profits for mortgage intermediaries. Figure 3 plots the quarterly evolution of lending during this period. Loan volumes grew consistently in the quarters leading up to the pandemic, reflecting falling interest rates and a solid housing market. Against this backdrop, the initial

economic disruptions associated with COVID-19 are clearly apparent in the first quarter of 2020, which saw a sharp drop in lending for both purchase mortgages and refinances. But the market quickly recovered. Originations peaked in the fourth quarter of 2020 at almost \$1.4 trillion, nearly double the level of the fourth quarter of the prior year. Although refinancing led the way, mortgage lending for home purchases also recovered strongly, and by the second half of 2020 it was running well above 2019 levels.

What accounts for this rapid recovery and the magnitude of the credit boom? Three key factors stand out.

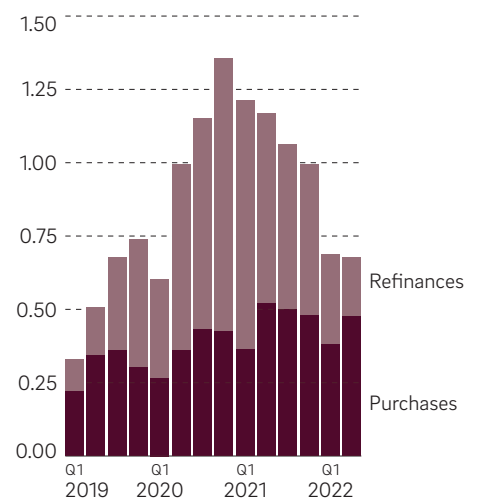
Government Policies

Expansionary fiscal policy and other federal government policy actions played a key role in stabilizing the mortgage market and the broader economy, particularly early in the pandemic. The CARES Act provided transfer payments to firms and to unemployed workers, supporting incomes and consumption. Mortgage forbearance prevented a wave of foreclosures that might have otherwise put downward pressure on home prices.¹² And actions by housing agencies helped support nonbank mortgage companies.

FIGURE 3

After a Drop in the First Quarter of 2020, Mortgage Lending Bounced Back Quickly

First-lien mortgages on single-family homes, trillions of dollars, quarterly, 2019–2022



Source: Mortgage Bankers Association via Haver Analytics.

For example, the government-sponsored enterprises Fannie Mae and Freddie Mac capped mortgage servicer advances for loans in forbearance, and Ginnie Mae created the Pass-Through Assistance Program (PTAP), a new liquidity facility for servicers.¹³

Monetary policy was also expansionary. The Federal Reserve reduced short-term interest rates to almost zero and implemented a significant new round of quantitative easing by purchasing large quantities of Treasuries and agency mortgage-backed securities (MBS). As a result, the Fed’s MBS portfolio grew rapidly during the early months of the pandemic, from \$1.37 trillion in March 2020 to \$1.90 trillion by early July.¹⁴

Low Interest Rates

As a result of the Federal Reserve’s actions and the overall economic environment, long-term interest rates in financial markets fell significantly over the course of 2020, and lenders consequently lowered their mortgage rates (Figure 4). Mortgage interest rates are typically closely tied to MBS yields in financial markets because most loans are packaged into securities and sold to investors.¹⁵

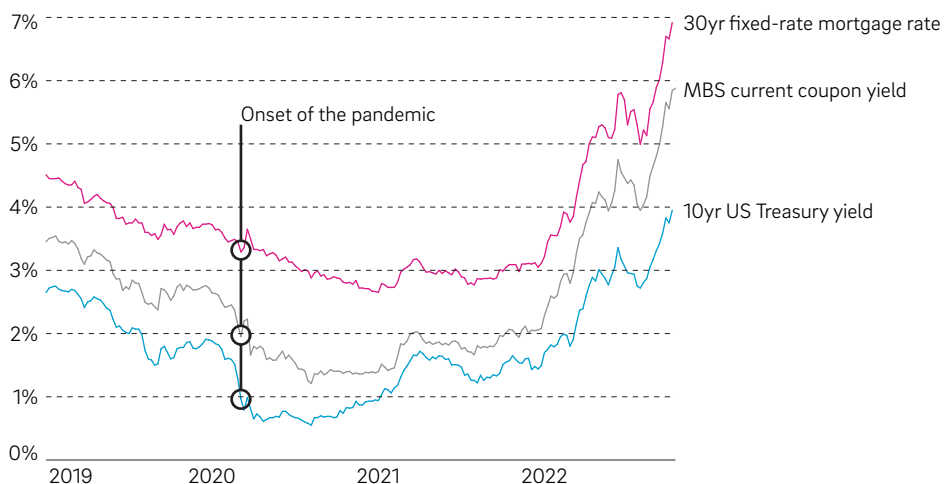
As discussed above, lower mortgage rates prompted a surge in mortgage refinancing activity. Refinancing was particularly strong for prime borrowers with high credit scores (Figure 5). The market was already primed for a period of elevated refinancing because rates had fallen significantly throughout 2019. But the further decline in rates in 2020 pushed refinancing to record levels, at least in nominal dollar terms.¹⁶

Aside from being a boon to households, the refinancing boom also provided significant support for nonbank mortgage companies through at least two channels. First, the volume of lending generated high fees and profits for mortgage lenders, strengthening their balance sheets. Second, refinancing provided a direct source of liquidity to mortgage companies because when a borrower refinances, the money used to pay off the original loan is held in trust by the mortgage servicer for around a month before it is forwarded to MBS investors. The surge in refinancing therefore provided a significant “float” of

FIGURE 4

Lower Mortgage Rates Reflected a Decline in Financial Market Yields

MBS current coupon yield, 10-year U.S. Treasury yield, and 30-year fixed mortgage rate paid by borrowers, 2019–2022



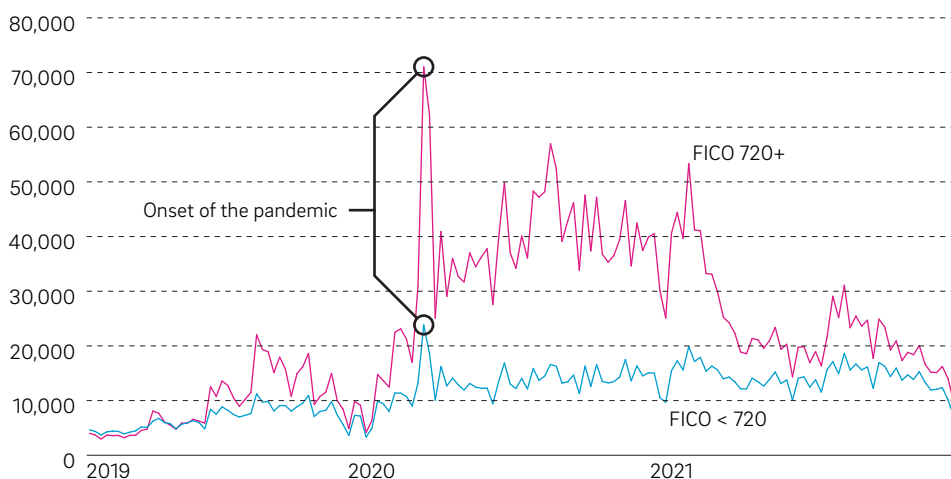
Sources: Freddie Mac Primary Mortgage Market Survey; Federal Reserve Board of Governors; Bloomberg.

Note: The MBS current coupon yield is a model-based estimate of yield-to-maturity on a synthetic to-be-announced forward contract trading at par. The difference between MBS yields earned by investors and mortgage rates paid by borrowers reflects the margin earned by the mortgage originator and other intermediaries.

FIGURE 5

Lower Rates Triggered a Surge in Refinancing Activity, Especially for Prime Borrowers

Weekly data on the number of mortgage refinance interest rate locks on the Optimal Blue platform, 2019–2021



Source: Optimal Blue.

Note: The Optimal Blue platform is used by more than 1,000 lenders and accounts for at least one-third of recent U.S. mortgage originations. Optimal Blue data are anonymized mortgage market/rates data that do not contain lender or customer identities or complete rate sheets. See Fuster et al. (2021) for more details.

liquidity to mortgage companies that offset liquidity outflows due to borrowers in forbearance not making their payments.¹⁷

Rapid Home Price Appreciation

Like the mortgage market, the housing market quickly recovered as the economy stabilized and the real estate industry adjusted to the pandemic-era operating environment. In fact, home prices surged, reaching a historic annualized growth rate of around 20 percent by early 2021 (Figure 6). Lower mortgage rates contributed to this boom in prices but were not the only factor. In particular, the increase in time spent at home and the shift to remote work significantly increased the demand for residential real estate. San Francisco Fed economist John Mondragon and University of California, San Diego, associate professor of economics Johannes Wieland estimate that the shift to remote work during the pandemic accounted for more than half of the increase in home prices in 2020-2021.¹⁸ Higher residential housing demand during this period is also evident in a sharp increase in housing rents. For example, the CoreLogic Single-Family Rent Index grew at an annualized rate of 9 percent between March 2020 and October 2021.

A hot housing market typically increases the total volume of mortgage lending, by way of three channels. First, since

homebuyers are likely to finance part of the higher purchase prices through debt, the average dollar size of each mortgage generally rises. Second, rising home prices make it easier for homeowners to qualify for refinancing, and also increase homeowners' ability to extract home equity through cash-out refinancing.¹⁹ Such cash-out activity did indeed become more popular during the pandemic. Third, rapid home price growth is typically associated with a higher volume of housing transactions, increasing the number of new mortgages originated for the purpose of purchasing a home.

Regarding this third channel, home sales also quickly bounced back after dropping sharply at the start of the pandemic, with home sales exceeding prepandemic levels by mid-2020 (Figure 7). Sales of both new and existing homes rose, with new home sales buoyed by a boom in housing construction. This combination of robust home sales and higher home prices explains why the volume of purchase mortgages surged above prepandemic levels (as shown earlier in Figure 3).

Conversely, as mortgage rates have risen in 2022, the housing market boom has also subsided, reflected in a sharp drop in home price appreciation and a decline in the volume of home sales. This in turn has contributed to the slowdown in the volume of mortgage lending.

The Limits of the Boom

Although the 2020-21 mortgage boom was of historic proportions, a number of factors limited its scope and prevented all borrowers from fully enjoying its benefits.

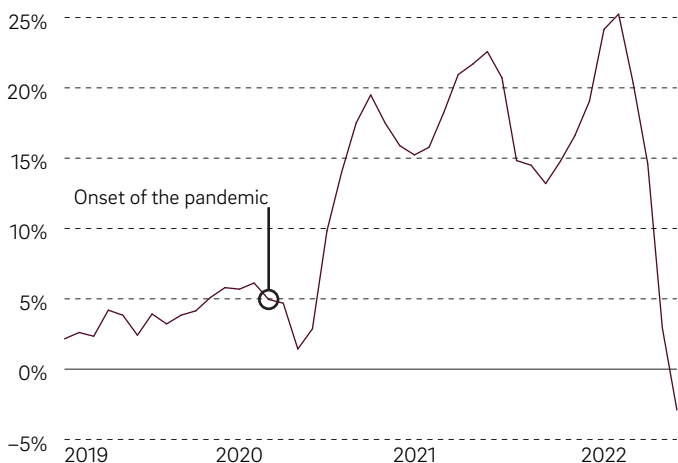
First, not all of the decline in financial market yields was passed through to mortgage borrowers. Although Treasury and MBS yields fell sharply in March and April 2020, mortgage rates declined only gradually. Furthermore, James Vickery, one of the authors of this article, working with Philadelphia Fed senior advisor and research fellow Lauren Lambie-Hanson, economist Andreas Fuster, and several other authors, estimates that the "primary-secondary" spread—the difference between mortgage rates and the relevant secondary-market MBS yield—increased by up to 100 basis points during the pandemic, reflecting a higher "gain-on-sale" earned by lenders.²⁰ In other words, although mortgage rates reached record lows, rates would have been even lower, by as much as 1 percentage point, if lower financial market yields had been fully passed through to borrowers.

Fuster, Lambie-Hanson, Vickery, et al. attribute this incomplete passthrough to the capacity constraints lenders faced. As interest rates fell, lenders experienced a dramatic increase in applications for mortgage refinances. Processing these applications and ramping up capacity

FIGURE 6

After a Pause, Home Prices Experienced a Historic Boom...

Annualized monthly percent growth in home prices, 2019–2022

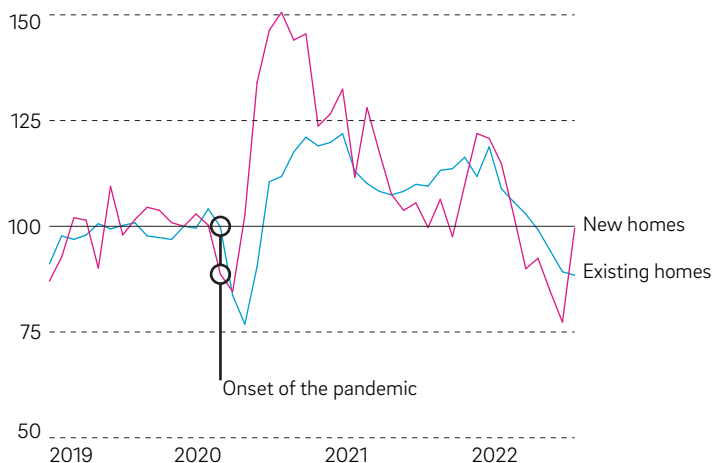


Source: Seasonally adjusted Case-Shiller U.S. National Home Price Index via Federal Reserve Bank of St. Louis/FRED.

FIGURE 7

...and Home Sales Also Quickly Rose Above Prepandemic Levels

Sales of new and existing single-family homes, seasonally adjusted, 2019–2022; indexed to 100 as of December 2019



Source: U.S. Census Bureau via Haver Analytics.

was particularly challenging due to the deteriorating economic situation (making it difficult to accurately confirm borrower employment and income), the unexpected shift to remote work, and the wave of forbearance requests from existing borrowers. In the words of one mortgage company CEO in March 2020, “Lending is in a bottleneck.... Most of our correspondent buyers and wholesale buyers are discouraging new loans. They are bloated with loans in process and cannot take on any more.”²¹ Capacity constraints are a typical feature of refinancing booms, but Fuster, Lambie-Hanson, Vickery, et al. find that operational frictions rendered the credit supply unusually inelastic in 2020–2021.²²


Fuster, Lambie-Hanson, Vickery, et al. also find that interest rate passthrough was even lower outside of the prime conforming mortgage market. First, mortgage rates fell by a smaller amount for jumbo mortgages, which are ineligible for government-backed credit guarantees. This likely reflects the amplification of credit risk premia during the pandemic as well as the greater difficulty of securitizing mortgages outside of the government-backed agency market. Second, interest rates were relatively elevated for mortgages sold to (typically) lower-income borrowers in the Federal Housing Administration (FHA) market. These loans carry government insurance against default, but this insurance does not fully insulate lenders from risk.²³ FHA loans were also at greater risk of forbearance, creating liquidity risk for mortgage intermediaries.²⁴

Aside from these differences in interest rate passthrough, Atlanta Fed economist Kristopher Gerardi, Boston Fed economist Paul S. Willen, and Lambie-Hanson also find evidence of disparities in the extent to which borrowers were able to take advantage of lower interest rates by refinancing. In particular, they find that Black, Latino, and Asian borrowers were significantly less likely to refinance, and therefore benefited less from the low-mortgage-rate environment. Their results demonstrate a general point: Borrowers often do not refinance when it seems to be in their financial interest to do so, because of either inattention, limited financial literacy, an inability to qualify for a new loan, or other factors.²⁵

Conclusion

The 2020–2021 period provides a valuable case study that illustrates both the strengths and the limitations of the U.S. mortgage finance system. Overcoming a variety of challenges, the mortgage market intermediated a record volume of credit, thereby supporting the housing market and providing liquidity to consumers through lower mortgage rates. But capacity constraints and other frictions limited the passthrough of lower financial market yields to mortgage borrowers. Furthermore, minority borrowers did not benefit as much as other groups from the opportunity to refinance at a lower rate.

The experience of the pandemic highlights the potential benefits of alternative mortgage designs that allow rates on existing mortgages to fall automatically with market interest rates, particularly during periods of stress. The U.S. mortgage market is dominated by long-term fixed-rate mortgages (FRMs), which require the borrower to refinance if they want to benefit from lower market rates. One alternative to this kind of market features a larger role for adjustable-rate mortgages (ARMs), as is the case in the UK, Australia, and many continental European economies. An intermediate design proposed by Boston University associate professor of economics Adam Guren and his coauthors, and by Northwestern Kellogg professor of finance Janice Eberly and Stanford professor of finance Arvind Krishnamurthy, is an FRM that converts to an ARM during recessions. Guren and his coauthors find that such a design would produce significant welfare benefits during economic downturns. Another variation is the ratchet mortgage advocated by finance professor Andrew Kalotay, which allows for the contract interest rate to decline but never increase.²⁶

Looking to the future, mortgage interest rates have risen very significantly in 2022, and mortgage lending has fallen sharply as a result. Higher interest rates, assuming they persist, will be a headwind for the housing market and presage a challenging period for the mortgage industry, which has grown in size and enjoyed record profits during the pandemic. Careful ongoing monitoring of the mortgage finance system seems warranted during this period of transition. 

Securitization and the Mortgage Finance System

A mortgage begins with a borrower—someone buying a home or refinancing an existing mortgage—and a lender—typically either a commercial bank or a nonbank mortgage company. But this is not where the story ends, because in the U.S., mortgages are typically securitized rather than being retained on the lender’s balance sheet.

Securitization involves packaging a pool of mortgages into a bond called a mortgage-backed security (MBS), which can then be sold to financial market investors, including banks, mutual funds, hedge funds, and life insurers. The Federal Reserve also holds a large volume of MBS as a result of its large-scale asset purchase programs. The most common form of mortgage securitization in the U.S. is “agency” securitization, in which an MBS carries a guarantee from Fannie Mae, Freddie Mac, or Ginnie Mae.²⁷

Securitization creates a way for lenders to sell their mortgages shortly after origination, which means that the size of the lender’s balance sheet need not limit how much lending they can do. This is particularly important for nonbank mortgage companies, which unlike banks cannot finance their mortgage lending through deposits. A liquid MBS market was a key factor in the rapid growth of nonbank mortgage lending over the past decade.²⁸

Even after the mortgage is sold, the original lender may retain a relationship with the borrower by acting as the mortgage servicer. The servicer collects payments from the borrower and forwards them to investors, tax authorities, and other parties. The servicer also manages the loan if the borrower becomes unable to make their payments. (For example, the servicer may arrange a forbearance or loan modification—or, as a last resort, foreclose on the mortgage and seize the underlying property.) In return, the lender receives a periodic fee calculated as a fixed percentage of the loan balance. When a mortgage is securitized or sold, the servicing rights are sometimes retained by the original lender, but in other cases servicing is transferred along with the loan, or the servicing rights are sold to a third party.

As discussed in the main text of this article, the forbearance programs set in place at the start of the COVID pandemic resulted in liquidity outflows for mortgage servicers. This is because servicers must temporarily forward payments to MBS investors, home insurers, local governments, and other parties even if the borrower has paused their payments.²⁹ The servicer will be reimbursed for these payments eventually, but they may not be able to finance themselves in the interim if there is a spike in nonpayment.

The U.S. mortgage finance system is complex, and this brief primer omits many details by necessity. More information on securitization and the MBS market and references to further literature can be found in a recent article by Andreas Fuster, David O. Lucca, and James Vickery.³⁰

Notes

1 Source: Mortgage Bankers Association. Trade publication *Inside Mortgage Finance* also reports a total of \$4.1 trillion of first-lien originations for 2020 and an even higher volume of \$4.8 trillion for 2021. We estimate that there were \$4.0 trillion of first-lien mortgage originations in 2020 based on 2020 Home Mortgage Disclosure Act (HMDA) data.

2 Mortgage rates were in fact already trending downward in the 12-18 months prior to the pandemic, and more broadly have declined significantly over the past two decades from levels above 8 percent in the early 2000s. However, mortgage rates have reversed course sharply in 2022, as discussed below.

3 Similarly, the previous high watermark in terms of lending volume, in 2003, also featured a boom in mortgage refinancing due to a decline in mortgage interest rates.

4 For example, Glaeser, Gottlieb, and Gyourko (2012) estimate that a 1-percentage-point drop in interest rates is associated with an increase in home prices of about 7–8 percent.

5 Mortgage originators typically hold mortgages in a portfolio for a few weeks or months after origination before they are sold or securitized into mortgage-backed securities (MBS). This exposes the lender to risk because the mortgages might decline in value before the sale. To protect themselves, lenders sell mortgages forward—that is, they use the TBA market to enter into a contract to deliver mortgage pools at a fixed price a few months into the future, essentially locking in current prices. (See Vickery and Wright [2013] for a primer on the TBA market.) But to ensure that the lender does not default on this contractual obligation, the lender can be required to put up additional cash if the value of this forward position moves against it before the contract matures. This is what happened in mid-March 2020, when the Fed restarted quantitative easing and MBS yields declined sharply.

6 For more details, see Pence (forthcoming) and Nasiripour (2020).

7 The CARES Act required servicers to provide forbearance to borrowers who requested it, without any required proof of hardship. The act directly applied only to mortgages in the “agency” market, consisting of loans securitized through the agencies Fannie Mae, Freddie Mac, and Ginnie Mae. In practice, though, financial institutions made forbearance available quite widely, even to nonagency borrowers. See Cherry et al. (2021), An et al. (2021), Elul and Newton (2021), and Lee et al. (2022) for detailed discussions and analyses of the CARES Act mortgage forbearance program.

8 See Black Knight (2020).

9 For details, see Pence (forthcoming) and Kim et al. (2018).

10 Nauman et al. (2020).

11 As documented by Pence (forthcoming), concerns along these lines were widely held at the time and expressed by a range of parties, including industry practitioners, regulators, affordable-housing advocates, and members of Congress from both major parties.

12 Anenberg and Scharlemann (2021) find direct evidence that mortgage forbearance programs supported home prices in 2020.

13 For details, see Loewenstein (2021) and Pence (forthcoming).

14 The source for this data is the Federal Reserve Bank of New York.

15 See Fuster et al. (2017).

16 Although the nominal dollar amount of refinancing and total mortgage lending was higher in 2020 than in 2003 (the previous recordholder), 2003 is still higher in inflation-adjusted terms or scaled by the volume of mortgages outstanding.

17 See Pence (forthcoming) and Loewenstein (2021).

18 These authors use cross-city variation in remote-work exposure to isolate the effect of remote work from other drivers of home prices such as mortgage interest rates.

19 See Bhutta and Keys (2016).

20 See Fuster et al. (2021).

21 Larry Goldstone, president and CEO of mortgage company Avenir Partners, as quoted in Berry and Kline (2020).

22 This combination of high lending volumes and an increase in the profit per loan due to inelastic supply resulted in record profits for lenders. For example, the net income of Rocket Companies, the largest U.S. mortgage lender, increased almost tenfold in 2020 to \$9.4 billion.

23 Two issues are at play here. First, FHA mortgage insurance claims often take a long time to be settled. This exposes the mortgage servicer to liquidity risk in the interim. Second, insurance claims do not cover all expenses incurred by the servicer in foreclosing or otherwise terminating the loan. Tozer (2019) estimates that servicers incur an uncompensated loss of about \$10,000 per FHA claim. For more on the limits of this government insurance, see Pence (forthcoming), Tozer (2019), and Kim et al. (2018).

24 Lee et al. (2022).

25 Also see Keys, Pope, and Pope (2016).

26 See McAndrews (2015) for a policy-oriented discussion of mortgage contract design. These alternative designs are not a free lunch. If, for example, a mortgage has a ratchet feature so that the rate can decline but never increase, mortgage lenders and investors will take that into account when setting the other terms of the loan. Other things being equal, this would result in a higher initial mortgage rate.

However, ARMs that allow the rate to go either up or down shift the risk to borrowers and will increase the borrower’s interest costs when interest rates rise. Even so, Guren et al. (2021) find that alternative mortgage designs can improve overall welfare by increasing borrower cashflows when households are less wealthy and more liquidity constrained.

27 Ginnie Mae is a federal agency that guarantees the timely payment of principal and interest on MBS composed of federally insured or guaranteed loans, such as loans insured by the Federal Housing Administration. Fannie Mae and Freddie Mac are privately owned but government-sponsored enterprises that issue MBS with a credit guarantee to investors; this guarantee is widely perceived to be implicitly backed by the federal government. See Frame et al. (2015).

28 Research by Buchak et al. (2018) shows that nonbanks have a smaller market share of mortgage lending for mortgages that are relatively more difficult to securitize. However, nonbank mortgage lenders retain a significant market share of lending for mortgages that are ultimately not securitized. This is because nonbanks often act as correspondent lenders, originating and then selling mortgages as whole loans at prearranged prices to banks and other investors. However, because they rely on short-term wholesale funding, nonbank mortgage companies do not typically retain mortgages in their portfolios for long.

29 See Pence (forthcoming), Goodman et al. (2020), and Kim et al. (2018).

30 See Fuster et al. (2022).

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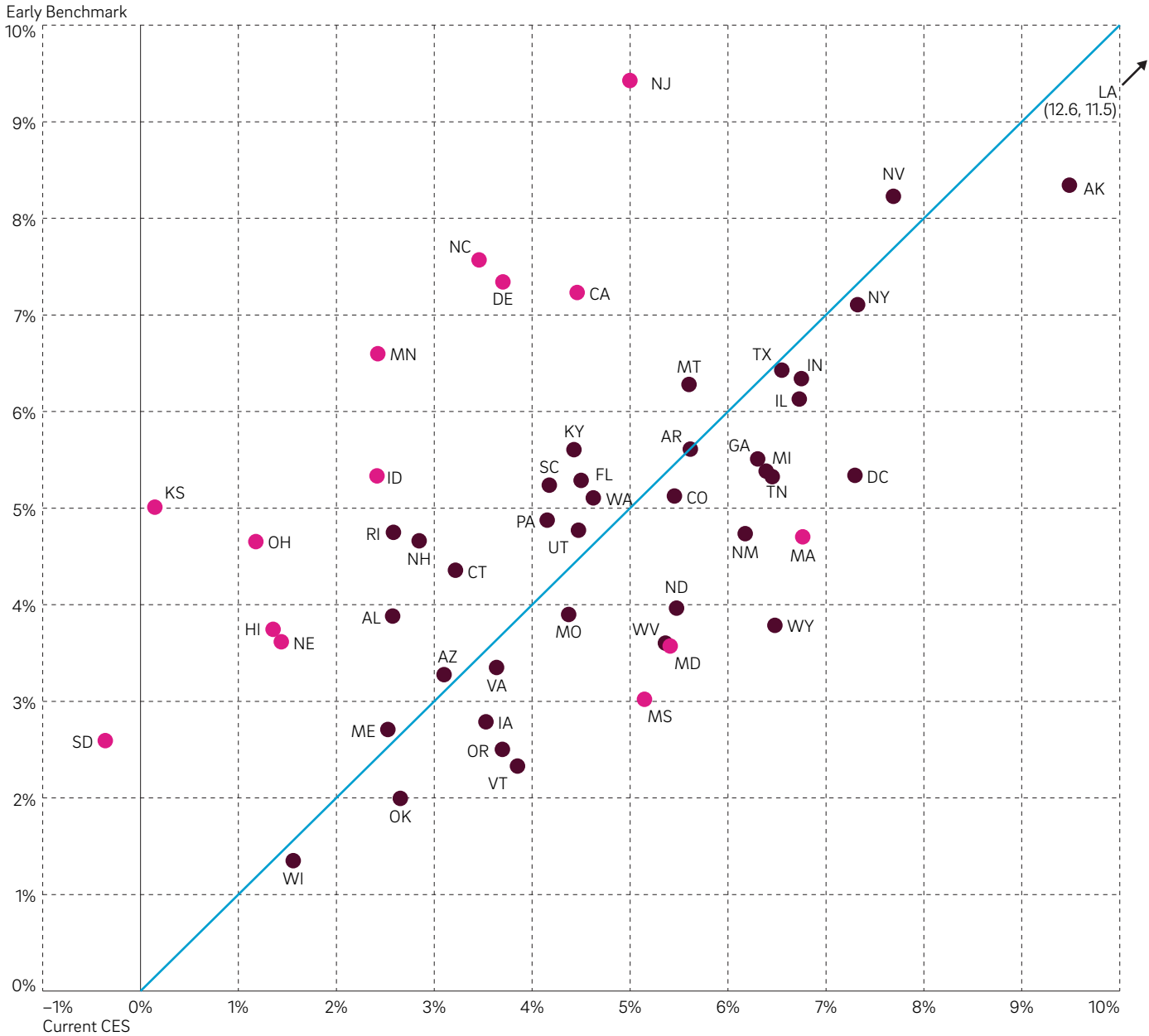
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Job Growth Estimates for all 50 States and D.C.
(Percent annualized), fourth quarter 2021



Regional Spotlight

Measuring State Employment

We introduce our new quarterly Early Benchmarks of monthly state employment estimates.

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

Economists can augment their understanding of national economic trends by examining state employment data. Preliminary (not-yet-benchmarked) state employment estimates from the Bureau of Labor Statistics (BLS) continue to be subject to significant revisions around turning points in the economy. Significantly large downward revisions for a majority of states—especially states with large economies—often confirm a downward inflection of the nation’s job growth. Likewise, large, widespread upward revisions of state employment often accompany periods in which national job growth is accelerating. If such revisions persist in the same direction over two or three quarters, that may confirm that the national economy has reached a turning point. This is a valuable observation for government policymakers.

The large revisions occur primarily because the preliminary state estimates are based on a small sample of firms, while subsequent benchmark revisions incorporate other BLS data based on a full count from nearly all firms. Moreover, the BLS issues its benchmark revisions for state employment estimates just once a year. However, the full count of data is issued quarterly, which offers an opportunity for researchers to create their own early benchmarks on a timelier basis.

This article describes our process of applying new benchmarks to payroll job estimates for all 50 states and the District of Columbia on a quarterly basis. By making timelier revisions, we produce more accurate estimates of states’ job growth, and we gain additional insights into recent national economic trends.

Our new benchmarks may also benefit state economic forecasts, which rely heavily on recent trends—and payroll jobs are almost always a key recent trend.

See *The BLS’s Methodology, and Ours.* →

More accurate payroll jobs data can correct the impression that a state economy was slowing when it was actually stable, or that the economy had begun to slow when it had not. Improving that accuracy reduces some of the uncertainty surrounding state forecasts, too.¹

Using QCEW Data to Revise Estimates

In March of each year, the BLS releases revised estimates of monthly nonfarm payroll employment for states and metropolitan statistical areas (MSAs) as part of its Current Employment Statistics (CES) program.² For its annual revisions of CES state estimates, the BLS incorporates more comprehensive data from the Quarterly Census of Employment and Wages (QCEW) program, which is also released by the BLS. The BLS also introduces new seasonal adjustment factors and other corrections to make the data revisions more accurate. For our purposes, the most significant monthly revisions affect the prior seven quarters of data.³

The QCEW data make a significant contribution to the annual revisions. Whereas the QCEW data cover more than 95 percent of all employers, the CES sample represents just 6 percent of the QCEW total. Therefore, the CES state estimates that result from the annual revision process reflect the broad universe of firms (as well as new seasonal factors) and thus more accurately depict a state’s job growth trend than does the original CES sample alone.

The BLS’s Methodology, and Ours

Our quarterly revisions of state payroll job growth are possible because the Bureau of Labor Statistics (BLS) issues its Quarterly Census of Employment and Wages (QCEW) data for all 50 states on a quarterly basis—even though it waits an entire year before reconciling this full job count with its Current Employment Statistics (CES) sample estimates.

The CES estimates are widely reported monthly payroll jobs numbers generated by a federal–state cooperative program. These monthly estimates are provided for the nation,¹⁵ the states, and designated metropolitan statistical areas (MSAs).¹⁶ The CES program relies on a monthly nationwide survey of about 131,000 businesses and government agencies representing about 670,000 establishments (Table 1). These samples are used to estimate total employment not only of states and MSAs but also of industrial sectors within states and MSAs.

In contrast to the CES sample of 670,000 establishments, the QCEW program reported employment counts for nearly 11 million establishments covered by state and federal unemployment insurance (UI) laws in the first quarter of 2021.¹⁷ The QCEW data for October, November, and December 2021 were released on June 8, 2022.

Thus, our process accurately assesses the growth path for the fourth quarter of 2021 in June 2022, rather than our having to wait until the BLS reconciles its QCEW data and CES sample estimates in March 2023. Similarly, our process assesses the first quarter of 2022 in September 2022 and the second quarter in December 2022.

Our methodology was adapted from an approach pioneered by the Dallas Fed and modified to work with all 50 states. The Dallas Fed publishes early benchmarks for Texas with additional details for Texas MSAs and specific industrial sectors. The New York Fed also publishes early benchmarks for its states and selected MSAs. Meanwhile, some states, including Colorado, Oregon, and Washington, produce their own employment estimates using the QCEW data for their states.¹⁸ The BLS recently explored quarterly benchmarking options, but it felt the problems outweighed the benefits and decided to redirect resources to other initiatives.¹⁹

TABLE 1

Sample Sizes for the Third District

Current CES Sample Size	Sample of UI Accounts	Establishments
United States	131,000	670,000
Delaware	960	2,110
New Jersey	3,410	17,280
Pennsylvania	4,070	24,590

However, because new QCEW data are released within five months after the end of each quarter, we can update four quarters of data—our Early Benchmarks—before the BLS releases its annual benchmark revisions. Our fourth and final Early Benchmark is completed in early March using third quarter data from the QCEW just as the BLS releases its annual revisions of state CES data by incorporating comparable third-quarter QCEW data.

There is obvious value in conducting timely revisions using QCEW’s comprehensive count of jobs. During periods of steady economic growth, our revisions do not tend to change much from the CES’s sample-drawn estimates. At other times, however, the revisions driven by benchmarking to the QCEW data can be substantial. Our quarterly Early Benchmark estimates have accurately predicted the BLS’s subsequent annual state benchmark revisions—for both quarterly and annual rates of change. Throughout the year, our Early Benchmarks tend to be better estimates than the preliminary CES sample estimates. However, once the BLS completes its more comprehensive annual revisions—with a more sophisticated methodology and better data access than we can deploy—we accept their benchmarked data as more accurate than our fourth and final Early Benchmark. We produce the fourth to validate our process.

QCEW data provide additional value because the direction and depth of the revisions of CES state data using QCEW data can signal turning points in the business cycle. The BLS has acknowledged this phenomenon. Prior to 2008, the BLS, in its annual release of state benchmark revisions, routinely noted that “historically, State estimates have underestimated March employment levels during periods of economic growth and overestimated these levels during periods of economic decline.”⁴ Although the BLS no longer includes this statement, the phenomenon persists, because the underlying cause persists—at least for the state CES. For the U.S. CES methodology, the BLS introduced quarterly updates to the net birth-death model beginning in 2011. This change may have significantly reduced the subsequent revisions to U.S. CES employment growth trends. However, state updates remain less frequent, so the signal remains intact.⁵

That underlying cause is how the BLS models business births’ and deaths’ net contribution to the monthly sample estimates.⁶ Because the CES cannot capture the employment attributable to new business formations in a timely fashion, the BLS models growth from new firms as a stable ratio of firm births to firm deaths.

This works well in periods of steady economic growth. However, when there is a turning point in the economy—shifting from job growth to job loss, for example—the stable relationship between firm births and firm deaths breaks down.⁷ Even a significant inflection point from rapid to slow job growth may reflect a breakdown of this relationship and thus generate substantive downward revisions to the initial sample estimates.

Tracking One State Through an Entire Year

To examine the accuracy of our Early Benchmarks, let’s look at one state, New Jersey, over the course of one year. At the beginning of March 2022, and prior to its annual state benchmark revisions, the BLS estimated 3.8 percent job growth for New Jersey from September 2020 to September 2021. That’s

equivalent to 144,800 jobs added over the year. However, our Early Benchmark process, which used the 2021 third quarter (Q3) vintage of QCEW data, suggested an upward revision to 4.8 percent—equivalent to 183,900 jobs added over the year. And indeed, the BLS, as part of its annual state benchmark revisions, revised job growth to 5.1 percent for the one-year period ending September 2021—or 198,100 additional jobs (Figure 1).

Revisions for individual quarters of growth are often larger than revisions over an entire year, because quarterly revisions sometimes offset each other over the course of the year. Our Early Benchmark estimates using the QCEW’S 2021 Q3 vintage suggested a 3.7 percent growth path (annualized)⁸ for New Jersey in just the fourth quarter of 2020, in contrast to the CES estimate of 0.5 percent. The BLS’s subsequent state benchmark revisions matched our estimated 3.7 percent growth for the fourth quarter.

The QCEW data are continually revised as late reports from some firms for a given quarter trickle in—sometimes for more than a year. Thus, our Early Benchmark results for any given quarter tend to converge quickly and then shift slowly toward the eventual BLS annual state benchmark revision. For example, as noted above, the BLS, relying on its CES sample, had initially indicated a growth rate of 0.5 percent for the fourth quarter of 2020. Meanwhile, our Early Benchmark estimates for that quarter, which were based on four consecutive QCEW vintages (beginning with the 2020 Q4 vintage and ending with the 2021 Q3 vintage) evolved from 2.7 percent to 3.1 percent, then 3.4 percent, and finally 3.7 percent—matching the BLS’s state benchmark growth rate (Figure 2).

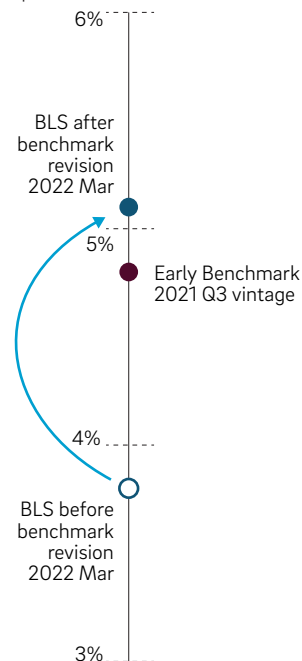
National Estimates from the QCEW

Now let’s examine the accuracy of the sum-of-states using our Early Benchmarks versus the CES U.S. estimates. In December 2021, prior to the benchmark revisions of the CES U.S. data, the growth estimate from September 2020 to September 2021 had been 4.2 percent.⁹ According to subsequent CES U.S. estimates available in March 2022, which had just been benchmarked to March 2021, the nation’s payroll jobs grew 4.0 percent from September 2020 to September 2021. This remains the official U.S.

FIGURE 1

Our Early Benchmark Pointed Toward the BLS’s Eventual Annual Benchmark Revision

Job growth estimates (percent) for New Jersey, September 2020 to September 2021



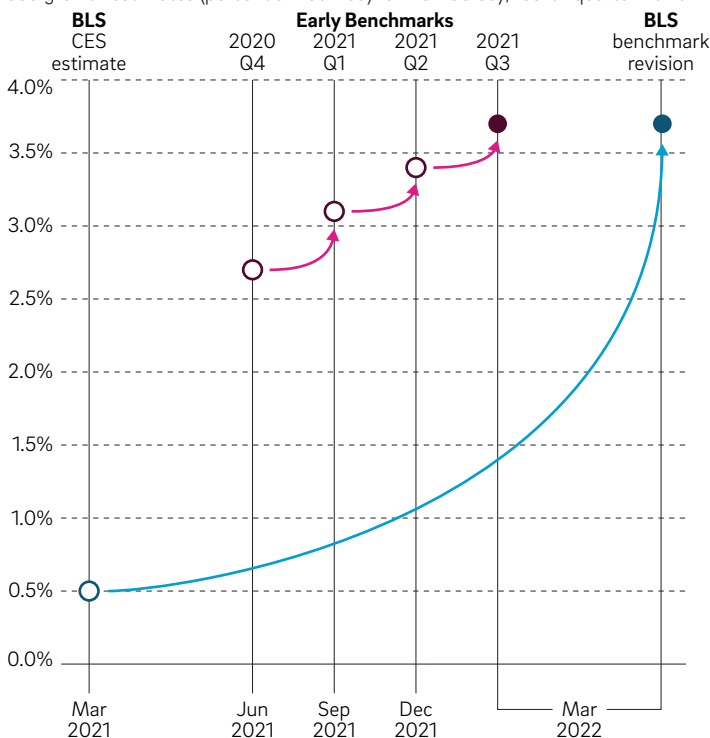
Source: U.S. Bureau of Labor Statistics’ Current Employment Statistics (CES) and Philadelphia Fed Early Benchmarks.

FIGURE 2

The BLS's Annual Revision for an Individual Quarter Is Often Large

Our Early Benchmarks often point to the BLS's eventual revision months ahead of time.

Job growth estimates (percent annualized) for New Jersey, fourth quarter 2020



Source: U.S. Bureau of Labor Statistics' Current Employment Statistics (CES) and Philadelphia Fed Early Benchmarks.

estimate for that period, and the BLS will not revise it again until February 2023.

However, the BLS did issue its annual preliminary benchmark announcement in September, which indicated an upward revision of 0.3 percent for March 2022 based on QCEW data alone.¹⁰ Our Early Benchmarks indicated upward revisions for three of the four quarters ending in March 2022. Because the BLS uses a wedge-back approach to revise employment estimates between March of each year, some of the upward revision for March 2022 is distributed across both the September 2020 to September 2021 period and the subsequent September 2021 to September 2022 period.

Meanwhile, the sum-of-states using CES state estimates for the same period showed an even lower 3.7 percent growth rate just prior to the BLS release of its annual benchmark revisions for CES state data on March 14, 2022.

However, during the prior year, our Early Benchmarks for all 50 states suggested that upward revisions would occur for the last quarter of 2020 and the first two quarters of 2021. Our estimates indicated downward revisions for only the third quarter of 2021, when economic disruptions from the Delta variant were peaking. And indeed, after the BLS released its 2021 Q3 vintage of QCEW data on March 9, 2022, our Early Benchmarks estimated an overall growth rate of 4.4 percent from September 2020 to September 2021. Given that the economy was still recovering from the

CES U.S. estimates

The Current Employment Statistics (CES) program of the Bureau of Labor Statistics (BLS) reports monthly estimates of nonfarm payroll jobs for the U.S. based on a sample survey of 670,000 establishments. These estimates are typically released on the first Friday of the following month and represent the headline number closely watched by economic observers.

U.S. benchmark revisions

In February of each year, the BLS revises its series of CES U.S. estimates. These revisions incorporate a benchmark to the more complete employment count from the QCEW for March of the prior year, new seasonal factors, and several other adjustments.

CES state estimates

Using the same sample as the CES U.S. estimate but different methodological approaches, the BLS reports monthly estimates of nonfarm payroll jobs for each state and the District of Columbia. These estimates are typically released on the third Friday of the following month.

State benchmark revisions

In March of each year, the BLS revises its series of CES state estimates. These revisions incorporate a benchmark to the more complete employment counts from the QCEW for each month through September of the prior year, new seasonal factors, and several other adjustments.

QCEW state estimates

The Quarterly Census of Employment and Wages (QCEW) program of the BLS reports monthly estimates (on a quarterly basis) of state employment based on the complete administrative records for 11.3 million establishments (as of the first quarter of 2022). These estimates are typically released within five months of the end of each quarter. For example, data for the third quarter of 2021 was released on March 9, 2022.

The Philadelphia Fed's Early Benchmarks

The Early Benchmarks from the Federal Reserve Bank of Philadelphia use the QCEW data to produce monthly estimates of nonfarm payroll jobs for each state and the District of Columbia. Our estimates are typically released within a week to 10 days of the QCEW data release.

Sum-of-states

The sum-of-states refers generally to any aggregation of the 50 states plus the District of Columbia for any of the state estimates, including our Early Benchmarks. Because of methodological differences, the sum-of-states applied to the CES state estimates does not equal the CES U.S. estimate.

pandemic shock, the upward revision was not surprising. When the BLS released its annual state benchmark revisions five days later, there were indeed upward revisions, and the growth rate for the sum-of-states was precisely 4.4 percent. This result plus the results from our new quarterly releases (described below) suggest that the growth path for national employment for the one-year period ending September 2021 may be revised upward again in February 2023 when the BLS benchmarks the U.S. data through March 2022.

Our New Quarterly Releases Begin

As this article was being written, we had access to the 2021 fourth quarter (Q4) and 2022 first quarter (Q1) vintages of QCEW data (released on June 8, 2022, and September 7, 2022, respectively). With that data, we produced the first two of our quarterly Early Benchmarks releases.¹¹

Our Early Benchmark estimates indicated that total payroll job growth from September 2021 through December 2021 was substantially faster in Delaware and New Jersey and somewhat faster in Pennsylvania than the then-current BLS's CES-based estimates indicated.

For New Jersey, our Early Benchmark estimate of fourth quarter growth was 9.4 percent (annualized), significantly more than the 4.0 percent growth based on CES estimates (Figure 3). Our fourth quarter estimate will evolve slightly with each new release of QCEW data. However, the BLS will surely revise its estimate upward when it issues its benchmark revisions next March.

Likewise, for the nation, the 2021 Q4 vintage of QCEW data suggests that the BLS may revise upward the growth path from September 2021 to December 2021. The CES's U.S. estimate indicated 5.3 percent growth, and its sum-of-states estimate indicated 4.9 percent growth. In contrast, the growth path from our Early

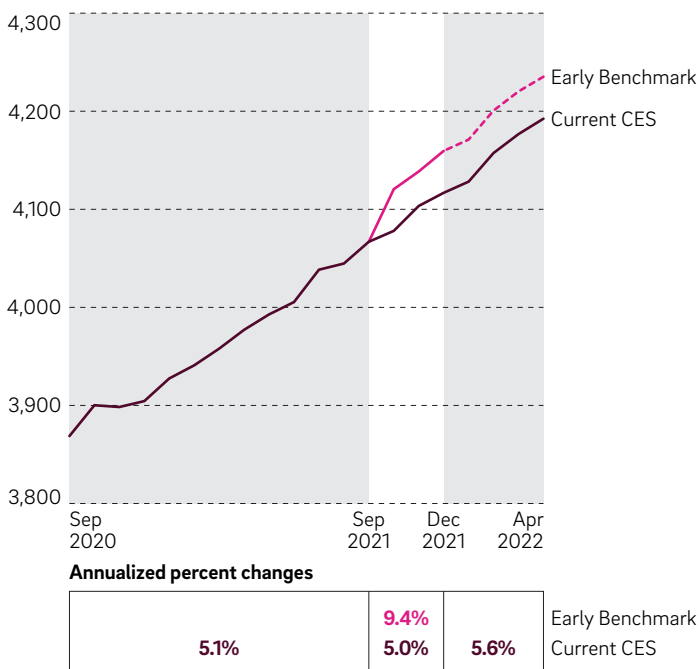
Benchmark estimates was higher than both, at 5.6 percent. Our Early Benchmark estimates were significantly higher in 11 states and significantly lower in three states, with lesser changes in the remaining 36 states plus the District of Columbia (Figure 4). The subsequent QCEW vintage for the first quarter of 2022 further reinforced the expectation of upward revisions for the fourth quarter of 2021 as our Early Benchmarks generated a still higher growth rate of 5.9 percent.

Our Early Benchmark process produces a more accurate path of job growth for states within two quarters. In particular, given the partial disruption from the Omicron wave, it would not have been surprising if QCEW's 2022 Q1 vintage suggested a slight downward revision to the 4.4 percent estimate of U.S. growth derived from both the current CES U.S. and sum-of-states estimates. Instead, our Early Benchmarks generated an estimate of 4.6 percent growth—slightly higher, but not significantly different from the CES sample estimates.

FIGURE 3

Our Estimate Will Evolve Slightly with New Data Releases

But the BLS will likely revise its estimate upward toward our estimate when it issues its benchmark revisions next March. Job growth estimates (percent annualized and number) for New Jersey, 2021 Q4 vintage of data as of June 2022, for 12-month, 3-month, and 4-month periods

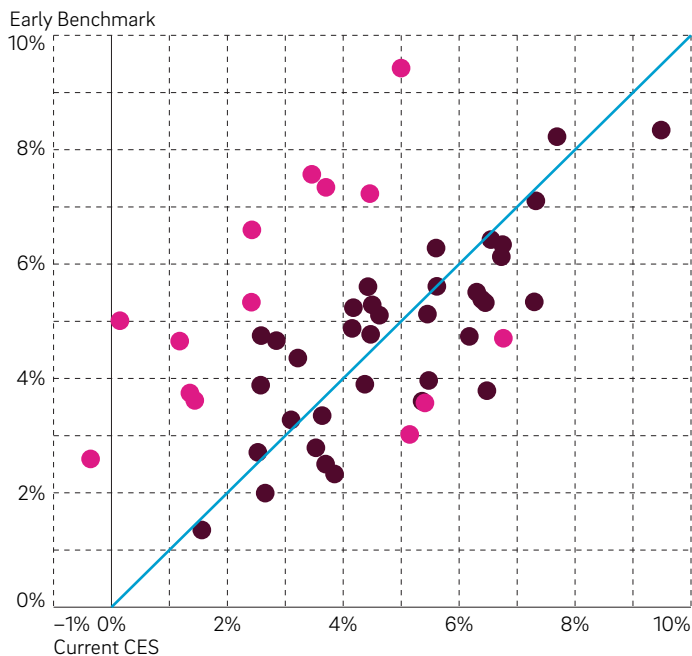


Source: U.S. Bureau of Labor Statistics' Current Employment Statistics (CES) and Philadelphia Fed Early Benchmarks.

FIGURE 4

Our Early Benchmark Estimates Were Significantly Higher in 11 States and Lower in Three States

BLS annual benchmark revision should approach our estimates. Job growth estimates (% annualized), for 50 states and D.C., fourth quarter 2021



Source: U.S. Bureau of Labor Statistics' Current Employment Statistics (CES) and Philadelphia Fed Early Benchmarks.

During periods when job trends are relatively steady, Early Benchmarks are less likely to differ from, and more likely to affirm, the CES sample estimates. Moreover, a series of upward revisions during the pandemic’s recovery period is also neither surprising nor worrisome. In contrast to recessions, strong recovery periods are often marked by upward revisions. However, the upcoming QCEW releases for the next three 2022 vintages are of greater interest to economists, who are currently searching for any signs of a recession.

Foretelling the Eventual Growth Path of National Payroll Jobs

We are currently investigating whether our Early Benchmarks also provide a more accurate path of job growth for the nation. Although direct comparisons are complicated by timing issues, our Early Benchmarks tend to indicate the direction of subsequent revisions to national employment trends.¹²

For example, in June 2019, when the BLS released its third (monthly) CES estimate of March 2019 U.S. payroll jobs, the implicit growth rate from March 2018 to March 2019 stood at 1.70 percent. Neither the monthly job estimates nor the growth rate for that one-year period changed until early February 2020, when the BLS released its annual U.S. benchmark revisions. Meanwhile, the sum-of-states data for the same period consistently registered a comparable growth rate of 1.67 percent before new state benchmark revisions were released in March 2020. After the national benchmark revisions, the growth path from March 2018 to March 2019 was revised downward to 1.37 percent. It stands at 1.39 percent today. The current sum-of-states estimated growth rate is 1.33 percent for the same period.

In contrast, our Early Benchmarks for that period were finalized in September 2019, predicting a growth path of 1.24 percent, which is much closer to the current 1.39 percent estimate.¹³

Another example: For the following year (March 2019 to March 2020), the preliminary growth estimate was 0.54 percent from the CES (in June 2020) and 0.46 percent from our Early Benchmarks (in September 2020). It is now 0.44 percent from the CES U.S. benchmark revisions.

These are just two examples of revisions over an entire year. We need to track this work over more years to learn whether our Early Benchmarks regularly predict the direction of data revisions to the CES estimates of national data.

Early Benchmark Revisions May Offer the Greatest Advantage During Recessions

We were not producing Early Benchmark estimates during the Great Recession. However, our subsequent experience has demonstrated that our Early Benchmark growth rates improve significantly upon the growth rates generated by the pre-benchmark CES sum-of-states estimates and confirm—if not outperform—the CES U.S. estimates. By looking at the prebenchmark and postbenchmark CES sum-of-states data during the Great Recession (as observed in March 2010), we have an idea of how much larger our Early Benchmark revisions can be during recessions.

For the one-year period from September 2008 to September 2009 (during the Great Recession), the downward revisions from prebenchmark to postbenchmark CES sum-of-states data affected nearly all states, became progressively more negative from the prior two years, and were much deeper than normal. The revision was downward by 1.2 percentage points, or 1.5 million additional jobs. The overall decline was 5.2 percent.

In contrast, the preliminary CES U.S. growth estimate was –4.11 percent for the same period (in December 2009). The BLS revised it downward to –4.72 percent in February 2010. Today, it is –4.76 percent. Had we been producing our Early Benchmarks on a quarterly basis, we would have identified much of that downward revision with each quarterly release—well in advance of the BLS benchmark revisions in February and March (for the states).

Based on five years of experience, our Early Benchmark revisions of job growth are often larger on a quarterly basis, whereas the annual growth rates lessen much of the variation—sometimes obscuring key trends. Our quarterly Early Benchmark releases allow us to observe trend shifts in aggregate U.S. job growth on a timely basis, but how should we evaluate these signals? To warrant concern, downward revisions must be: 1) pervasive—downward revisions must appear among a majority of states and among a majority of large states; 2) persistent—downward revisions must persist over several quarters and not appear as a random walk around a trend; and 3) deep—downward revisions must grow increasingly (cumulatively) larger.

Real-time payroll job growth for the nation has typically weakened and turned negative for a few months starting at or soon after the month that the NBER (eventually) selects as the peak of the business cycle. However, in real time, the trend is often neither well defined nor stable, and economists are often skeptical about only one month of data or several months of volatile data. Although our Early Benchmark revisions lag the real-time data by five months, the results are typically strong enough at turning points to corroborate otherwise shaky national trends.

The Pandemic Recession, however, is an exception. Jobs fell suddenly and sharply, leaving no doubt about the change in trend. As defined by the NBER and delineated by payroll jobs numbers, this recession lasted only two months from its peak in February 2020 to its trough in April 2020.


However, this short span and the economy’s response had more in common with nonrecessionary shocks, such as 2005’s Hurricane Katrina in New Orleans or the 1959 national steel strike’s impact on Pittsburgh. Neither our Early Benchmarks nor any other economic signal can predict a pandemic.

Conclusion: Interpreting Our Early Benchmarks in Real Time and at Critical Times

Our Early Benchmark process reveals a more accurate path of job growth for individual states within two quarters of the event, rather than only in March of each year, when the CES issues its state benchmark revisions. Had Omicron caused U.S. payroll job growth to dip during the first quarter of 2022, our aggregate Early Benchmarks may have hinted at the shift as early as September 2022. (They did not.)

If payroll job growth did shift to a markedly slower pace during the second quarter of the year as interest rates were raised to counter high inflation, our Early Benchmark process should note larger downward revisions in December 2022.¹⁴ Not until February 2024—with the incorporation of the March 2023 benchmarks—will the CES estimates offer a full accounting of U.S. employment for the bulk of 2022.

Unfortunately, our Early Benchmarks lag the moments when critical policy deliberations are made, but they do offer earlier confirmation of apparent shifts in recent payroll job trends.

And pervasive, persistent, and deep downward revisions may presage the NBER's declaration of a recession. 

Notes

1 Unfortunately, even our quarterly revisions fail to “repair the tail”—that is, they shed no light on the accuracy of the most recent five months of payroll jobs estimates.

2 The BLS releases its annual revisions of CES U.S. estimates every February.

3 Annual benchmark revisions of monthly CES state employment estimates released in any given year typically affect 21 months of not-seasonally-adjusted data and five years of seasonally-adjusted data (ending in December of the prior year). Occasionally, revisions will reach further back for specific geographic areas and/or industrial sectors. See Bureau of Labor Statistics (2022).

4 White (2007).

5 See Bureau of Labor Statistics (2010).

6 See Bureau of Labor Statistics (2022).

7 The BLS cannot develop a stable relationship because it is unable to predict these turning points.

8 All quarterly rates of change are annualized throughout the article.

9 For the comparative analysis between the CES U.S. estimate and our Early Benchmarks, we often use growth rates over 12-month periods rather than individual quarters because of two key confounding differences between the BLS benchmark revision processes for states and the nation. First, the national estimates are benchmarked to March of the prior year, whereas state data are benchmarked to September of the prior year. Second, revisions to the state estimates represent the actual job count, whereas revisions to the national data use a wedge-back approach between one March and the next, which does not reflect the contributions of each individual quarter.

10 See CES Preliminary Benchmark Announcement at <https://www.bls.gov/web/empisit/cesprelbnk.htm>.

11 See “Early Benchmark Revisions of State Payroll Employment” at <https://www.philadelphiafed.org/surveys-and-data/regional-economic-analysis/early-benchmark-revisions>.

12 Estimates for the nation are typically released on the first Friday of the following month. National data and other information can be found at <https://www.bls.gov/ces/>. For more technical details, see <https://www.bls.gov/web/empisit/cestn.htm>.

13 For comparisons with growth estimates as they were observed during prior time periods, we are indebted to the resources available at the Philadelphia Fed's Real-Time Data Research Center.

14 The BLS is scheduled to release the 2022 second quarter (Q2) vintage of QCEW data on December 6, 2022. Our third quarterly release of Early Benchmarks will be available on December 13, 2022, at <https://www.philadelphiafed.org/surveys-and-data/regional-economic-analysis/early-benchmark-revisions>.

15 Estimates for the nation are typically released on the first Friday of the following month. National data and other information can be found at <https://www.bls.gov/ces/>. For more technical details, see <https://www.bls.gov/web/empisit/cestn.htm>.

16 State estimates are typically released about 10 business days after the U.S. release. Estimates for MSAs are released about seven business days after state estimates. Data and other information for states and MSAs can be found at <http://www.bls.gov/sae/>.

17 QCEW data is released within five months after the end of each quarter and can be found at <https://www.bls.gov/cew/>. For more technical details, see <https://www.bls.gov/opub/hom/cew/home.htm>.

18 Early benchmarks for selected states can be found at: Early Benchmarked Employment Data—FEDERAL RESERVE BANK OF NEW YORK (https://www.newyorkfed.org/research/regional_economy/early-benchmarked-employment); Texas Employment Data—(<https://www>.

dallasfed.org/research/econdata/tx-emp.aspx); LMI Gateway Home page (colmigateway.com) for Colorado; Oregon (<https://www.qualityinfo.org/ed-ceest/>); ESDWAGOV—Washington employment estimates (WA-QB & CES) (<https://esd.wa.gov/labormarketinfo/employment-estimates>).

19 For more on BLS research about pursuing quarterly benchmarks, see Bureau of Labor Statistics (2017). For a statement on the BLS decision, see Bureau of Labor Statistics (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.

Demographic Transition, Industrial Policies, and Chinese Economic Growth

We build a unified framework to quantitatively examine the demographic transition and industrial policies in contributing to China's economic growth between 1976 and 2015. We find that the demographic transition and industrial policy changes by themselves account for a large fraction of the rise in household and corporate savings relative to total output and the rise in the country's per capita output growth. Importantly, their interactions also lead to a sizable fraction of the increases in savings since the late 1980s and reduce growth after 2010. A novel and important factor that drives these dynamics is endogenous human capital accumulation, which depresses household savings between 1985 and 2010 but leads to substantial gains in per capita output growth after 2005.

WP 22-17. Michael Dotsey, Federal Reserve Bank of Philadelphia Research Department; Wenli Li, Federal Reserve Bank of Philadelphia Research Department; Fang Yang, Louisiana State University, and Visiting Scholar, Federal Reserve Bank of Philadelphia Research Department.

The Causal Effects of Lockdown Policies on Health and Macroeconomic Outcomes

We assess the causal impact of epidemic-induced lockdowns on health and macroeconomic outcomes and measure the trade-off between containing the spread of an epidemic and economic activity. To do so, we estimate an epidemiological model with time-varying parameters and use its output as information for estimating SVARs and LPs that quantify the causal effects of nonpharmaceutical policy interventions. We apply our approach to Belgian data for the COVID-19 epidemic during 2020. We find that additional government mandated mobility curtailments would have reduced deaths at a very small cost in terms of GDP.

WP 22-18. Jonas E. Arias, Federal Reserve Bank of Philadelphia Research Department; Jesús Fernández-Villaverde, University of Pennsylvania and Federal Reserve Bank of Philadelphia Research Department Visiting Scholar; Juan F. Rubio-Ramírez, Emory University and Federal Reserve Bank of Philadelphia Research Department Visiting Scholar; Minchul Shin, Federal Reserve Bank of Philadelphia Research Department.

Self-Fulfilling Debt Crises, Revisited

We revisit self-fulfilling rollover crises by exploring the potential uncertainty introduced by a gap (however small) between an auction of new debt and the payment of maturing liabilities. It is well known (Cole and Kehoe, 2000) that the lack of commitment at the time of auction to repayment of imminently maturing debt can generate a run on debt, leading to a failed auction and immediate default. We show that the same lack of commitment leads to a rich set of possible self-fulfilling crises, including a government that issues more debt because of the crisis, albeit at depressed prices. Another possible outcome is a "sudden stop" (or forced austerity) in which the government sharply curtails debt issuance. Both outcomes stem from the government's incentive to eliminate uncertainty about imminent payments at the time of auction by altering the level of debt issuance. An interesting aspect of the novel crisis equilibria is that the government always transacts at prices

associated with the most optimistic beliefs. That is, beliefs induce the government to change debt issuances to a level at which prices are invariant to beliefs, even if this means a sharp reduction or increase in equilibrium issuances relative to the best-case scenario. The distortion of debt policy generates a large increase in spread volatility in both a one-period and a multi-period quantitative debt model.

WP 20-03 Revised. Mark Aguiar, Princeton University, and Visiting Scholar, Federal Reserve Bank of Philadelphia Research Department; Satyajit Chatterjee, Federal Reserve Bank of Philadelphia Research Department; Harold Cole, University of Pennsylvania, and Visiting Scholar, Federal Reserve Bank of Philadelphia Research Department; Zachary Stangebye, University of Notre Dame.

Getting Schooled: The Role of Universities in Attracting Immigrant Entrepreneurs

We study immigrant founders of venture-capital-backed firms using a new and detailed data set that we assemble on the backgrounds of founders. Immigrant founders have been critical to the entrepreneurial ecosystem, accounting for roughly 20 percent of all venture-capital-backed founders over the past 30 years. We document the channels through which immigrant founders arrive in the U.S. and how those channels have changed over time. Higher education has served as the primary entry channel for immigrant founders. The share of foreign-educated immigrant founders who initially arrive for work has decreased over time, while the share of immigrant founders with undergraduate education in the U.S. has increased over time. Immigrant founders are likely to start their companies in the state in which they were educated, leading to potentially large local economic benefits associated with attracting foreign students. The results of this paper have important policy implications for the supply of entrepreneurial talent and efforts to promote entrepreneurial ecosystems.

WP 22-19. Natee Amornsiripanitch, Federal Reserve Bank of Philadelphia; Paul A. Gompers, Harvard Business School and National Bureau of Economic Research; George Hu, Harvard University; Kaushik Vasudevan, Yale University.

Has COVID Reversed Gentrification in Major U.S. Cities? An Empirical Examination of Residential Mobility in Gentrifying Neighborhoods During the COVID-19 Crisis

This paper examines whether neighborhoods that had been gentrifying lost their appeal during the pandemic because of COVID-induced health risks and increased work-from-home arrangements. By following the mobility pattern of residents in gentrifying neighborhoods in 39 major U.S. cities, we note a larger increase of 1.2 percentage points in the outmigration rate from gentrifying neighborhoods by the end of 2021, relative to nongentrifying ones, with out-of-city moves accounting for over 71 percent of the increased flight. The share of out-of-city moves into gentrifying neighborhoods also decreased significantly during the pandemic. Residents with high credit scores, younger residents, and probable homeowners were more likely to leave gentrifying neighborhoods and their respective cities. Gentrifying neighborhoods closer to city centers, with higher density or higher housing costs, or in cities that are more vulnerable to the pandemic were hit harder by COVID-induced adjustments. The results are consistent with the contention that the pandemic has slowed the pace of gentrification in many major U.S. cities. This slowed gentrification has important policy implications for local government public finance, as well as the long-term future of cities.

WP 22-20. Lei Ding, Federal Reserve Bank of Philadelphia Community Development and Regional Outreach Department; Jackelyn Hwang, Stanford University and Visiting Scholar, Federal Reserve Bank of San Francisco.

Foreclosure Kids: Examining the Early Adult Credit Usage of Adolescents Affected by Foreclosure

We investigate the long-term effects of foreclosure-induced relocations on adolescents and their subsequent use of credit. We ask whether individuals who experience a foreclosure-induced move between the ages of 10 and 17 are more likely to exhibit signs of credit scarring later in life. To establish a set of counterfactual outcomes, we implement propensity score matching with exact matching on certain characteristics and regression adjustment of the remaining covariate imbalances. We then compare the credit behavior of individuals who experienced a foreclosure-induced move in adolescence to similar individuals who neither experienced a foreclosure nor moved during adolescence. We find that young adults who experience a foreclosure-induced move tend to spend more time with one or more tradelines in a state of severe delinquency and tend to seek credit at a higher rate, which lowers their credit score trajectory relative to individuals who did not experience a foreclosure or a move in adolescence. This association is most evident within the group of children whose parents had nonprime credit scores one year prior to mortgage origination. Delinquency and low credit scores are also more pronounced in the group of adolescents who were between the ages of 10 and 14 at the time of foreclosure.

WP 22-21. Larry Santucci, Federal Reserve Bank of Philadelphia Consumer Finance Institute; Alaina G. Barca, Federal Reserve Bank of Philadelphia Community Development and Regional Outreach; Leigh-Ann Schultz, Federal Reserve Bank of Philadelphia Research Department.

PEAD.txt: Post-Earnings-Announcement Drift Using Text

We construct a new numerical measure of earnings announcement surprises, standardized unexpected earnings call text (SUE.txt), that does not explicitly incorporate the reported earnings value. SUE.txt generates a text-based post-earnings-announcement drift (PEAD.txt) larger than the classic PEAD. The magnitude of PEAD.txt is considerable even in recent years when the classic PEAD is close to zero. We explore our text-based empirical model to show that the calls' news content is about details behind the earnings number and the fundamentals of the firm.

WP 21-07 Revised. Vitaly Meursault, Federal Reserve Bank of Philadelphia Research Department; Pierre Jinghong Liang, Carnegie Mellon University Tepper School of Business; Bryan R. Routledge, Carnegie Mellon University Tepper School of Business; Madeline Marco Scanlon, University of Pittsburgh Katz School of Business.

Driving, Dropouts, and Drive-Throughs: Mobility Restrictions and Teen Human Capital

We provide evidence that graduated driver licensing (GDL) laws, originally intended to improve public safety, impact both high school completion and teen employment. Many teens use automobiles to commute both to school and to employment. Because school and work decisions are interrelated, the effects of automobile-specific mobility restrictions are ex ante ambiguous. Combining variation in the timing of both GDL law adoption and changes in compulsory school laws into a triple-difference research design shows that restricting teen mobility significantly reduces high school dropout rates and teen employment. These findings are consistent with a model in which teens use automobiles to access educational distractions (employment or even risky behaviors). We develop a discrete choice model that reflects reduced access to school, work, and other activities, which reveals that limiting access to work alone cannot explain the reduction in high school dropout rates.

WP 22-22. Valerie Bostwick, Kansas State University, Department of Economics; Christopher Severen, Federal Reserve Bank of Philadelphia Research Department.

Freeway Revolts! The Quality of Life Effects of Highways

Why do freeways affect spatial structure? We identify and quantify the negative local quality of life effects of freeways. Freeways cause slower growth in central neighborhoods (where local disamenities exceed regional accessibility benefits) compared with outlying neighborhoods (where access benefits exceed disamenities). A quantitative model calibrated to Chicago attributes one-third of the effect of freeways on central-city decline to reduced quality of life. Barrier effects are a major factor in the disamenity value of a freeway. Local disamenities from freeways, as opposed to their regional accessibility benefits, had large effects on the spatial structure of cities, suburbanization, and welfare.

WP 22-24. Jeffrey Brinkman, Federal Reserve Bank of Philadelphia Research Department; Jeffrey Lin, Federal Reserve Bank of Philadelphia Research Department.

Vacancy Chains

Replacement hiring—recruitment that seeks to replace positions vacated by workers who quit—plays a central role in establishment dynamics. We document this phenomenon using rich microdata on U.S. establishments, which frequently report no net change in their employment, often for years at a time, despite facing substantial gross turnover in the form of quits. We devise a tractable model in which replacement hiring is driven by a novel structure of frictions, combining firm dynamics, on-the-job search, and investments into job creation that are sunk at the point of replacement. A key implication is the emergence of vacancy chains. Quantitatively, the model reconciles the incidence of replacement hiring with the large dispersion of labor productivity across establishments, and largely replicates the empirical volatility and persistence of job creation and, thereby, unemployment.

WP 22-23. Michael W. L. Elsby, University of Edinburgh; Ryan Michaels, Federal Reserve Bank of Philadelphia Research Department; Axel Gottfries, University of Edinburgh; David Ratner, Board of Governors of the Federal Reserve System.

Understanding Growth Through Automation: The Neoclassical Perspective

We study how advancements in automation technology affect the division of aggregate income between capital and labor in the context of long-run growth. Our analysis focuses on the fundamental trade-off between the labor-displacing effect of automation and its positive productivity effect in an elementary task-based framework featuring a schedule of automation prices across tasks linked to the state of technology. We obtain general conditions for the automation technology and technical change driving automation to be labor-share displacing. We identify a unique task technology that reconciles the Kaldor facts with the presence of automation along the balanced growth path. We show that this technology aggregates to the Cobb–Douglas production function—thus providing novel task-based microfoundations for this workhorse functional form. We employ our theory to study the connection between the recent declines in the labor share and the unique nature of the current, IT-powered wave of automation.

WP 22-25. Lukasz A. Drozd, Federal Reserve Bank of Philadelphia Research Department; Mathieu Taschereau-Dumouchel, Cornell University; Marina M. Tavares, International Monetary Fund.

Consumer Bankruptcy, Mortgage Default and Labor Supply

We specify and estimate a lifecycle model of consumption, housing demand, and labor supply in an environment where individuals may file for bankruptcy or default on their mortgage. Uncertainty in the model is driven by house price shocks, education-specific productivity shocks, and catastrophic consumption events, while bankruptcy is governed by the basic institutional framework in the U.S. as implied by Chapter 7 and Chapter 13. The model is estimated using microdata on credit reports and mortgages combined with data from the American Community Survey. We use the model to understand the relative importance of the two chapters (7 and 13) for each of our two education groups that differ in both preferences and wage profiles. We also provide an evaluation of the BAPCPA reform. Our paper demonstrates the importance of distributional effects of Bankruptcy policy.

WP 22-26. Wenli Li, Federal Reserve Bank of Philadelphia Research Department; Costas Meghi, Yale University, NBER, IZA, CEPR, and IFS; Florian Oswald, Sciences Po.

Scarcity and Intertemporal Choice

Scarcity is a ubiquitous experience, and existing evidence largely suggests that people become more myopic when they feel their resources are scarce. Importantly, evidence for this proposition comes primarily from contexts in which scarcity threatens needs that require resources imminently. The current work examines instances in which scarcity threatens needs along a broader time horizon. Archival data from the Federal Reserve Bank of Philadelphia's Consumer Finance Institute and five pre-registered studies (N=7,728) show that the time horizon of threatened needs is an important determinant of scarcity's effect on intertemporal choice. Studies 1 and 2 measure perceptions of scarcity and demonstrate that scarcity's effect on intertemporal choice is moderated by the time horizon of people's needs. Study 3 experimentally manipulates perceptions of scarcity and demonstrates a polarizing effect of scarcity on intertemporal choice. When scarcity threatens needs with shorter time horizons, scarcity increases choices of smaller, sooner outcomes; however, this effect attenuates and sometimes reverses when scarcity threatens needs with longer time horizons. Studies 4-6 examine process evidence and find that the effect of scarcity on intertemporal choice is driven at least in part by differences in the perceived relative marginal utility of intertemporal choice options, rather than other factors such as a general change in time preference. Our findings suggest that scarcity does not inherently lead to myopic decisions and contribute to the ongoing debate regarding how and why scarcity influences intertemporal choice.

WP 22-27. Eesha Sharma, San Diego State University and Federal Reserve Bank of Philadelphia Consumer Finance Institute Visiting Scholar; Stephanie M. Tully, University of Southern California and Federal Reserve Bank of Philadelphia Consumer Finance Institute Visiting Scholar; Xiang Wang, University of Florida

The Reversal Interest Rate

The reversal interest rate is the rate at which accommodative monetary policy reverses and becomes contractionary for lending. We theoretically demonstrate its existence in a macroeconomic model featuring imperfectly competitive banks that face financial frictions. When interest rates are cut too low, further monetary stimulus cuts into banks' profit margins, depressing their net worth and curtailing their credit supply. Similarly, when interest rates are low for too long, the persistent drag on bank profitability eventually outweighs banks' initial capital gains, also stifling credit supply. We quantify the importance of this mechanism within a calibrated New Keynesian model.

WP 22-28. Joseph Abadi, Federal Reserve Bank of Philadelphia Research Department; Markus Brunnermeier, Princeton University; Yann Koby, Brown University.

Polarized Contributions but Convergent Agendas

The political process in the United States appears to be highly polarized: Data show that the political positions of legislators have diverged substantially, while the largest campaign contributions come from the most extreme donor groups and are directed to the most extreme candidates. Is the rise in campaign contributions the cause of the growing political polarization? In this paper, we show that, in standard models of campaign contributions and electoral competition, a free-rider problem among potential contributors leads naturally to polarization of campaign contributors but without any polarization in candidates' policy positions. However, we go on to show that a modest departure from standard assumptions—allowing candidates to directly value campaign contributions (because of “ego rents” or because lax auditing allows them to misappropriate some of these funds)—delivers the ability of campaign contributions to cause policy divergence. Consistent with the model, we document that a candidate's share of contributions in U.S. House of Representatives races is higher when her opponent's agenda is more extreme.

WP 22-29. Thorsten Drautzburg, Federal Reserve Bank of Philadelphia Research Department; Igor Livshits, Federal Reserve Bank of Philadelphia Research Department; Mark L.J. Wright, Federal Reserve Bank of St. Louis, CAMA, and NBER.

Uniform Priors for Impulse Responses

There has been a call for caution when using the conventional method for Bayesian inference in set-identified structural vector autoregressions on the grounds that the uniform prior over the set of orthogonal matrices could be nonuniform for key objects of interest. This paper challenges this call. Although the prior distributions of individual impulse responses induced by the conventional method may be nonuniform, they typically do not drive the posteriors if one does not condition on the reduced-form parameters. Importantly, when the focus is on joint inference, the uniform prior over the set of orthogonal matrices is not only sufficient but also necessary for inference based on a uniform joint prior distribution over the identified set for the vector of impulse responses. We also propose variants of the conventional method to conduct inference based on a uniform joint prior distribution for the vector of impulse responses. We generalize our results to vectors of objects of interest beyond impulse responses.

WP 22-30. Jonas E. Arias, Federal Reserve Bank of Philadelphia Research Department; Juan Rubio-Ramírez, Emory University and Federal Reserve Bank of Atlanta; Daniel F. Waggoner, Federal Reserve Bank of Atlanta and Emory University.

The Racial Wealth Gap, Financial Aid, and College Access

We examine how the racial wealth gap interacts with financial aid in American higher education to generate a disparate impact on college access and outcomes. Retirement savings and home equity are excluded from the formula used to estimate the amount a family can afford to pay. All else equal, omitting those assets mechanically increases the financial aid available to families that hold them. White families are more likely to own those assets and in larger amounts. We document this issue and explore its relationship with observed differences in college attendance, types of institutions attended, degrees attained, and education debt using data from the Survey of Consumer Finances (SCF), the National Postsecondary Student Aid Study (NPSAS), and the Panel Study of Income Dynamics (PSID). We show that this treatment of assets provides an implicit subsidy worth thousands of dollars annually to students from families with above-median incomes. White students receive larger subsidies relative to Black students and Hispanic students with similar family incomes, and this gap in subsidies is associated with disadvantages in educational advancement and student loan levels. It may explain 10 percent to 15 percent of white students' advantage in these outcomes relative to Black students and Hispanic students.

WP 22-32. Phillip Levine, Wellesley College and Federal Reserve Bank of Philadelphia Consumer Finance Institute Visiting Scholar; Dubravka Ritter, Federal Reserve Bank of Philadelphia Consumer Finance Institute.

Price Setting with Customer Capital: Sales, Teasers, and Rigidity

This paper studies price setting in an equilibrium search model of frictional product markets with long-term customer relationships. The theory gives rise to temporary sales when pricing is constrained to be anonymous across a firm's customer base. Equilibrium prices are inefficiently high, giving rise to overselling and excess trade, and the emergence of sale pricing can improve allocations by limiting this overselling. Pricing is also characterized by an asymmetry involving a stable regular price and variable sale price when firms face idiosyncratic shocks. Absent anonymous pricing, the theory gives rise to teaser pricing, which attains efficient allocations. Teaser pricing is also characterized by a stable regular price and variable teaser price, but in this case the seeming rigidity is not allocative.

WP 22-31. Leena Rudanko, Federal Reserve Bank of Philadelphia Research Department.

A Model of the Gold Standard


The gold standard emerged as the international monetary system by the end of the 19th century. We formally study its properties in a micro-founded model and find that the scarcity of the world gold stock not only results in a suboptimal output of goods that are purchased with money but also subjects the domestic economy of a country to external shocks. The creation of inside money in the form of private credit instruments adds to the money supply, usually resulting in a Pareto improvement, but opens the door to the international transmission of banking crises. These properties of the gold standard can explain the limited adherence by peripheral countries because of the potential risks to their economies. We argue that the gold standard can be sustainable at the core but not at the periphery.

WP 22-33. Jesús Fernández-Villaverde, University of Pennsylvania, NBER, CEPR, and Visiting Scholar, Federal Reserve Bank of Philadelphia Research Department; Daniel Sanches, Federal Reserve Bank of Philadelphia Research Department.

Data in Focus

State Coincident Indexes

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

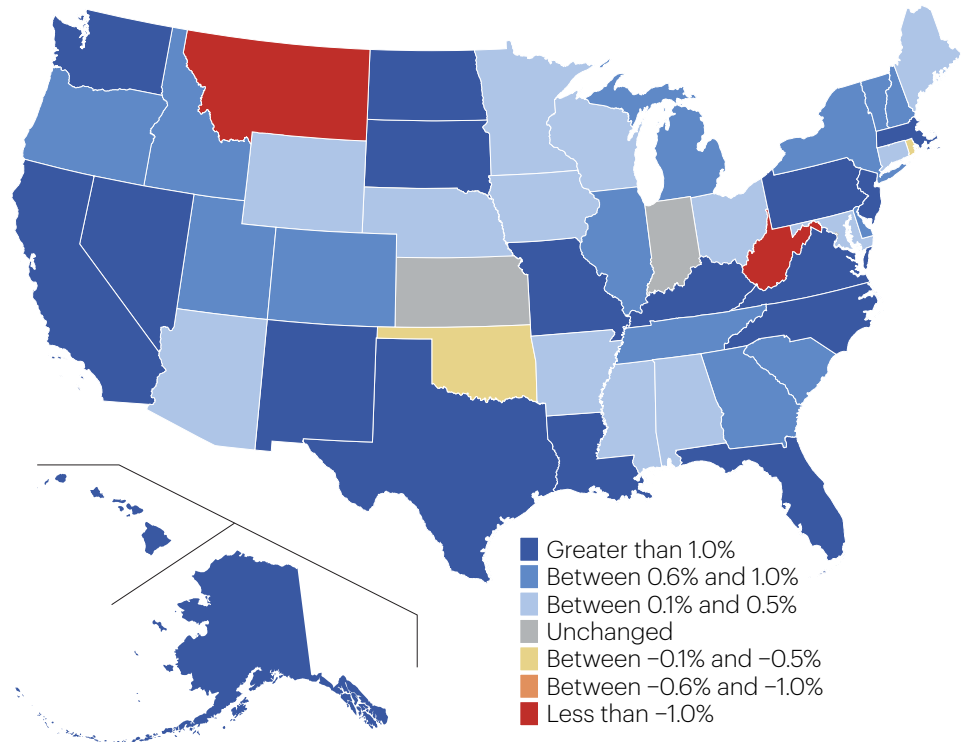
For most businesses and households, economics is a local concern. Macroeconomic indicators may not align with what's going on at the local level. The National Bureau of Economic Research, which is tasked with identifying when recessions begin and end, doesn't consider that some states can remain in a recession even after the rest of the country has bounced back, and that other states can avoid a recession altogether. That's why Theodore M. Crone, who was then a vice president in the Philadelphia Fed's Research Department, joined forces with economist Alan Clayton-Matthews in the early 2000s to create the State Coincident Indexes, which use four state-level variables to summarize current economic conditions in a single statistic for each state.¹ Because the variables largely reflect state labor market conditions, the coincident indexes allow us to pinpoint which states are suffering and which are booming regardless of the national business cycle. And, by subtracting the percentage of states in which the economy is declining from the percentage in which the economy is expanding, we can compute a diffusion index for all 50 states. As Crone noted in 2006, this diffusion index does a good job of predicting a coming recession.² Thanks to tools like this one, state-level policymakers can better tailor their policies to address local economic conditions. 

Notes

¹Theodore M. Crone and Alan Clayton-Matthews, "Consistent Economic Indexes for the 50 States," *Review of Economics and Statistics*, 87:4 (2005), pp. 593–603, <https://doi.org/10.1162/003465305775098242>.

September 2022 State Coincident Indexes

Three-month change



Source: Regional Economic Analysis, Federal Reserve Bank of Philadelphia.

Note: The District of Columbia is not part of the data set and is thus not colored on this map.

²Theodore M. Crone, "What a New Set of Indexes Tells Us About State and National Business Cycles," Federal Reserve Bank of Philadelphia *Business Review* (First Quarter 2006), pp. 11–24, <https://www.philadelphiafed.org/the-economy/regional-economics/what-a-new-set-of-indexes-tells-us-about-state-and-national-business-cycles>.

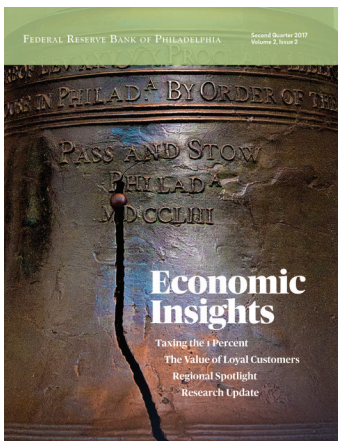
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Online: <https://www.philadelphiafed.org/surveys-and-data/regional-economic-analysis/state-coincident-indexes>

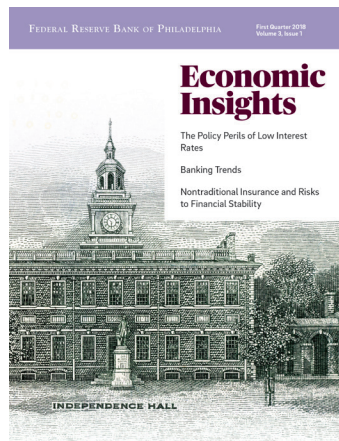
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