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Economic Insights

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How Mortgage Lock-In Affects the Price of Housing

U.S. Dollar Dominance: A Blessing or a Curse?

Surveying Mobility

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Economic Insights

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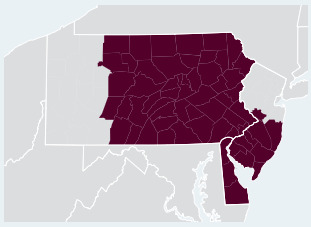

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How Mortgage Lock-In Affects the Price of Housing

There has never been such a huge gap between the rate homeowners pay and the rate for new mortgages.

Kyle Mangum
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FEDERAL RESERVE BANK OF PHILADELPHIA

The views expressed in this article are not necessarily those of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

Millions of American homeowners are experiencing something somewhat unprecedented: The prevailing rate for a new mortgage significantly exceeds the rate of their current mortgage. This means that, all else being equal, the monthly payment on a new mortgage would substantially exceed a homeowner's current monthly payment. This produces a financial disincentive to reset the terms of a loan by either moving or refinancing. Economists call this phenomenon "mortgage lock-in."

In this article, I explain why mortgage lock-in happens, explore how it affects the housing market, and discuss potential policies to counteract it.

Why Mortgage Lock-In Happens

Mortgage lock-in arose because of trends in mortgage rates and institutional features of the mortgage market.

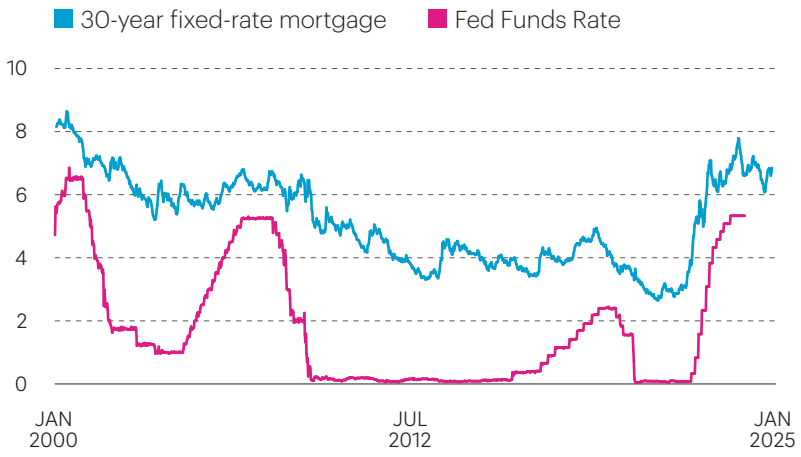
Until recently, mortgage rates had been sinking. The average rate on a 30-year fixed-rate mortgage (FRM) was 12.7 percent in

FIGURE 1

Until Recently, Mortgage Rates Were Sinking

Thanks to the long-term trend and a flurry of refinancing, by 2021 most leveraged homeowners held mortgages at historically low rates.

Effective fed funds rate and 30-year fixed-rate mortgage average, weekly, not seasonally adjusted, 2000–2024



Data Sources: Board of Governors of the Federal Reserve System (U.S.) and Freddie Mac via FRED

the 1980s, 8.1 percent in the 1990s, 6.2 percent in the 2000s, and 4.0 percent in the 2010s. Then, at the onset of the COVID-19 pandemic, substantial monetary easing sent rates below 3 percent for much of 2020 and 2021. Thanks to the long-term trend and a flurry of refinancing, by 2021 most leveraged homeowners held mortgages at historically low rates.

But then rates shot up. In 2022, the Federal Reserve began aggressively raising interest rates to fight a surge in inflation. The rising short-term interest rates—and the expectation of persistently higher rates—led to a spike in mortgage rates. Since 2023, mortgage rates have hovered in the range of 6.5 to 7.5 percent, levels not seen since the late 1990s (Figure 1).

This history matters because of institutional features peculiar to the U.S. mortgage finance system. The 30-year FRM—a long-term, market-insensitive payment contract—is ubiquitous in the United States. It is also asymmetric. Because of the ability to refinance, homeowners can (subject to their attention, time horizon, equity position, and creditworthiness) draw from among the lowest mortgage rates throughout their time in the property. Even when rates go up, their monthly mortgage payment doesn't change.

Moreover, mortgages in the United States are tied to a borrower/property pair. That is, they are neither portable (transferable across properties) nor assumable (transferable to a property's new owner). These features link the mortgage's interest rate to the homeowner/property match, which generates the disincentive to move when rates rise.

Put together, these conditions have produced a stock of homeowners who hold mortgage contracts with rates well below those of new mortgages. By 2023, over 80 percent of outstanding mortgages were locked in at a rate difference of 1 percentage point or more (Figure 2).[1]

Mortgage Lock-In and Moving

The disincentive of individual mortgage holders to sell their current home has several knock-on effects for the housing market—and potentially for the wider economy. Several studies have found that lock-in has reduced the number of sellers entering the market. Much of this work is based on mortgage record data, with samples varying from study to study, but the findings consistently point in the same direction. Using credit report data that identify sellers as homeowners changing zip codes, University of Illinois at Urbana-Champaign associate professor of finance Julia Fonseca and University of Pennsylvania assistant professor of finance Lu Liu find that lock-in reduced moving rates by 16 percent from 2022 to 2024. Using similar data, University of California, Irvine, assistant professor of economics Jack Liebersohn and University of California, Berkeley, professor of public policy and economics Jesse Rothstein constructed a research design that accounts for marketwide trends (such as the effect of higher rates on potential buyers) by comparing mortgage holders with nonmortgage holders. They find

FIGURE 2

Most Homeowners Have Locked in Very Low Rates

Percent of mortgages with a rate more than 1 percentage point below the market rate, 2005–2023

Data Sources: ICE, McDash® and Freddie Mac

that each percentage point of lock-in decreases mobility between zip codes by 7 to 8 percent.

See ***How Lock-in Affects Other Economic Outcomes***

Another way to chart the selling behavior of mortgage holders is to match mortgage records to property sales. Using these matched records, Ross Batzer, Jonah Coste, William M. Doerner, and Michael Seiler of the Federal Housing Finance Agency find that each percentage point of lock-in reduces a mortgage-bearing homeowner's probability of executing a sale by 18 percent. Using real estate listings and transactions matched to a large sample of mortgages, Federal Reserve Bank of Atlanta economist Kristopher Gerardi, University of North Carolina assistant professor of finance Franklin Qian, and Rice University assistant professor of finance David Zhang find that lock-in reduces the probability of a sales listing by 21 to 23 percent. Even after listing, lock-in roughly doubles a property's time on the market. Using similar data, Aditya Aladangady, Jacob Krimmel, and Tess Scharlemann of the Federal Reserve Board of Governors find that lock-in reduces moving—although to a slightly more modest degree of about 15 percent when rate increases create a 3 percentage point lock-in, as has happened since 2022.

However, lock-in's effect on selling behavior is not uniform across all households, and the effect can change as lock-in deepens. Fonseca and Liu and Aladangady, Krimmel, and Scharlemann, for example, find that a marginal change in mortgage rates has a large effect when the homeowner is just crossing into lock-in but a smaller additional effect when lock-in is already substantial. Aladangady, Krimmel, and Scharlemann also note that intracity moves—which are more likely to be a change motivated by housing consumption than, say, job relocation—are more affected than intercity moves. And Gerardi, Qian, and Zhang argue that younger households are more sensitive to lock-in than older households, as the former tend to move more frequently on average.[2]

Mortgage Lock-In and the Housing Market

The combination of a low volume of sales and high price growth, as seen in the past few years, is historically rare. The housing market typically cycles through hot and cold phases, with periods of surging transactions and price growth followed by periods of fewer transactions and decelerating price growth. Mortgage lock-in is also historically rare, making it a probable cause of the currently atypical housing market. More directly, the line from lock-in to price increases seems a simple application of supply and demand: As the supply of homes for sale falls, prices will rise, all else being equal.

But everything else in the current housing market is not necessarily "equal." Rising mortgage rates have also depressed demand. And many sellers are also buyers. Indeed, the very language and logic of "lock-in" presupposes that potential sellers are reluctant to re-enter the market as buyers because they are unwilling to reset the terms of their mortgage. Hence, lock-in of sellers is also "locking out" potential buyers, meaning demand has shifted with supply. If lock-out suppresses demand enough, the buyer/seller ratio could remain steady or even decrease.

The effect of lock-in on moving propensity is directly measured from mortgage and transaction data. But since we cannot see the housing market in a counterfactual world with only seller lock-in and not buyer lock-out, researchers have turned to models of the housing market. Using these models, they can estimate the net effects of the rate increase on the buyer/seller ratio and prices. The findings to date show that, on balance, lock-in is making markets slightly tighter, with a modest to moderate effect on prices.

Using their estimates of sale probability and a model of housing tenure choice, Batzer, Coste, Doerner, and Seiler find that lock-in has prevented 1.7 million transactions and increased home prices by 7 percent. This, however, is an average effect across the entire market. Models with segmented markets—that is, with different types of homebuyers and sellers, and with the option to rent or own—account for the differential incentives the rate increase has had on, for example, young versus old households. Using these models, Gerardi, Qian, and Zhang and Fonseca, Liu, and INSEAD assistant professor of Finance Pierre Mabille find that, on net, lock-in has produced a small increase in prices because the exit of sellers from the market is only marginally offset by the decline in how much buyers are willing to pay for these homes.

Aladangady, Krimmel, and Scharlemann find that lock-in has produced price increases because of a "perfect storm" of circumstances beginning in 2022, though in general the effect of lock-in on prices is ambiguous. They use a model of housing search in which buyers and sellers meet in the market, and outcomes such as price and time to sale are fundamentally dependent on the ratio of buyers to sellers—that is, the "tightness" of the market. They find that whether seller lock-in increases prices depends on the degree of tightness. When markets are loose, lock-in's effect is small. But when markets are tight, a decline in the number of sellers matters a lot, so prices rise. They conclude that the historically tight conditions of the rate hike period led to an increase in prices. Specifically, what would have been an increase of 4.5 percent in looser markets is 11 percent in tighter markets.

There is little debate as to whether the rise in rates and concomitant lock-in has led to fewer transactions. There is clearly a reduction in both sides of the market—that is, a reduction in both the number of buyers and the number of sellers. But even if lock-in did not increase prices, the reduction in transactions could decrease the welfare of prospective buyers. Fewer sellers means a limited menu of homes for sale. With fewer choices, buyers may settle on a worse match than they might have otherwise found if more homes had been listed for sale.

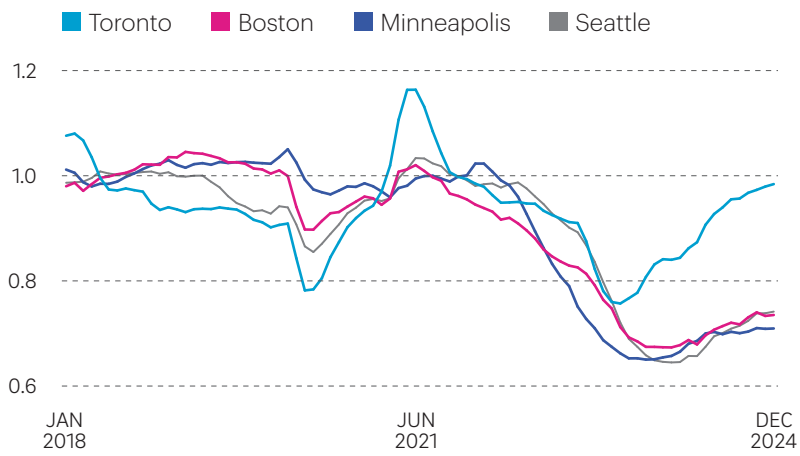
Moreover, these effects may not be equally distributed, a point emphasized by Gerardi, Qian, and Zhang. A homeowner of a large, expensive property may be indifferent between a slightly better match and their current match. But a homeowner of a smaller, less expensive property looking to move up to a larger one now has two challenges: New borrowing is more expensive, and their desired next house is being held off the market by a locked-in owner. Their model shows that buyers in lower-income census tracts would see more welfare gain in a world without lock-in.

FIGURE 3

The Toronto Market Is Similar to Many Tight U.S. Housing Markets

But in Canada most mortgages have an adjustable rate, and Toronto saw a recovery in listings even as mortgage rates rose.

Properties listed for sale, index of 12-month cumulative count, 2018–2024



Data Sources: Toronto Regional Real Estate Board; Multiple Listing Service via CoreLogic

How Policymakers Can Respond to Lock-In

The fastest way to end mortgage lock-in is for mortgage rates to fall. Although a return to rates below 3 percent is unlikely, Batzer, Coste, Doerner, and Seiler suggest that even a moderate decline in mortgage rates would have a discernible effect. Mortgage rates, however, are largely affected by monetary policy, and policymakers are more focused on price stability and full employment than a peculiar outcome in the housing market. So, the unwinding of lock-in will likely come about through normal housing market turnover—that is, through changes in family status, jobs, health, and so on. Thanks to this turnover, most new and existing mortgages will eventually converge to the market rate. But this unwinding will take time to run its course—and extra time because the rate at which people move is dampened by lock-in.

New construction could speed this process. Only a home with a current occupant can be locked in. New construction should ease the housing market by matching homeowners with new units, which would bring more mortgages in line with prevailing rates. Furthermore, the housing market has for some time been characterized by a low building rate (especially in expensive areas), which has led to a historic demand/supply imbalance and a shortage of affordable housing. Therefore, public policies that address the housing shortage may also help unravel lock-in.

Reforms to the mortgage market could also alleviate lock-in and prevent it from happening in the future. As described earlier, lock-in is the result of rising rates combined with long-term FRMs tied to a borrower/property match. Making any of these institutional attributes more flexible could deter future lock-in. For example, if more mortgages had an adjustable rate instead of a fixed rate, then homeowners' average mortgage rate would be close to the market rate, regardless of when the mortgage contract was signed. Gerardi, Qian, and Zhang point to the example of the Toronto market, which is similar to many tight U.S. housing markets, except that in Canada most mortgages have an adjustable rate. And Toronto, they note, did not see an increase in market tightness when mortgage rates rose (Figure 3).

More mortgages could be made assumable or portable. In their evaluation of these two options, Batzer, Coste, Doerner, and Seiler argue that mortgage lenders are more likely to accept portability than assumability because when mortgages are portable, only the asset backing the debt—rather than the borrower—changes, and they can assess the value of those assets reasonably well. Portability would also alleviate the moving and selling disincentives that appear to be the most problematic elements of lock-in. But a portable mortgage would have to be repriced relative to a nonportable contract, with the new price reflecting the extra option afforded the borrower (portability to a new home) and the change in expected duration for the lender (expected time to repayment). If there is a gap in acceptable prices between borrowers and lenders, there may be no functioning market for portable mortgages.

Any of these reforms would likely require widespread changes to the mortgage financing model in the United States, where capital market investors finance mortgages by buying them as securities. The U.S. government, long interested in promoting home ownership, has influence in this space through the government-sponsored enterprises (such as Fannie Mae and Freddie Mac) that facilitate the securitization of mortgages.[3] However, major reforms can be difficult to execute, as they require a widespread rewriting of rules and changes to longstanding institutions and habits.

A more modest reform would follow the Danish model, which also features long-term FRMs and capital market financing. When rates rise, investors would like to offload their older, low-rate mortgages. In Denmark a homeowner can buy back their own mortgage from the securitization pool at a significant discount.[4] This allows the investor to sell the old mortgage and the current homeowner to reap a discount from the purchase of the old mortgage. The buyback discount ameliorates the financial disincentive of moving, which allows homeowners to search freely without lock-in. This modest reform could promote flexibility in the housing market without upsetting the entire mortgage finance system.

How Lock-in Affects Other Economic Outcomes

Because homeownership and residential location are linked, the effect on the housing market could spill over into a regional economy. Fonseca and Liu (2024) argue that mortgage lock-in, through its disincentive to move, has prevented workers from relocating to new labor markets for better jobs. In this way, lock-in could have macroeconomic implications for business cycles and aggregate growth. However, this finding has been challenged by subsequent work. Using a different statistical model, Liebersohn and Rothstein (2025) find that long-distance moves (between states) were less affected by lock-in than local moves (between zip codes). Similarly, Aladangady, Krimmel, and Scharlemann (2025), armed with more geographically detailed data, argue that moves between cities were less affected by lock-in than moves within cities. More importantly, they find, buyers may opt for lower-value homes to afford the new mortgage rate. Overall, the largest effect they find is on total transactions. The findings of both of these studies suggest that lock-in has a limited effect on labor misallocation.

According to other studies, high mortgage rates for owner-occupied homes also have a spillover effect on the rental market. De la Roca, Giacoletti, and Liu (2025) find that Los Angeles neighborhoods with more locked-in starter homes show a greater increase in advertised rents, a pattern they attribute to demand spillovers—that is, rental demand increases when renter households cannot transition to homeownership. Using a nationally representative rental listings data set, Abramson, De Llanos, and Han (2025) also find that higher interest rates lead to higher rental prices, although they attribute this increase to the substitution from owner-occupancy to rental demand and not necessarily to the mortgage lock-in of existing owners. They further show that, when owner-occupant transactions decline, real estate investors move into the market and buy properties as rentals.

Notes

1 See Ahmad and Elul (2024).

2 However, they also find that different demographic groups experience a similar proportional effect on moving.

3 For more discussion of the promotion of homeownership in the United States, see Li and Yang (2010).

4 Denmark and the United States are alike in that much of their mortgage financing is provided through capital markets, not deposits. Thus, financial institutions can originate long-term mortgages without having to do "maturity transformation" from short-term deposits into long-term lending contracts. Borrowers, presumably liking the certainty that FRMs provide, tend to select them when both adjustable-rate mortgages and FRMs are available. See Berg, Nielsen, and Vickery (2018).

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U.S. Dollar Dominance: A Blessing or a Curse?

The international dominance of the dollar has benefitted the U.S. economy, but not without risks.

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The views expressed in this article are not necessarily those of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

When it comes to the global economy, typically one currency is widely used for invoicing international trade, denominating global financial contracts, and serving as a reserve asset. For 80 years, that currency has been the U.S. dollar. This helps the U.S. economy but also creates risks. In this article, I discuss how the U.S. dollar became the dominant international currency, the benefits and risks associated with being the dominant international currency, and challenges to the dollar's dominance.

The Rise and Fall of the British Pound

To understand how the U.S. dollar became the dominant means of payment for international transactions in goods and assets, we must first revisit the story of the currency that preceded dollar dominance: the British pound.

The Industrial Revolution, which started in the United Kingdom, vastly expanded the international flow of goods and capital. The international network created by British firms, banks,

and other financial institutions made London the main financial center of world commerce. The bulk of international trade was settled through transfers of bank deposits among London banks. Thus, the era of British pound dominance was born.

Network effects played a major role in the rise of the British pound.[1] Network effects occur when the value a user derives from a product or service depends on the number of users of compatible products and services. As the number of users increases in a network, the value or importance of the products and services also increases. So, as more exporters adopted the British pound as their preferred currency for receiving payments, importers were increasingly compelled to use the British pound as their means of exchange in international transactions, too.

As of 1900, the British pound was accepted as a means of payment in 100 percent of international markets, whereas the U.S. dollar was accepted in only 25 percent.[2] By then, U.S. gross domestic product (GDP) had surpassed that of the United Kingdom, but network effects ensured that the international network centered on the British pound would remain largely intact until World War I. Once global trade resumed after the war, the pound regained its dominance. But the global economy had changed, and with that change came the opportunity for another currency to challenge the British pound.

As New York City became a leading global financial center in the 1920s, Federal Reserve officials and U.S. banks mounted a global campaign to promote the internationalization of the U.S. dollar.[3] By 1929, the U.S. dollar represented 56 percent of aggregate foreign currency holdings, whereas the British pound represented only 41 percent (Figure 1).[4] The British pound, it seemed, was on its way out.

However, the Great Depression dealt a blow to the dollar's rise on the global stage. To deal with the downturn, policymakers everywhere focused on boosting domestic production and employment, even at the expense of international trade. As international trade declined in the 1930s, so too did the rationale for an international network built around the U.S. dollar. The outbreak of World War II at the end of the decade further delayed the reestablishment of global flows of trade and finance.

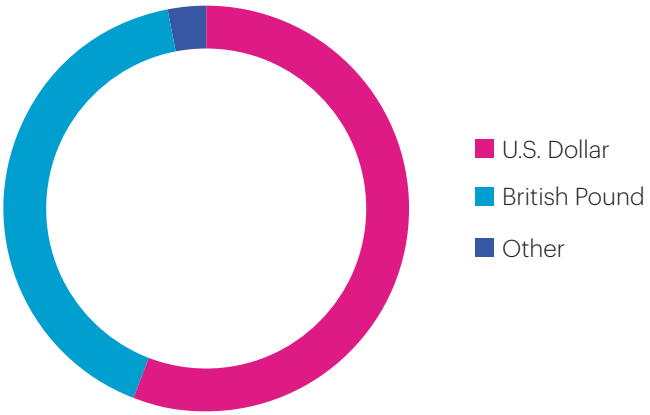
This history teaches us three important lessons about dollar dominance. First, only one currency tends to dominate an integrated market at a time. Second, the dominant currency is not necessarily the currency of the world's largest economy. And third, network effects explain why a currency can remain dominant even after another economy has grown larger.

FIGURE 1

By 1929, the U.S. Dollar Represented 56 Percent of Aggregate Foreign Currency Holdings

The British pound represented only 41 percent.

Aggregate foreign currency holdings of 16 countries, 1929



Data Source: Eichengreen et al. (2018)

The Rise of the U.S. Dollar

As World War II neared its end and the world economy prepared itself for the resumption of international trade, the Bretton Woods conference established the U.S. dollar as the central currency in a new, postwar international monetary system. Under Bretton Woods, the U.S. dollar was the only currency convertible into gold. Other countries had to peg the value of their currencies to the U.S. dollar, resulting in a system of fixed exchange rates. For example, the Bank of England maintained its assigned peg of $4.03 to the British pound by buying and selling U.S. dollars every day on the foreign exchange market. In other words, the Bretton Woods system of fixed exchange rates depended on governments exerting capital controls over international asset flows. Otherwise, speculative capital flows would eventually force a country to abandon its peg and allow its currency to devalue.

This became a problem as the total value of U.S.-issued convertible liabilities surpassed available gold reserves in the United States. Foreign central banks held their reserves in U.S. dollar-denominated assets, which they needed for managing their pegs to the U.S. dollar. If all foreign holders of U.S. dollar-denominated assets decided to redeem their claims to obtain gold, the U.S. government would not be able to make good on all its payments. If, however, the U.S. government were to abandon its commitment to convert U.S. dollars into gold at a predetermined exchange rate, as many feared was likely to happen, all investors would suffer large losses. This gave investors an incentive to exchange their U.S. dollar-denominated assets before the United States abandoned its commitment. As investors exchanged these assets, the U.S. dollar price of gold in the London market rose. The situation had become unsustainable by 1971, so President Richard Nixon ended the U.S. obligation to convert U.S. dollars into gold.

Since 1971, the exchange value of the U.S. dollar has been determined by market forces, which reflect fiscal and monetary policies adopted by the U.S. government and its trading partners. And yet, the U.S. dollar remains the dominant international currency.

Why U.S. Dollar Dominance Survived

Why were foreign investors and governments still attracted to the U.S. dollar (and U.S. dollar-denominated assets) after the

end of Bretton Woods? As with the British pound earlier in the 20th century, network effects allowed the dollar to maintain its dominance even as the global economy changed. Moreover, the U.S. dollar benefited from two additional circumstances: a lack of a competing alternative and the emergence of newly industrializing nations that unilaterally pegged their currencies to the U.S. dollar.

See ***The Path to Network Effects***

First, since the end of Bretton Woods, none of the currencies that seemed poised to supplant the U.S. dollar—the Japanese yen and the German deutsche mark in the 1980s and the euro after 1999—managed to do so. Although Japanese firms and banks played a major role in international markets in the last quarter of the 20th century, Japanese policymakers were reluctant to promote a greater international role for the Japanese yen for fear of overvaluation of the yen and deterioration of the Japanese trade balance. Although Western European countries established a fixed exchange rate regime centered on the deutsche mark following the collapse of Bretton Woods, the German government, like the Japanese government, feared overvaluation of its currency and the deterioration of its trade balance.[5] In both cases, the issuing country was unwilling to adopt the policies that would enable its currency to displace the U.S. dollar. (For more on this subject, see the sidebar "The Path to Network Effects.") The situation was different for the euro, which most countries of the European Union adopted in 1999, but for reasons discussed below, the euro has also failed to become an attractive alternative to the U.S. dollar.

Second, since the collapse of Bretton Woods, developing nations have either dollarized or pegged their currencies to the U.S. dollar, creating additional demand for U.S. dollars. (Like the signatories of Bretton Woods before 1971, these foreign central banks sustain their exchange rates by buying and selling U.S. dollars on the international capital market.)[6]

Network effects alone would have likely kept the U.S. dollar dominant, but these two additional circumstances make it even harder for the dollar to lose its dominance.

The Benefits (and Risks) of Issuing a Dominant Currency

The country issuing the dominant international currency can run a large trade deficit, borrow lots of money, and run big budget deficits without having to worry too much about rising prices or interest rates. But with each of these benefits comes a risk.

The international demand for U.S. dollars is one of the factors that has allowed the U.S. economy to run a large trade deficit (that is, to import far more than it exports) for an extended period without making imports more expensive for U.S. consumers. To understand why, let's consider a hypothetical country whose currency is not widely accepted internationally. In this country, an exporter receives U.S. dollars in payment for its sale of goods and services abroad. Because the exporter also wants to purchase goods and services domestically, it needs to exchange its U.S. dollar receipts for domestic currency. An importer in this same country wants to convert its domestic currency holdings into U.S. dollars to make purchases abroad, so it needs to trade in the foreign exchange market, too. The equilibrium exchange rate in this market (that is, the price of the U.S. dollar in terms of the domestic currency) depends on two things: the quantity of U.S. dollars that exporters can offer and the importers' demand for U.S. dollars.[7]

However, if this country runs a trade deficit, its larger demand for U.S. dollars in the foreign exchange market—which is due to its imports expanding relative to its exports—will put upward pressure on its currency's nominal exchange rate. If this country runs a trade deficit for too long, the value of its currency will depreciate over time, making imports more expensive for its residents.

None of this is true for the United States. International investors and foreign central banks demand U.S. dollar-denominated assets because they can be easily sold in international markets at a predictable price, making them a key financial asset in their portfolio strategy. So long as there is this large global market for U.S. dollar-denominated assets, U.S. importers don't need to convert their domestic currency into a foreign currency to pay for these imports—they can just pay foreign exporters in U.S. dollars, and the exchange rate holds steady (all else being equal).

Indeed, U.S. consumers did not experience (much) inflation during the Bretton Woods period. And although the trade deficit has reemerged since 2000, inflation has (mostly) held steady.[8] However, running a large trade deficit for a long period creates a risk for the country that issues the dominant currency. If we ever transition to an international monetary system in which the U.S. dollar is no longer dominant, the large U.S. trade deficit may trigger a substantial decline in the demand for U.S. dollars. This would result in a persistent depreciation of the U.S. dollar and more expensive imports for U.S. consumers. This can prove difficult for U.S. households and firms that have become accustomed to cheap imports.

The second advantage of U.S. dollar dominance is that American firms can borrow more cheaply internationally and without any exchange-rate risk. In their forthcoming *Journal of Finance* article, Wharton School assistant professor of finance William Diamond and Federal Reserve Bank of New York economist Peter Van Tassel find that international demand for U.S. dollar assets reduces interest rates for U.S. firms versus a counterfactual. Because they can borrow more cheaply, these firms can invest more, boosting economic growth and incomes.

U.S. firms do not face exchange-rate risk because they can borrow by issuing debt claims denominated in U.S. dollars. This gives them a significant advantage over foreign competitors. To understand why, suppose that a foreign firm borrows U.S. dollars on the international market, but then its home country's currency depreciates before the debt obligation matures. Although the U.S. dollar value of the firm's debt obligation hasn't changed, the value of its domestic liabilities has risen. As the domestic value of the firm's liabilities increases in proportion to its revenues, it must pay more interest on its debts relative to its revenues, which reduces its profits. This problem stems from the mismatch between the denomination of the firm's liabilities (U.S. dollars) and the denomination of its revenues (domestic currency).

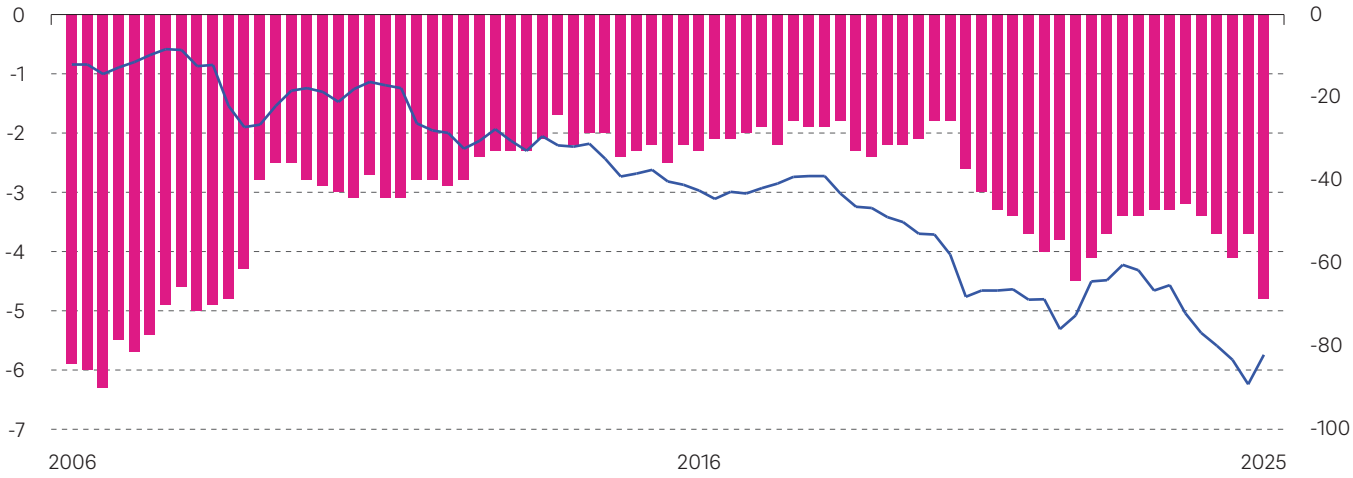
So long as U.S. firms have both their debt obligations and

FIGURE 2

Foreigners Now Own About Twice as Much U.S. Debt as Americans Own Foreign Debt

But because the U.S. dollar is the dominant international currency, this hasn't led to inflation or a shrinking economy.

The U.S. current account as a percent of GDP (red bars, left scale); the U.S. net international investment position as a percent of GDP (blue line, right scale); 2006–2024



Data Source: U.S. Bureau of Economic Analysis

their revenues denominated in U.S. dollars, they face no exchange-rate risk. However, a sudden change in the international demand for U.S. dollar assets could sharply increase the cost of borrowing for U.S. firms and eventually reduce U.S. investment. If U.S. firms can no longer issue debt denominated in U.S. dollars, they may face exchange-rate risk, which can affect their profitability.

The third advantage is that the U.S. Treasury can finance large budget deficits at lower interest rates. As noted above, international investors and foreign central banks want U.S. dollar-denominated assets such as Treasury securities because they can be easily sold in international markets at a predictable price. The higher demand for Treasury securities makes them more expensive in the secondary market, which in turn reduces the profit (or yield to maturity) an investor receives for owning a security they bought on that market.[9] This allows the United States to finance its budget deficits at a lower cost versus a counterfactual. The fact that Treasury securities have a higher price than that predicted by a counterfactual in which these securities are evaluated only by their return-risk characteristics suggests that there is a *liquidity premium*. In other words, investors are willing to pay more for U.S. Treasury securities (and thus earn a smaller yield) because they are liquid. We can even measure how much more they are willing to pay: In their 2012 *Journal of Political Economy* article, Stanford University professor of finance Arvind Krishnamurthy and University of California, Berkeley, professor of finance and management Annette Vissing-Jørgensen document that Treasury yields were reduced by 73 basis points on average from 1926 to 2008 because Treasuries were so liquid.

But here too there is a risk for the issuing country: Because borrowing is so cheap, policymakers may delay necessary budget adjustments that ensure the sustainability of debts in the long run. If there is a sudden decline in the global demand for U.S. dollars, the cost of servicing the U.S. debt can become unsustainably large, risking a sovereign debt crisis.

The risks to the U.S. economy are particularly clear when we compare the U.S. current account as a percent of GDP with the U.S. net international investment position as a percent of GDP (Figure 2). The latter figure tells us that the total foreign wealth owned by Americans is much less than the total U.S. wealth owned by foreigners. This gap is currently at 82 percent of U.S. GDP. In any other country, such a mismatch would be dangerous and would likely lead to inflation or a deep economic contraction. But the U.S. is still able to attract enough foreign investment to keep our economy steady. This is only possible because the U.S. dollar is the dominant international currency. If the dollar would ever lose its dominance, the United States would be unable to avoid a severe economic disruption. In short, the longer the U.S. dollar maintains its dominance, the more painful it may be for the U.S. economy once it loses that dominance.

Challenges to U.S. Dollar Dominance

An ongoing question in international economics is whether the U.S. dollar will maintain its dominant status. Economists propose three scenarios in which this dominance could end.

In one scenario, the U.S. dollar loses its dominant status through the emergence of a rival sovereign currency issued by an economic bloc as large as the U.S. economy. In his 2011 book *Exorbitant Privilege*, University of California, Berkeley, professor of economics and political science Barry Eichengreen argued that the 2007–2008 Global Financial Crisis (GFC), which started in the United States, damaged the United States' reputation as a financial center. This, he wrote, opened the door for the euro to emerge as a serious rival to the U.S. dollar because the same network effects that led to the rise of the U.S. dollar could emerge in a large economic bloc such as the euro zone.

Although Eichengreen built a coherent framework for modeling the rise of a new dominant sovereign currency, the euro has experienced only a limited expansion in international markets since the GFC, granting it only a distant second place in the share of international reserves and the invoicing of international trade. The strong network effects that reinforce U.S. dollar dominance remain in place despite the existence of a serious rival. As previously mentioned, it would require a sufficiently big shock to dethrone the U.S. dollar, and not even the GFC was big enough to do that. (Indeed, it took two world wars and the Great Depression to dethrone the British pound.) Also, it is not clear that the euro network has any technological or strategic advantage over the U.S. dollar network, even in the absence of a large external shock to the system.

The ascent of China to the world's second-largest economy has led some economists to argue that the Chinese yuan can rival the U.S. dollar. Although the Chinese economy plays an important role in international commerce, capital controls imposed by an autocratic regime make the Chinese currency an unappealing international currency. The Chinese government, like the Japanese and German governments before it, does not seem to attach a high priority to the internationalization of its currency, probably because it is not willing to adopt the necessary policies.[10]

In a third scenario, privately issued digital currencies replace the U.S. dollar in international commerce. Because digital currencies such as Bitcoin and Ethereum are designed to be traded on a network of computers, they are a useful means of direct payment for international exchanges.[11] In contrast, conventional international payments run through a network of correspondent banks that process cross-border payments on behalf of their customers. This market tends to be dominated by a small group of large banks, which increases their market power and results in high transactions fees.

Theoretically, a privately issued digital currency could one day displace the U.S. dollar in international payments. However, the excessive volatility of privately issued digital currencies creates serious problems for international traders.[12] In most international transactions, it takes 30 to 60 days between the invoicing of merchandise and the receipt of payment. If the transaction is invoiced in terms of a volatile digital currency, the actual real value of the exporter's sale can be very different from the expected real value at the time the merchandise was invoiced. This explains why they are not yet a popular tool for settling international transactions, even though they enable direct payments across borders.

One type of digital currency, however, could address this concern. A stablecoin is designed to provide a stable value through the implicit promise to convert one unit of the digital currency into one U.S. dollar.[13] As stablecoins have become useful for investors hoping to manage their exposure to digital assets, they have grown considerably. The current market capitalization of the two major stablecoins, Tether and USD Coin, is approximately $250 billion.

But because stablecoins are pegged to the U.S. dollar, they cannot become an alternative to the U.S. dollar in international payments. A true alternative to the U.S. dollar would be a digital currency that is not a promise to pay U.S. dollars. Although stablecoins have provided a haven for digital-currency investors, it is not clear that stablecoins can maintain their value if they sever their peg to the U.S. dollar. In this sense, stablecoins are a branch of–rather than a rival to–the broader U.S. dollar international network. Indeed, most investors buy stablecoins *because* they are pegged to the U.S. dollar.

If, however, someone were to design a stablecoin pegged to the value of a basket of sovereign currencies, then this new instrument could rival the U.S. dollar even if that basket included the U.S. dollar. But many problems would have to be solved before this instrument could develop into a sufficiently large payment network. Would the issuer of such an instrument be regulated? How would the weights in the basket of sovereign currencies be determined? Would they change over time?

More importantly, if the market value of one unit of this stablecoin deviated from the peg, stablecoin holders might want to convert their stablecoins into cash. But if the stablecoin issuer

The Path to Network Effects

Why was it the U.S. dollar—and not some other currency—that benefited from network effects in the first place? In our 2025 working paper, Philadelphia Fed senior economist Joseph Abadi, University of Pennsylvania professor of economics Jesus Fernandez-Villaverde, and I show that the initial design of a country's currency system plays a large role in the subsequent development of an international monetary system (including the rise of a dominant currency). The important elements of this initial design are the choice of a monetary standard, the creation of a central bank, the rules governing central bank policy, the ease with which residents can make foreign payments, the ease with which domestic banks can establish branches abroad, and the rules governing the way foreigners can invest in domestic assets and expatriate funds. These design choices determine the initial size of a country's currency network, which then influences a foreign agent's decision to accept that currency in payments, and thus that currency's network effects.

In our model of the world economy, if the initial size of a country's currency network is slightly larger than that of foreign competitors, foreigners will have a greater incentive to use its network to settle their international transactions, and that country's currency will become dominant. In other words, the initial, relative advantage of a country's network, even if that network is small, will drive the long-run outcome for the international monetary system. Moreover, the long-run regime is remarkably robust: Only a sufficiently large external shock can result in a dynamic process that changes the status of a dominant currency.

Based on our research, we conclude that network effects, not just the size of the U.S. economy, enabled the rise of the U.S. dollar. Because U.S. policymakers and bankers had designed a currency system between 1913 and 1944 that gave the U.S. dollar an edge in terms of network effects, the dollar could become and remain dominant for decades thereafter.

cannot quickly sell some of the assets that back its liabilities, it will need a lender of last resort to provide that liquidity. Who would be this lender? Would any of the sovereign governments or central banks that issue the fiat currencies that form the basket of currencies offer immediate assistance to the issuer? Without that expectation of immediate assistance, would the issuer be willing to overcollateralize its liabilities to insulate it from changes in the market value of its assets? Would this overcollateralization be credible? Solving these problems might not be in the interest of any one firm.[14] Therefore, it is likely that no one will issue such an instrument without governmental involvement.

Conclusion

In this article, I have discussed the history of the U.S. dollar as the dominant international currency and the main advantages and risks involved in the provision of a dominant currency. I have also considered some alternatives to the U.S. dollar. I conclude that the most feasible alternative is a stablecoin pegged to a basket of sovereign currencies. Until somebody successfully develops such a stablecoin and a sufficiently large and stable network to support it, the dollar should maintain its dominance thanks to network effects, the lack of a viable alternative, and the decision by developing nations to either dollarize or peg their currencies to the U.S. dollar. But if that dominance ends, the implicit risks of being the dominant currency may pose challenges for the entire U.S. economy.

Notes

1 See Eichengreen (2019).

2 See Flandreau and Jobst (2005).

3 In his 2011 book *Exorbitant Privilege*, Eichengreen shows how New York bankers and the Federal Reserve, which was established in 1913, developed the U.S. dollar network in the 1920s.

4 See Eichengreen et al. (2018).

5 The system built around the deutsche mark was also unstable. Member countries frequently devalued their currencies to accommodate a decline in domestic employment.

6 In the post–Bretton Woods regime, a developing country's peg to the U.S. dollar is not as rigid as it was under Bretton Woods. Central banks in developing countries frequently allow their peg to change over time in a predictable way or allow it to fluctuate within a specific band around a target value.

7 In this example, I assume that domestic households and firms do not buy foreign assets and that foreigners do not buy domestic assets.

8 In 2024, the U.S. trade deficit was about 3 percent of U.S. GDP.

9 Specifically, the yield to maturity is the difference between what you pay for a security and what you earn if you keep it until it matures.

10 See Abadi et al. (2025).

11 In my 2018 *Economic Insights* article, "Bitcoin vs. the Buck: Is Currency Competition a Good Thing," I explain the mechanics of making payments using Bitcoin.

12 So do cyberthreats, such as hackers accessing digital wallets.

13 I discuss the properties of stablecoins and other digital currencies in my 2023 *Economic Insights* article, "New Monies in the Digital Era."

14 There are additional problems: If this stablecoin is fully backed, how will the supply adjust to fluctuations in the global demand for money? Would governments always be willing to supply more debt when the stablecoin issuer needs to purchase more reserves?

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Surveying Mobility

A new survey provides unique insights into economic mobility in the Third District.

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The views expressed in this article are not necessarily those of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

Understanding economic mobility—the ups and downs people experience in their employment, income, and financial situation—is important for understanding the opportunities and challenges faced by people and communities, as well as the state of the economy. However, measuring economic mobility is difficult because many data sets do not provide adequate information on changes in people's economic circumstances over time. To address this gap, the Federal Reserve Bank of Philadelphia recently launched its Survey of Economic Mobility. The survey generates new insights into the experiences and expectations of Third District residents regarding work, school, and economic mobility. In this article, I describe the survey's design and the results from a pilot of the survey. I then share some initial insights we have gained from the survey.

The Survey's Design and a Pilot Study

We designed the Survey of Economic Mobility to provide us with detailed information from a broad cross-section of people.

First, we directly recruit survey participants by sending letters to residential addresses in the Third District inviting people to participate in a survey. This allows us to recruit survey participants from specific geographic areas of interest (for example, certain neighborhoods in Philadelphia). This also allows us to obtain a more representative sample because we are not limited to individuals who have opted in to any particular online survey platform.

Second, participants complete monthly text message surveys; we use text messages so that a broader range of individuals can participate. Some people don't have the ability to sit down at a computer and take a survey for 10 or 15 minutes, but they can respond to text messages throughout the day.

Third, we ask participants specific questions about their economic opportunities and challenges. We first ask about their baseline characteristics, such as age, education, and household income. We also ask individuals whether their ability to work or look for a job is limited by their health or access to transportation. This information provides us with a detailed snapshot of everyone's economic circumstances. During each month of the survey, we ask these individuals follow-up questions about their employment situation, recent job search activities, income, and expectations for future employment and job searches. We also ask whether their ability to work or look for a job was affected by a change in their health or access to transportation.[1]

Finally, we invite some participants to participate in focus groups. The survey provides a unique opportunity to recruit focus group participants based on their responses to previous questions. For example, we can identify people who experience particularly positive or negative income changes and ask them nuanced questions about what led to their change in income and what other things in their life, such as their spending patterns or plans, changed afterward.

To understand the unique benefits of our Survey of Economic Mobility, let's compare it with another leading survey. The Current Population Survey (CPS), which is sponsored by the U.S. Census Bureau and the U.S. Bureau of Labor Statistics, provides invaluable labor force statistics such as the unemployment rate. The CPS is structured as a monthly panel in which individuals answer questions for a four-month period, followed by eight months out of the survey, then four more months in the survey. As a result, the CPS can measure monthly changes in individuals' employment. So too can the Survey of Economic Mobility, but the Survey of Economic Mobility collects additional information, including the income respondents earn each month, the types of jobs they are searching for, how many hours they spend searching, and how they view the costs and benefits of education. Thus, we collect more nuanced data about how workers of different backgrounds experience changes in their economic conditions.

Between December 2023 and August 2024, we undertook a pilot study of the Survey of Economic Mobility and recruited survey participants from lower- and middle-income zip codes in Philadelphia. We used this pilot to see if we could recruit our desired number of survey participants and if individuals would continue to participate in the survey over several months. The answer to both questions is "yes": Around 600 people completed the first month of the survey, and around 60 percent of these individuals completed all six months. Moreover, survey respondents were broadly representative of residents in the zip codes we targeted.[2]

Initial Insights

The Survey of Economic Mobility is uniquely suited to provide data on the determinants of economic outcomes. There are two broad explanations for why some people have poor outcomes. According to one explanation, individuals have either short- or long-term *fixed characteristics* that aren't valued in the labor market. For example, some people have minimal schooling or lack the skills that are sought by employers. But according to another explanation, some individuals experience *negative changes* that they have difficulty responding to. For example, some people experience a deterioration of their health, which leads them to work fewer hours, earn less income, and have greater difficulty paying their bills. Similar dynamics might emerge for individuals who experience reduced access to transportation.

These two explanations have different implications for our understanding of people's economic circumstances and the types of policies that could improve them. If the *fixed characteristics* explanation is the main reason people have poor outcomes, then improving their outcomes might require an investment in their education or skills. On the other hand, if the *negative changes* explanation is more relevant, then policies that help individuals respond to hardships might be most valuable. In practice, both explanations could be in play, so we need evidence on the relative importance of each.

The Survey of Economic Mobility is well suited for the provision of this evidence. In particular, the survey provides monthly measures of respondents' economic circumstances and their experience of specific challenges. The key survey questions that measure challenges are: "During the last 4 weeks, did you experience any changes in your [physical, mental, or emotional health / access to transportation] that affected your ability to work or look for a job?" and, for people who reported a change, "Did your [physical, mental, or emotional health / access to transportation] get better or worse during the last 4 weeks?"

People in lower-income households are much more likely to report monthly changes in their health (Figure 1). Among people in households with an income below $25,000, almost 33 percent of survey responses indicate a worsening of individuals' health that affected their ability to work or look for a job. Only about 8 percent of responses from lower-income households indicate an improvement in health, which means that, on balance, lower-income individuals' self-reported health worsened over time. In contrast, for people from households with an income above $100,000, only about 7 percent of responses indicate a decline in health and 4 percent an improvement. People from lower-income households are also more likely to report a decline in their access to transportation that affected their ability to work or look for a job (Figure 2). Essentially no one from a household with an income above $100,000 reported *any* change in their access to transportation that affected their ability to

FIGURE 1

Lower-Income Individuals Are More Likely to Report a Change in Their Health

And these changes tend to be negative.

Percent of survey respondents reporting that their health got worse, did not change, or improved over the previous four weeks

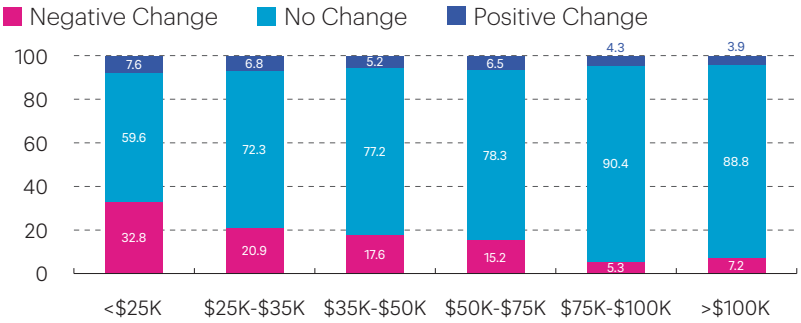
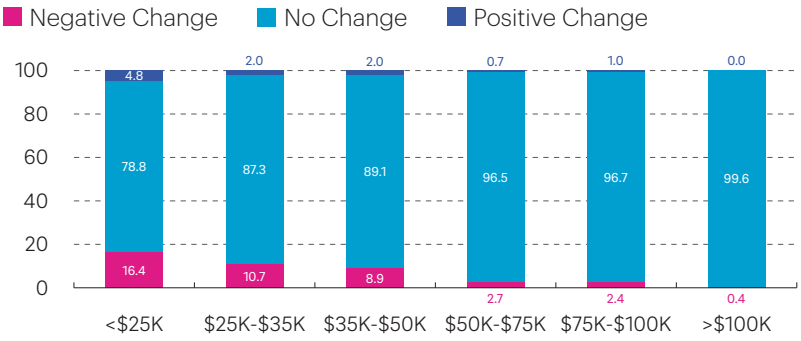


FIGURE 2

Lower-Income Individuals Are More Likely to Report a Change in Their Access to Transportation

And these changes tend to be negative, too.

Percent of survey respondents reporting that their access to transportation got worse, did not change, or improved over the previous four weeks



Source: Philadelphia Fed Survey of Economic Mobility

Notes: Household income is measured at the start of the survey. Each observation in this figure represents a monthly survey response.

work or look for a job. This makes sense: People from higher-income households have access to more reliable transportation in the first place, and they have more resources that allow them to pay for auto repairs or switch transportation modes as needed.

These results show that lower-income individuals are more likely to report negative changes that affect their ability to work or look for a job. However, these results alone are not enough to conclude that the *negative changes* explanation is in play. Lower-income individuals differ from higher-income individuals in many ways, including education and background. This creates an identification challenge: Do negative changes have an independent effect on people's outcomes, or are they simply associated with other factors that lead to poor outcomes?

To answer that question, I studied how negative changes in people's health affect their employment (Figure 3). For this analysis, I excluded people who reported that their health limited their ability to work or look for a job in the first month of the survey, and I excluded situations in which people reported an improvement in their health (which is less frequent). This left me with a sample of individuals who started the survey with reasonably good health and then experienced either no change or a worsening in their health. I then measured the association between individuals' employment and the experience of a decrease in health over the previous four weeks. I find that people with a decrease in their health are 13 percentage points less likely to be employed.

As discussed above, this association might reflect other characteristics of people besides their health. So, for my second estimate, I controlled for differences across people in observed characteristics: age, gender, race, ethnicity, education, and initial household income. When I control for these variables, the negative association declines in magnitude but still shows that people with a decrease in their health, holding the other characteristics fixed, are 9 percentage points less likely to be employed. Nonetheless, people have many characteristics that are not observed, even in a data set as rich as that provided by the Survey of Economic Mobility. Thus, my final estimate includes a person fixed effect, which controls for *all* features of individuals–both observed and unobserved–that are constant over the survey period. Using this approach, I can more definitively quantify how much people's employment changes when their health worsens. The resulting estimate implies that a decrease in health lowers individuals' employment rate by 5 percentage points.[3]

To summarize, decreases in health appear to have sizable, negative impacts on individuals' employment in the short run. However, the size of this relationship depends on how we account for the finding that people who report a deterioration of their health also tend to have characteristics that predict lower employment.

The effects of a decrease in access to transportation are broadly similar to the effects of a decrease in health (Figure 4). Using a parallel analysis, I find that decreases in access to transportation lower people's employment by around 11 percentage points.

These estimates suggest that decreases in health and access to transportation have sizable, immediate impacts on people's employment. To understand the importance of these channels for the employment rate of lower-income individuals, consider a simple back-of-the-envelope calculation. Among people with less than $35,000 in household income at baseline, 29 percent of survey responses indicate a negative change in health. Combined with the bottom-line estimates, this implies that negative changes in health lower the employment rate for this group by about 1.5 percentage points. Among the same group, a similar calculation suggests that negative changes in transportation also reduce the employment rate by about 1.5 percentage points. The average employment rate for this group is 48 percent, so this calcu-

FIGURE 3

Negative Changes in Health Lower Individuals' Employment

But accounting for differences across people is quantitatively important.

Percentage change in employment status for people who report worse health

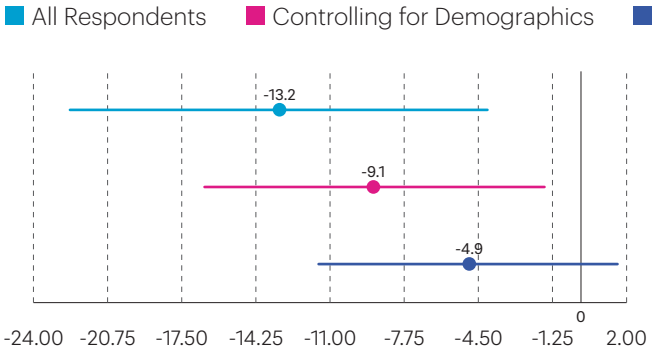
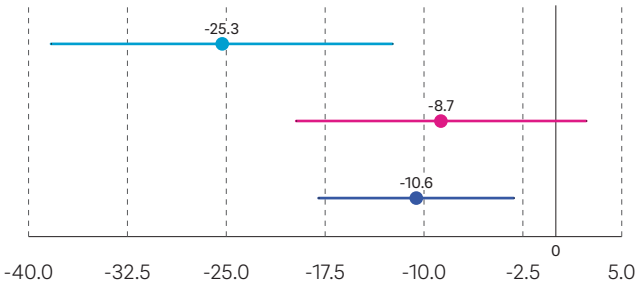


FIGURE 4

Negative Changes in Access to Transportation Lower Individuals' Employment

But accounting for differences across people is quantitatively important.

Percentage change in employment status for people who report a decline in transportation access



Source: Philadelphia Fed Survey of Economic Mobility

Notes: The controls in the top row are fixed effects for the survey month (1-6) interacted with fixed effects for the calendar month in 2024 when the survey was completed. In the middle row, I add indicators for race/ethnicity (non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, non-Hispanic other race, Hispanic), gender, age category, education level, and household income category. In the bottom row, I replace these individual control variables with individual fixed effects. The figure reports point estimates along with 95 percent confidence intervals based on standard errors that are clustered by survey respondent.

lation suggests that negative changes in health and transportation explain only a fraction of this group's low employment rate. In sum, *negative changes* appear to play a meaningful role in shaping the employment of low-income households, but *fixed characteristics* matter more.

Conclusion

The Survey of Economic Mobility is a unique approach to collecting data on the economic circumstances, opportunities, and challenges of residents of the Third District. The survey allows us to better understand the determinants of individuals' economic mobility, which is an important aspect of economic conditions. Initial results suggest that the employment of lower-income individuals is meaningfully held back by their greater incidence of negative changes in health and access to transportation.

Notes

1 We ask many other questions in the survey, but for the purpose of this article I focus on just the two questions about health and transportation.

2 See Anglin et al. (2025) for more details about this pilot study.

3 There is statistical uncertainty surrounding these estimates, as shown by the confidence intervals in the figures. This statistical uncertainty will fall as the survey sample size grows.

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Banking Trends

Synthetic Risk Transfers

Many U.S. banks use financial instruments to reduce regulatory capital and hedge credit risk.

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In 2023, the Federal Reserve's Board of Governors (FRB) issued a set of FAQ about a seemingly esoteric financial instrument called a synthetic risk transfer (SRT).[1] The FAQ spurred rapid growth in the U.S. market for SRTs, which allow banks to transfer some of the risk of their loans to outside investors. In this article, we describe these financial instruments, explain how banks can benefit from them, provide an overview of the market's size and growth, and highlight potential risks as the use of SRTs increases.

*See **A Synthetic Risk Transfer by Any Other Name***

Defining a Synthetic Risk Transfer

An SRT is a combination of a portfolio of loans and another financial instrument that together mimics a securitized financial product.[2] To create an SRT, a bank pays a third party for credit protection against a portfolio of loans on its balance sheet. The bank's goal is to transfer a portion of the credit risk of its loans to an outside investor, who will then cover the bank's losses if some

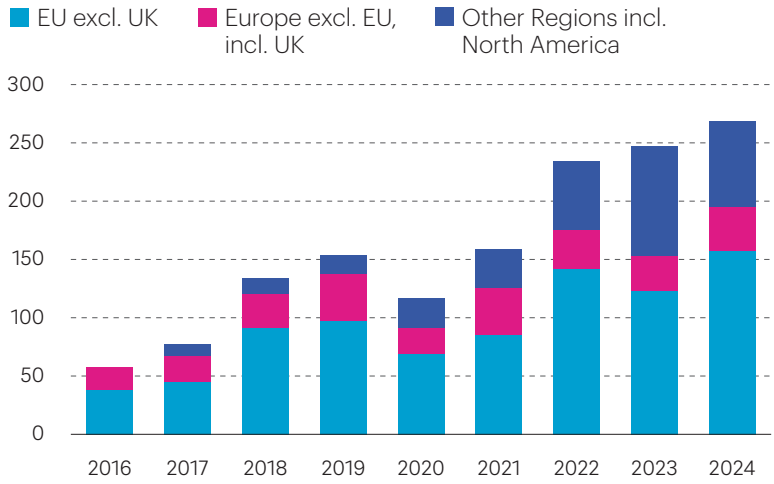
Key Takeaways:

- Banks issue synthetic risk transfers (SRTs) to hedge credit risk and optimize regulatory capital.
- U.S. capital rules allow banks to use SRTs to reduce the capital they are required to hold against possible losses, increase their returns relative to their capital, and create an opportunity to increase lending to their customers.
- In the U.S., the total amount of outstanding SRTs as of the fourth quarter of 2024 was $170 billion.
- The market experienced substantial growth following the Federal Reserve's publication of its frequently asked questions (FAQ) related to SRTs in 2023.
- If not well structured, SRTs could increase risk to banks and the broader financial system.

FIGURE 1

Synthetic Securitization Volumes Have Grown in Recent Years

Underlying pool size of synthetic securitization at inception by issuer region, billions of U.S. dollars



Data Source: International Association of Credit Portfolio Managers (2024)

Note: Authors converted euros to dollars.

of the bank's borrowers default on their loans. Unlike an actual securitized product, in which the bank sells loans to a third party, the underlying loans of an SRT remain on the issuing bank's balance sheet.

The fact that SRTs mimic securitizations is important because, according to U.S. capital rules, SRTs are treated similarly to securitized products. By using an SRT, a bank can reduce its risk-weighted assets (RWA)[3] and thus the amount of capital it is required to hold—just as it would if it had created a securitized product to sell to an outside investor, but without having to sell some of its loans. Thus, an SRT allows a bank to keep loans on its balance sheet while reducing credit risk and reducing the capital it is required to hold.

Types of Synthetic Risk Transfers

There are three main types of transactions that keep the underlying loans on the bank's balance sheet while shifting credit risk outside the bank. A credit default swap (CDS) is a derivative where the bank buys credit protection, paying a regular premium to the protection seller. A credit-linked note (CLN) is a debt security that references a portfolio of loans on the bank's balance sheet. Whoever buys a CLN receives interest payments from the bank but loses principal if some of the underlying loans default. In the third main type of transaction, a third party provides the bank a guarantee such as a letter of credit that covers future loan losses. There are strict guidelines in the U.S. capital rule on what type of firm may provide the guarantee.

How SRTs Help Banks

There are three key benefits for a bank that issues an SRT: credit hedging, a reduction in its RWA, and a higher return relative to capital.

Banks use SRTs to hedge credit risk by buying credit protection for loans on their balance sheets, usually for the first 12–15 percent of losses.[4] This protects them against future losses. If structured in a certain way, these transactions can even be fully cash funded. The investors who provide credit protection can pay the bank the full amount of potential loan losses up front, and the bank holds onto those funds. If there are no losses on the loan portfolio, the bank returns the cash to the investors.

Banks like SRTs because they relieve their capital requirements. Under U.S. capital rules, if a bank uses an SRT, its RWA is reduced by a commensurate amount, thus decreasing the amount of capital it must hold.[5]

*See **How a Hypothetical Bank Can Use an SRT***

The SRT Market

One challenge for understanding the market for SRTs is the lack of data. There is no single regulatory reporting requirement for SRTs, and generally only large or internationally active banks are required to report information on synthetic securitizations.

The Global Market

The International Monetary Fund (IMF) recently provided some valuable insight into the global market for SRTs.[6] Recently updated data about SRTs through 2024 show that over $1.4 trillion in underlying assets have been synthetically securitized since 2016 (Figure 1). Although these data are useful for analyzing the global SRT market, they can only obliquely tell us about the U.S. market.

The U.S. Market

In the United States, the Federal Reserve has nonpublic data obtained through bank supervisory activities. We used these data and certain vendor data sets to estimate U.S. market activity.[7] Because there is not a requirement for all U.S. banks to disclose information about SRTs, we do not have data on all of the banks, so our findings may underestimate the total U.S. market for SRTs.

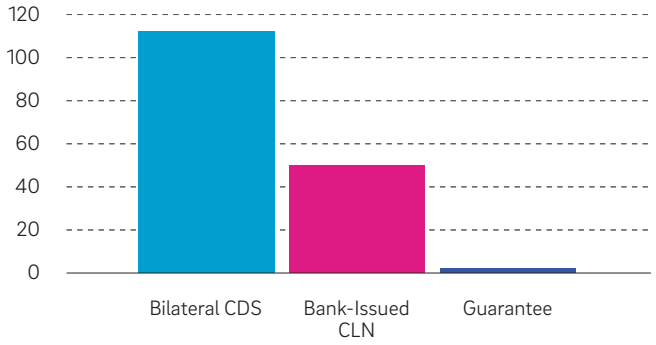
As of the fourth quarter of 2024, the total value of outstanding SRTs in

FIGURE 2

Roughly Two-Thirds of Outstanding SRTs in the United States Are Bilateral CDS

This high share may be a result of the wording of the U.S. regulatory definition of synthetic securitizations.

U.S. synthetic securitization by deal type, current collateral balance as of 12/31/24, billions of U.S. dollars



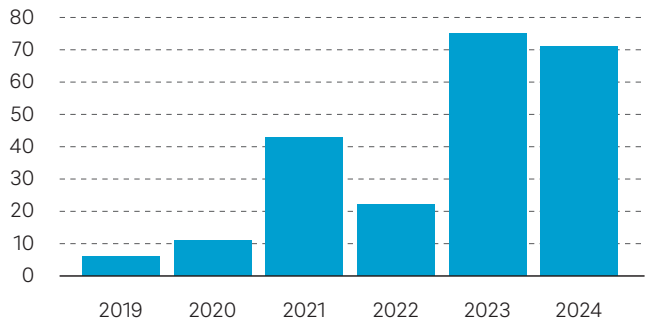
Data Source: FRB Philadelphia RADAR US SRT Database

FIGURE 3

The Volume of SRTs Issued in the United States Has Grown Substantially

Most of this surge occurred after the FRB issued its SRT FAQ in September 2023.

U.S. synthetic securitization issuance balance as of 12/31/24, billions of U.S. dollars



Data Source: FRB Philadelphia RADAR US SRT Database

the United States was $170 billion. The data suggest that roughly two-thirds of this balance is in the form of bilateral CDS (Figure 2). This high share may be a result of the U.S. regulatory definition of "synthetic securitizations."[8]

In the United States, SRT activity is not limited to large banks. As of the fourth quarter of 2024, at least seven banks with assets below $100 billion had issued SRTs.

The volume of SRTs issued in the United States grew substantially in 2023 and 2024 (Figure 3). Not coincidentally, in September 2023 the FRB published its SRT FAQ, and a large portion of that year's issuance occurred after that date. Although neither the IMF data set nor the FRB data set gives us a complete picture of this market's growth in the United States, the two together strongly suggest that this market is growing rapidly in size and importance.

The Key Risks of SRTs

Although these transactions can provide valuable credit hedging for banks, they may also create risks. As with most complex financial instruments, the way an SRT is structured determines the risk it creates and who bears that risk. The IMF,[9] the CFA Institute's Systemic Risk Council,[10] U.S. Senator Jack Reed (D-RI),[11] and former Federal Deposit Insurance Corporation Chair Sheila Bair[12] have all flagged potential concerns. Below we highlight two fundamental risks in the SRT market.

Unfunded SRTs

SRTs allow banks to hedge potential loan losses by transferring the risk of loss to third parties. In most transactions, the protection provided to banks is fully cash funded up front. For bank-issued CLNs, for example, investors must pay the purchase price of the notes at issuance. However, U.S. capital rules allow unfunded SRTs under some conditions, so not all SRTs are fully funded. In those cases, the bank that issues the SRT becomes exposed to counterparty risk, which is the risk that the protection provider will not be able to pay for loan losses as required by the SRT. The counterparty risk is most concerning in an economic downturn when both the bank and the investor could experience financial stress.

Banking System Interconnectedness

In addition to the benefits for individual banks, SRTs can make the financial system more resilient. SRTs can transfer credit risk from banks—which are exposed to the threat of runs by their depositors—to investors outside the banking system. Because those investors typically do not rely on deposits for their funding as banks do, the risk of a run is lower for them. This means they are better positioned to absorb losses without jeopardizing financial stability.

However, there are some types of SRT transactions that increase bank interconnectedness and as a result, could increase risk to the banking system. For example, SRTs in which one bank provides credit protection to another bank may jeopardize financial stability. In this case, the bank providing credit protection is exposed to the credit risk of the other bank's loan portfolio. Although there is a transfer of risk, the potential loan losses stay within the banking system rather than being dispersed among external investors.

Financing is another channel by which SRTs may increase bank interconnectedness and thus, increase systemic risk. For example, if an external investor buys a junior tranche[13] of CLNs from a bank, those notes can be pledged as collateral for a loan from another bank. In that transaction, some of the credit risk that was originally transferred to the external investor returns to the banking system.

TABLE 1

A Hypothetical SRT Scenario

Because the SRT increases the bank's RoRAC from 6 percent to 24 percent, the return on its required capital has quadrupled.

	Prime Auto Loans *No SRT*	**Prime Auto Loans with SRT** *Bank retains 87.5 percent*
Loans Pool Size	$100	$100
Retained Exposure	$100	$87.5
Interest Rate on Loan	6%	6%
Income on Loans	$6	$6
Interest Paid to Investors	0%	14%
Cost of Hedge	--	$1.75
Income on Loans (Net of Hedge)	$6	$4.25
Applicable Risk Weight	100%	20%
Risk-Weighted Assets	$100	$17.5
Return on Risk-Weighted Capital	6%	24%

Note: All dollar amounts in millions.

How a Hypothetical Bank Can Use an SRT

Bank A holds $100 million of prime auto loans on its balance sheet, earning 6 percent interest on its portfolio. Under the capital rule, auto loans receive a 100 percent risk weighting, so the bank's risk-weighted assets (RWA) for these loans is $100 million. The bank earns $6 million in interest and its RWA is $100 million, so on a return on risk-adjusted capital (RoRAC) basis, the bank earns $6 million, or 6 percent.

Bank A then enters into a credit default swap (CDS) agreement in which the investor who provides the credit protection agrees to cover the first $12.5 million in loan losses on the portfolio (Figure 4).

As compensation for covering potential losses up to $12.5 million, Bank A pays the investor 14 percent interest on the $12.5 million, or $1.75 million. The bank keeps all the loans on its balance sheet, so it still earns $6 million in interest on its portfolio, but it must now pay the investor $1.75 million. Thus, the bank's net income is $6 million minus $1.75 million, or $4.25 million.

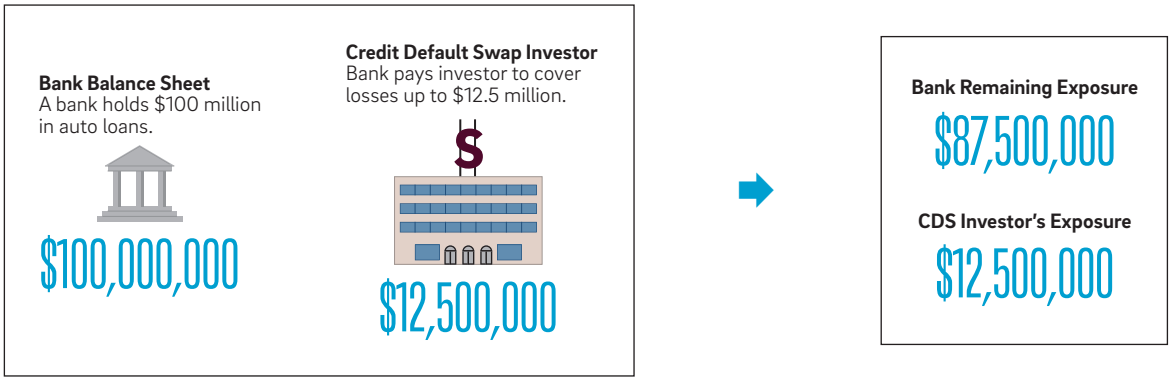
The combination of the loan portfolio and the CDS creates the SRT. Based on the U.S. capital rule, the bank will have to hold only 20 percent capital for the $87.5 million in credit exposure remaining after accounting for the CDS. (The assumption is that a loss in excess of the insured $12.5 million is highly unlikely.) The bank's RWA is $87.5 million x 0.20 = $17.5 million, which means that the bank's RoRAC is $4.25 million / $17.5 million = 24 percent.

Because the SRT increases Bank A's RoRAC from 6 percent to 24 percent, the return on Bank A's required capital has quadrupled (Table 1). The decrease in required capital from the SRT gives Bank A the option of increasing lending without raising new capital.

This hypothetical example shows how the reduction in their required capital can incentivize banks to issue SRTs. As Francisco Covas and Benjamin Gross explain in their 2024 blog post, SRTs "are particularly appealing when regulatory capital requirements significantly exceed the actual risk of the loans."

FIGURE 4

A Hypothetical Bank Creates an SRT



Conclusion

If structured well, SRTs offer many benefits. They can help banks hedge their credit risk, reduce their required capital, and expand lending to their customers. In addition to the benefits for banks, SRTs can provide an attractive risk-return tradeoff for external investors[14] and reduce systemic risk in the financial system. However, as with any complex financial instrument, these transactions are not risk-free. Banks, investors, and banking supervisors should pay close attention to the specific structure of each SRT transaction to ensure that SRTs provide those benefits without creating unintended risks.

A Synthetic Risk Transfer by Any Other Name

Although "synthetic risk transfer" (SRT) is widely used by financial market participants in the United States, not everyone uses that term. Under EU and UK capital rules, SRT refers to "significant risk transfer"; U.S. capital rules use "synthetic securitizations" for similar transactions.

To complicate matters further, some market participants use the acronym CRT, which for them means either "capital relief trade" or "credit risk transfer." Although "CRT" does not appear in the capital rules, the term generally has the same meaning as SRT or synthetic securitization.

The nomenclature is confusing, but the bottom line is that these are different names for similar types of transactions that transfer credit risk to third parties.

Notes

1 Board of Governors (2023).

2 Securitization refers to the process by which a bank packages loans together to create financial instruments that can be bought and sold.

3 Risk-weighted assets (RWA) reflect the varying levels of risk associated with different types of assets held by a bank. By assigning higher weights to riskier assets, regulators require the bank to hold more capital for the riskier assets, which gives the bank greater capacity to absorb losses. Under current regulations, for example, U.S. treasuries receive a 0 percent risk-weighting, which implies the debt is riskless, so the bank is not required to hold any capital against potential losses. Auto loans, on the other hand, generally receive a 100 percent risk-weighting, so the bank would have to hold capital against the full amount of those loans.

4 This amount of protection minimizes the risk-weighted assets on the senior tranche retained by the bank. In the United States, SRTs that reference different loan types tend to protect 12.5 percent of the loan amount, which produces the lowest possible risk weighting (20 percent) for the senior tranche.

5 For more details on how SRTs work, see Simmons et al. (2024) and Horn et al. (2024).

6 International Monetary Fund (2024).

7 In some cases, non-U.S. banks issue loans in U.S. dollars to U.S. companies but only take the RWA relief at the non-U.S. parent level. We do not include those transactions in our analysis. In other cases, U.S. banks issue loans denominated in euros to European borrowers but take the RWA benefit at the U.S. consolidated parent company. These transactions we do include.

8 One of the definitional requirements of "synthetic securitization" within the U.S. capital rule is the use of a credit derivative or a guarantee; the FAQ provided an avenue for CLNs, which are issued as securities but require Federal Reserve Board review and approval.

9 International Monetary Fund (2024).

10 CFA Institute (2024).

11 Reed (2023).

12 Bair (2023).

13 A junior tranche of a security is one with lower repayment priority than other tranches. If the referenced loans default, the owners of the junior tranche will take the first losses.

14 See Khanna et al. (2024) for a discussion of potential benefits for SRT investors.

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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.

Fintech Innovations in Banking: Fintech Partnership and Default Rate on Bank Loans

We explore whether banks could leverage data and technology to expand their customer base without taking on more credit risk. Previous studies have not explored the impact of fintech partnerships on the quality of banks' loan portfolios. Our analysis utilizes data on relevant bank–fintech partnerships and loan-level data from Y-14M reports. For credit cards, we find that banks that had fintech partnerships extended larger lines of credit to consumers with low credit scores or missing credit scores. We also find that credit card default rates declined among nonprime borrowers with missing credit scores. For mortgages, unlike credit cards, our sampled banks did not grant larger mortgage loans to nonprime borrowers. However, the fintech tools seem to have improved the effectiveness of banks' credit decisions, resulting in a decline in mortgage default rates. Further analysis of the interest rate spread residual shows that, after gaining access to fintech tools, banks were better able to differentiate between nonprime borrowers that were good credit risks and those that were not. This was evident in the pricing of the loans after the banks entered partnerships. This allowed banks with access to fintech tools to attract creditworthy nonprime borrowers by giving them (appropriately) discounted mortgage rates relative to the traditional risk-pricing models. Those banks continued to charge risky nonprime borrowers a large risk premium on their mortgages. Overall, fintech partnerships have made it possible for banks to offer a larger credit card line and charge a lower mortgage interest rate to some nonprime borrowers while seeing nonprime defaults decline on average.

WP 25-21. Julapa Jagtiani, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department; Catharine Lemieux, Federal Reserve Bank of Chicago (Retired); Brandon Goldstein, Federal Reserve Bank of Philadelphia Supervision, Regulation, and Credit Department

Recurring-Payment Sensitivity in Household Borrowing

This paper provides evidence of payment sensitivity in household borrowing decisions: Mortgage borrowers respond to the size of the recurring payment as opposed to discounted total loan costs when choosing between loan options. I develop a test for payment sensitivity that exploits differences in predicted bunching at kinks and notches generated by mortgage insurance requirements. I find that borrowing is substantially more responsive to nominal recurring payments than to the net present value of total costs. To rationalize the result, outside borrowing costs would have to be implausibly high, exceeding 40 percent a year. Payment sensitivity is the most likely explanation for observed borrowing choices as alternatives require implausible nonmortgage borrowing costs or household preferences. I develop a dynamic consumption-savings model and show that underlying preferences can generate the observed payment sensitivity only if borrowers initially have a high marginal utility of cash-on-hand that coincidentally and sharply falls by more than 50 percent in a narrow time window after loan origination. Payment sensitivity has important implications for regulation and policy. Lenders can manipulate loan features and shroud increases in total costs from payment-sensitive borrowers even while keeping fixed or even decreasing recurring payments. This type of shrouding could enable excessive borrowing and attenuate the transmission of monetary policy.

WP 25-22. Jing Xian Ng, the Wharton School and Federal Reserve Bank of Philadelphia Consumer Finance Institute

Consumer Wealth and Price Expectations

Prices have reached record-high levels, and inflation is one of the primary concerns for consumers worldwide. Interestingly, changes in prices are in part a self-fulfilling prophecy: If consumers expect prices to rise, prices will rise. Moreover, consumers' future price expectations influence policy-making, firms' decisions, and consumer choice. Across 11 studies (N = 289,437), including a nine-wave longitudinal survey, a multinational study in 12 countries, a multidecade study with 250,000+ consumers, and multiple experiments, we show that consumers who feel more financially constrained expect future prices to be higher, compared with consumers who feel less financially constrained. We demonstrate that this effect is driven by pain of paying: Financially constrained consumers experience greater pain when paying for purchases, causing them to expect higher prices in the future. Accordingly, this effect is stronger in product categories, countries, and historical periods in which paying for purchases is especially painful. Finally, we show that consumers' future price expectations are consequential, predicting stockpiling and a preference for fixed-price contracts among financially constrained consumers. Overall, the current work underscores the role of future price expectations as a driver of consumer behavior, demonstrates how these expectations are formed, and offers insights for consumers, marketers, and policymakers.

WP 25-23. Rodrigo S. Dias, University of Colorado Boulder; Eesha Sharma, San Diego State University and Federal Reserve Bank of Philadelphia Consumer Finance Institute; Gavan J. Fitzsimons, Duke University

Unintended Consequences of Regulating Central Clearing

Recent U.S. and European regulations promote centrally clearing derivatives to reduce complexity and systemic risk in the financial system. We argue that more clearing does not guarantee less systemic risk. We identify conditions under which the core clears less intensively than the periphery, which increases systemic risk by substituting multilateral netting for bilateral netting and making contagion less likely to start in the core but more likely to spread from the core. We study confidential derivatives regulatory data and find evidence of such clearing patterns. We further explore the implications of complexity and centrality within the financial system for stability.

WP 25-24. Pablo D'Erasmo, Federal Reserve Bank of Philadelphia; Selman Erol, Carnegie Mellon University Tepper School of Business; Guillermo Ordoñez, University of Pennsylvania, NBER, and Visiting Scholar, Federal Reserve Bank of Philadelphia Research Department

Precision Without Labels: Detecting Cross-Applicants in Mortgage Data Using Unsupervised Learning

We develop a clustering-based algorithm to detect loan applicants who submit multiple applications ("cross-applicants") in a loan-level data set without personal identifiers. A key innovation of our approach is a novel evaluation method that does not require labeled training data, allowing us to optimize the tuning parameters of our machine learning algorithm. By applying this methodology to Home Mortgage Disclosure Act (HMDA) data, we create a unique data set that consolidates mortgage applications to the individual applicant level across the United States. Our preferred specification identifies cross-applicants with 92.3 percent precision.

WP 25-25. Hadi Elzayn, Stanford University; Simon Freyaldenhoven, Federal Reserve Bank of Philadelphia; Minchul Shin, Federal Reserve Bank of Philadelphia

Assessing Maximum Employment

We suggest a core set of indicators for evaluating the position of the labor market relative to maximum employment. The unemployment rate remains the key indicator of the cyclical position of the labor market, as it is time-tested, is highly correlated with other indicators, and has practical measurement advantages. But other indicators can provide complementary evidence to get a fuller picture of the labor market. A joint analysis of job vacancies and unemployment in a Beveridge curve diagram is helpful when structural shocks affect the labor market and when the labor market is very tight, while the employment-to-population ratio is useful late in expansions, when increases in employment tend to arise from higher labor force participation. Additional indicators—including wage growth and worker flows—can complement the core indicators we discuss. We draw on lessons from the Global Financial Crisis and the COVID-19 pandemic to evaluate the effectiveness of various indicators.

WP 25-26. Christopher Foote, Federal Reserve Bank of Boston; Shigeru Fujita, Federal Reserve Bank of Philadelphia; Amanda Michaud, Federal Reserve Bank of Minneapolis; Joshua Montes, Board of Governors of the Federal Reserve System

(Visualizing) Plausible Treatment Effect Paths

We consider estimation and inference for treatment effect paths. Examples include dynamic treatment effects, impulse response functions, and event study paths. We present two sets of plausible bounds to help visualize uncertainty associated with these paths. Both plausible bounds are often tighter than traditional confidence intervals and can provide insights even when traditional (uniform) confidence bands appear uninformative. Our first set of bounds covers the average (or overall) effect rather than the entire path. Our second set of bounds imposes data-driven smoothness restrictions on the treatment path, using post-selection inference (Berk et al. [2013]) to provide formal coverage guarantees.

WP 25-27. Simon Freyaldenhoven, Federal Reserve Bank of Philadelphia; Christian Hansen, University of Chicago and Visiting Scholar, Federal Reserve Bank of Philadelphia Research Department

Research in Focus

Summaries of Working Papers.

In Consumer Credit Markets, Can Fairness and Profits Rise Simultaneously?

Through a novel combination of machine learning and fairness goals, four researchers show how consumer credit can be distributed more fairly while maintaining lender profitability.

The Blending of Conventional and Unconventional Monetary Policies With "Inelastic" Asset Markets

Joseph Abadi of the Philadelphia Fed creates a model to analyze how central bank interest rate policy and balance sheet adjustments transmit through "inelastic" asset markets.

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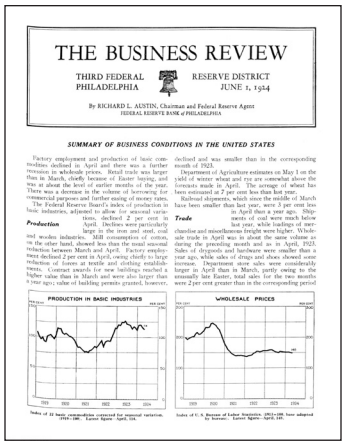

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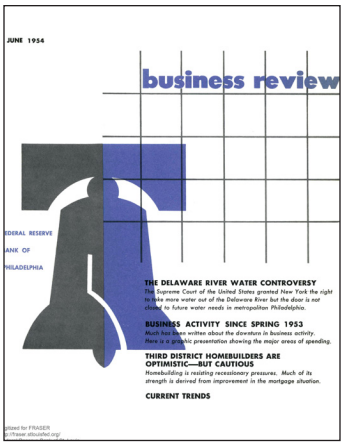

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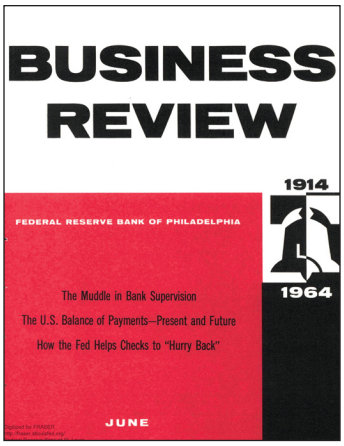

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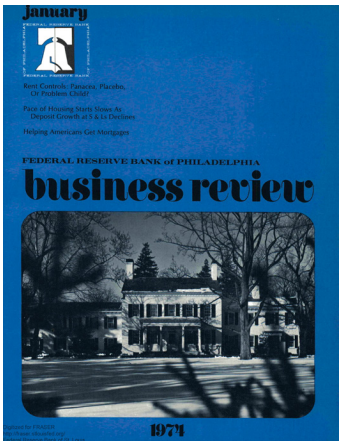

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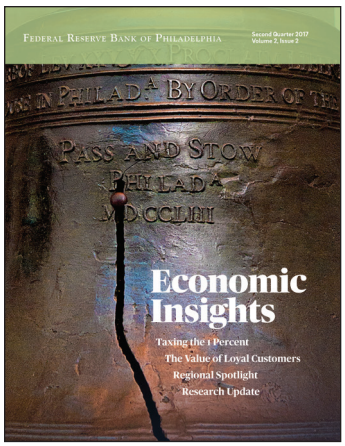

2010s

2020

2023