FEDERAL RESERVE BANK OF KANSAS CITY

ECONOMIC REVIEW

Second Quarter 2023 *Volume 108, Number 2*

The Implications of Unrealized Losses for Banks

By W. Blake Marsh and Brendan Laliberte

Interest rates have risen across the yield curve since the Federal Open Market Committee began tightening monetary policy in March 2022. After amassing securities during the pandemic, commercial banks saw rising interest rates erode the value of their securities portfolios by nearly $600 billion, or about 30 percent of their capital holdings. In some cases, declines in valuation of securities holdings in response to interest rate changes—known as "unrealized losses"—can mechanically reduce key regulatory capital and liquidity ratios. Should banks need to sell the securities to generate income when their valuations are low, the realized losses could erode capital buffers and threaten the banks' solvency.

W. Blake Marsh and Brendan Laliberte investigate how recent interest rate changes and banks' associated unrealized losses have affected bank decision-making. They find four channels through which unrealized losses have reduced bank liquidity and capital, potentially dampening loan growth. These channels highlight that unrealized losses can affect all types of banks irrespective of size, regulatory treatment, or funding access.

The Shifting Expectations for Work from Home

By Jason P. Brown and Colton Tousey

As COVID-19 moves to an endemic state, employers have brought workers back to the office. Many workers prefer to continue working from home a portion of time, resulting in a gap between employee preferences for work from home and employer plans. Knowing who currently works from home a larger share of time and where this gap is narrowest across worker characteristics and locations helps explain where and for whom work from home is most likely to remain a permanent feature in the labor market.

Using a relatively new data source, the Survey of Working Arrangements and Attitudes, Jason P. Brown and Colton Tousey find that the share of paid working days from home is higher for workers with higher income, those who live in more densely populated areas, and those with faster internet connections. They show that workers report a desire to work from home "post-COVID" a larger fraction of time compared with their expectations of their employers' plans for permitting work from home. Although employer plans on average have moved closer to

workers' expectations over time, the size of this expectations gap varies with workers' income, age, urban environment, industry, occupation, and internet infrastructure, with the narrowest gap among higher income workers in more densely populated areas. These findings suggest that workers in larger urban areas will be more likely to benefit from the flexibility provided by work from home.

The Employment Effect of an Increase in the National Minimum Wage: Review of International Evidence

By Taeyoung Doh and Luca Van der Meer

Recent U.S. proposals to increase the federal minimum wage from $7.25 per hour to $15 per hour have not yet come to fruition. One challenge in implementing minimum wage increases is estimating the potential effect on employment. Past increases in the federal minimum wage have been modest and are unlikely to provide much insight into employment effects. International experiences with large minimum wage increases may provide more insight by accounting for greater variation in firm exposure to the change. Hungary and South Korea both implemented large, rapid shifts in their national minimum wages in recent decades. Brazil implemented a similarly large but more gradually paced increase, while Germany implemented a large change by instituting its first minimum wage in 2015.

Taeyoung Doh and Luca Van der Meer compare these countries' experiences with large minimum wage changes and summarize the effects on employment. Together, these international experiences suggest that both the pace and the size of the increase matter: large, rapid increases in the minimum wage have a more negative effect on employment than more gradual increases, especially in competitive sectors. The international evidence suggests that a gradual and steady increase of the federal minimum wage over the course of a few years is likely to generate a smaller employment effect than a one-time rapid increase.

The Implications of Unrealized Losses for Banks

By W. Blake Marsh and Brendan Laliberte

Since the Federal Open Market Committee (FOMC) began tightening monetary policy in March 2022, interest rates have risen across the yield curve. As a result, borrowing costs have increased for firms and households. Commercial banks have been affected, too. After amassing securities during the pandemic, banks saw rising interest rates erode the value of their securities portfolios by nearly $600 billion, or about 30 percent of their capital holdings.

Declines in the value of a bank's securities portfolio—known as "unrealized losses" since they do not affect income—may pose consequences for banks and borrowers alike. In some cases, declines in the valuation of securities holdings in response to interest rate changes mechanically reduce key regulatory capital and liquidity ratios. Further, should banks need to sell the securities to generate income when their valuations are low, the unrealized losses will become realized losses, eroding capital buffers and possibly threatening the solvency of the bank. Lower capital can reduce the willingness of banks to lend, as solvency concerns increase debt and equity costs. Ultimately, lower securities valuations can increase loan prices and reduce loan growth.

In this article, we investigate how recent interest rate changes and banks' associated unrealized losses have affected bank decision-making. We find that unrealized losses have reduced bank liquidity and capital,

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potentially dampening loan growth through four channels. First, unrealized losses can increase equity costs as investors' perceptions of financial health deteriorate. Second, deterioration of financial strength combined with increased liquidity needs can increase debt funding costs. These increased equity and debt funding costs are likely to be passed on to borrowers as higher interest rates, potentially reducing loan demand. Third, unrealized losses can also make banks more reluctant to sell securities, creating liquidity demand that could limit future loan supply. Lower loan demand due to higher prices and lower loan supply due to higher funding costs could reduce total loan growth. Fourth, unrealized losses can dampen merger and acquisition (M&A) activity because potential buyers may be reluctant to purchase a bank holding securities in a deep loss position. Reduced M&A activity can result in a less effective banking system to the extent that it allows inefficiently run banks to continue operating. In this way, a slowdown in M&A activity can result in poorly allocated, or reduced, aggregate lending.

These channels highlight that unrealized losses can affect all types of banks irrespective of size, regulatory treatment, or funding access. Some channels, such as public equity or debt costs, most obviously affect large banks. Indeed, we show that public banks have taken steps to mitigate the balance sheet effects of unrealized losses, likely because they are more subject to the disciplining effects of investors. However, smaller community and non-public banks can also be affected by unrealized losses due to funding covenants, limited access to alternative liquidity sources, and the ability to market themselves as acquisition targets.

Section I provides background on standard securities accounting and the key market and regulatory features that create frictions for banks holding unrealized losses. Section II examines recent trends in securities valuations and how they have affected bank balance sheets. Section III discusses potential ways that security valuations can broadly affect bank behaviors.

I. Accounting for Changes in the Market Value of Banks' Securities Portfolio

Unrealized losses can influence bank behaviors due in part to the way banks report securities on their financial statements. Table 1 illustrates a basic balance sheet, highlighting the two broad types of

Table 1
Bank Balance Sheet Basics

Total assets	Total liabilities and equity
Cash	Deposits
Loans	Issued debt
Investment securities	Total book equity
Held-to-maturity (amortized cost)	Common stock
Available-for-sale (market value)	Retained earnings
Other (including trading securities)	Accumulated other comprehensive income (AOCI)

securities: trading securities and investment securities. Trading securities are intended to generate short-term gains and typically make up a small share of a bank's total securities holdings. Trading securities are routinely purchased and sold and are reported at market value on the balance sheet. Changes in their market value are reported as income, which affects total book equity through the retained earnings account. Investment securities, on the other hand, make up most of a bank's securities holdings. These securities typically have longer holding periods, and changes in their value are reported on the balance sheet differently depending on the bank's investment intentions.

Investment securities are designated on the balance sheet as either "held to maturity" (HTM) or "available for sale" (AFS). As the name suggests, HTM securities are those the bank does not intend to sell but instead expects to hold until they fully mature. AFS securities, on the other hand, are securities that the bank intends to hold for some time but may sell before maturity. HTM securities are reported at amortized cost on the balance sheet, and changes in their market value do not affect total assets or book equity. Instead, the reported value of HTM securities changes as their underlying discount or premium amortizes over time. AFS securities, on the other hand, are reported at market value. Changes in the market value of AFS securities—that is unrealized gains or losses—are reported in book equity as part of the accumulated other comprehensive income (AOCI) account.[1] Therefore, as the market value of AFS securities rises (falls), assets and book equity also rise (fall).

Changes to the market value of AFS securities can also affect regulatory capital—a specialized equity measure defined by regulatory

accounting rules. Regulatory capital determines the minimum level of equity banks must hold to comply with regulatory rules. More specifically, advanced-approach banks—typically, very large banks—must report AOCI as part of regulatory capital. As is the case with book equity, this requirement causes regulatory capital to increase (decrease) as the market value of AFS securities rises (falls). Non-advanced-approach institutions—which are most banks—can opt out of this reporting requirement.[2] As a result, regulatory capital is typically unaffected by changes in the market value of securities.

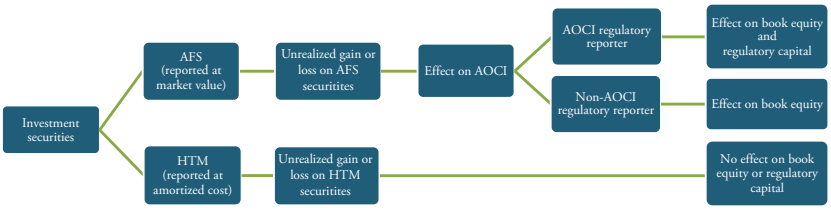
Figure 1 summarizes the effect of securities' unrealized gains and losses on both book equity and regulatory capital. As the figure shows, unrealized changes to the market value of HTM securities do not affect either assets, book equity, or regulatory capital. Instead, HTM securities are recorded at amortized cost on the balance sheet, and changes between reporting periods are due to changes in a security's amortized discount or premium.[3] Unrealized gains and losses on AFS securities affect total assets—because AFS securities are reported at market value—as well as book equity at all banks. Unrealized gains and losses also affect regulatory capital at large, advanced-approach banks through the AOCI account.

The dual classification system that differentiates AFS and HTM—and the system's treatment of unrealized gains and losses—is intended to make banks internalize the risk of interest rate changes affecting bank asset prices. HTM securities are intended to never be sold under any conditions. But banks may choose to sell AFS securities at any time, either to generate liquidity for other investment purposes or to realize gains that boost income. Thus, accounting rules that recognize unrealized gains and losses on securities in regulatory capital are designed to provide a more realistic picture of a bank's financial condition.

Importantly, banks are most likely to sell securities during times of stress, when both liquidity needs and borrowing costs are high. Banks that must sell securities at prices far below their fundamental values during times of stress might reduce credit availability or other intermediation activities, further hampering the real economy (Shleifer and Vishny 2010). Holding more capital against falling securities prices helps banks avoid solvency issues during downturns and increases the

Figure 1

Reporting Changes in the Market Value of Investment Securities Depends on Classifications and Regulatory Rules



Notes: Investment securities are part of total assets. Accumulated other comprehensive income (AOCI) records unrealized profits and losses on various financial transactions, including available-for-sale (AFS) securities. Unrealized gains and losses on held-to-maturity (HTM) securities are reported in notes on the balance sheet but are not reported on the balance sheet directly.

probability that the bank will continue to lend when credit demand is high but securities prices are low.

Although market value accounting is intended to more accurately represent the value of banks' securities portfolios to investors and regulators, including market value changes in certain equity measures can also make bank capital more volatile (Barth, Landsman, and Wahlen 1995).[4] Capital volatility driven by changes in the market value of securities will require banks to hold larger equity buffers to ensure they do not fall below regulatory minimums when interest rates change.

In theory, banks can avoid equity volatility by reclassifying securities from AFS to HTM, which would leave equity measures unaffected. However, reclassification is generally restricted. Securities are classified upon acquisition and may not be reclassified due to changes in market conditions. Moreover, intentional and recurring sales of HTM securities are prohibited. Banks that do so may be forced to reclassify all current and future HTM securities as AFS. In this way, reclassifying securities is costly and encourages banks to accurately classify securities at acquisition.

In sum, unrealized losses affect bank balance sheets only because of accounting rules—that is, if securities were all reported at amortized cost, then unrealized losses would not affect securities reporting on the balance sheet. The argument against reporting unrealized losses on balance sheets is straightforward: if banks hold securities to maturity, then they will collect all the expected cash flows and the unrealized gain or loss will never be realized. Indeed, this is the rationale for reporting

HTM securities at amortized cost. However, if banks do not intend to hold the securities to maturity, recognizing the change in the securities' fair market value may more accurately represent a bank's financial health to regulators and investors.

II. Recent Trends in Banks' Securities Portfolios

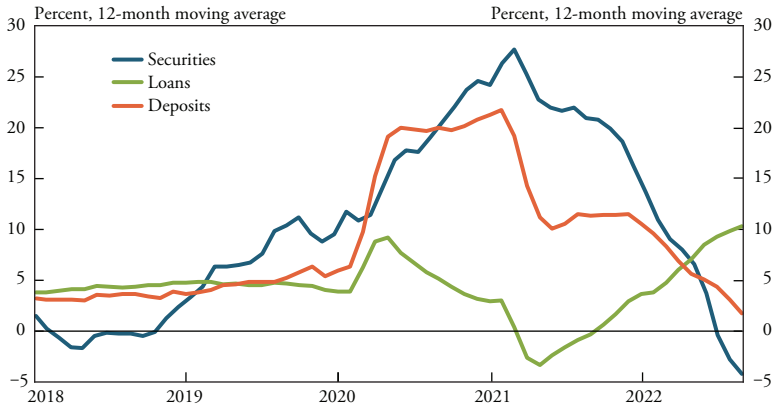
Bank balance sheets changed dramatically during the COVID-19 pandemic, making banks more vulnerable to rising interest rates. Chart 1 shows that deposits (orange line) increased rapidly at the onset of the pandemic, in part due to federal support programs that provided cash to businesses and consumers. Borrowers quickly increased their precautionary cash holdings by drawing down existing lines of credit, thereby increasing loan growth (green line) (Acharya and Steffen 2020). As the economy recovered, however, loan growth began to decline as firms and households, flush with cash, demanded fewer loans. Facing higher deposits and a dearth of safe investment options, banks began to rapidly accumulate securities (blue line).

Overall, banks have accumulated about $2 trillion in new securities since the start of the pandemic, and securities now constitute about one-quarter of total assets at commercial banks, up from just over 20 percent at the end of 2019. Chart 2 shows that most of the securities acquired during the pandemic were agency mortgage-backed securities (MBS) and Treasury securities. These securities are frequently traded in deep secondary markets and are considered to have minimal credit risk: agency MBS are guaranteed by government-sponsored enterprises (GSEs), while Treasury securities are backed by the full faith and credit of the U.S. government. However, these securities are not free of interest rate risk—that is, the risk that valuations will drop sharply should market interest rates rise. As a result, a larger fixed-rate securities portfolio, even if it is composed of securities free of credit risk, makes bank balance sheets more sensitive to interest rate changes.

In addition to simply acquiring more securities, banks also purchased longer-maturity securities during the pandemic. Longer-maturity securities typically pay higher interest rates than shorter-term securities to compensate investors for risks such as inflation, the potential for rising rates, or, in the case of MBS, pre-payment risk. However, longer-maturity securities are also typically more sensitive to interest

Chart 1

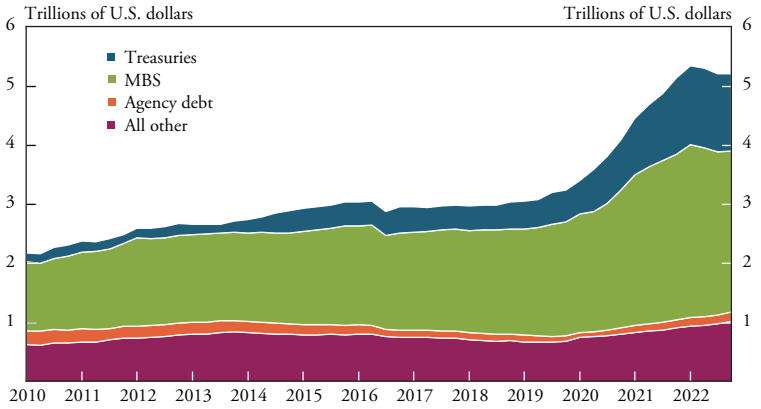
Banks Accumulated Securities as Deposits Swelled and Loan Growth Stagnated



Source: Board of Governors of the Federal Reserve System.

Chart 2

Most Securities Held by Banks Are Treasury or Agency MBS



Note: Chart shows total investment securities held by commercial banks measured at amortized cost.
Source: FFIEC Call Reports.

rate changes than securities with shorter maturities, a concept known as duration risk.

Chart 3 shows that in their bid to increase asset yields, banks of all sizes increased the average maturity of their securities portfolios during the pandemic. Securities with maturity or repricing dates five or more years in the future climbed sharply at smaller community banks (orange line). Longer-maturity securities also increased materially at regional banks (green line), which already held more duration risk than their peers, and increased to a lesser degree at larger banks (blue line). More recently, shares of longer-duration securities have fallen toward pre-pandemic levels, but that decline likely represents lower valuations rather than a material reduction in duration risk.[5]

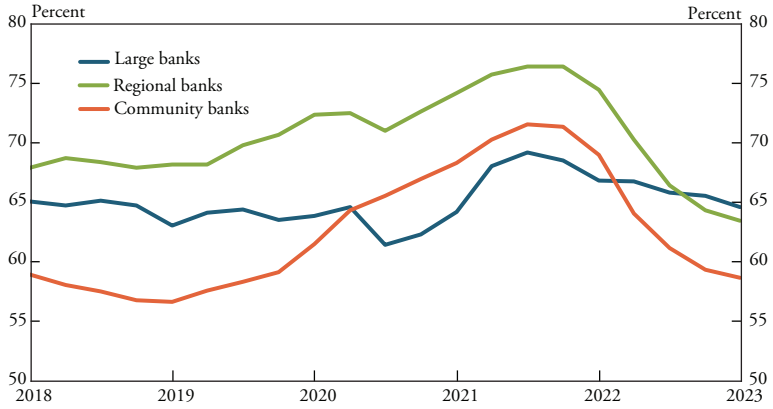
Larger shares of longer-maturity securities substantially increased duration risk for banks. Because these securities were purchased during the pandemic—when interest rates were near the effective lower bound and the Federal Reserve was purchasing both Treasury and agency MBS securities—their prices were near record highs when banks bought them. Subsequent monetary tightening and increasing interest rates have decreased the value of these securities, raising the likelihood that banks would incur losses in the future should they need to sell.

Indeed, Chart 4 shows that securities valuations fell precipitously as interest rates rose during 2022. By the end of 2022, unrealized losses on all securities were about 30 percent of aggregate Tier 1 bank capital. Unrealized losses on AFS securities, which affect book equity for all banks and regulatory capital for large banks, accounted for about 10 percent of Tier 1 capital in aggregate. These unrealized losses far exceed losses in recent past periods of rising rates (for example, during the policy tightening cycle from 2017 to 2019), increasing the chance that banks will have to curtail lending due to higher funding costs or binding capital constraints.

Notably, unrealized losses on HTM securities are larger than those on AFS securities, suggesting banks are strategically protecting their capital levels by increasing the relative level of HTM securities (Kim, Kim, and Ryan 2019). As noted previously, unrealized losses on AFS securities directly reduce regulatory capital for large banks, but changes in the value of HTM securities do not. Consequently, large banks have a greater

Chart 3

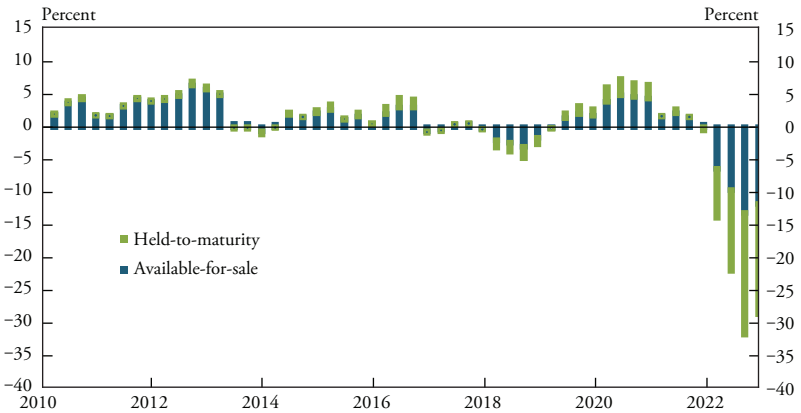
Remaining Maturity of Commercial Bank Security Portfolios Has Increased



Notes: Chart shows share of securities, excluding non-pass-through MBS, with more than five years remaining until maturity or next repricing date. AFS securities are measured at fair value and reflect unrealized losses. Large banks have total assets over $50 billion, regional banks have total assets between $10 and $50 billion, and community banks have total assets less than $10 billion.
Source: FFIEC Call Reports.

Chart 4

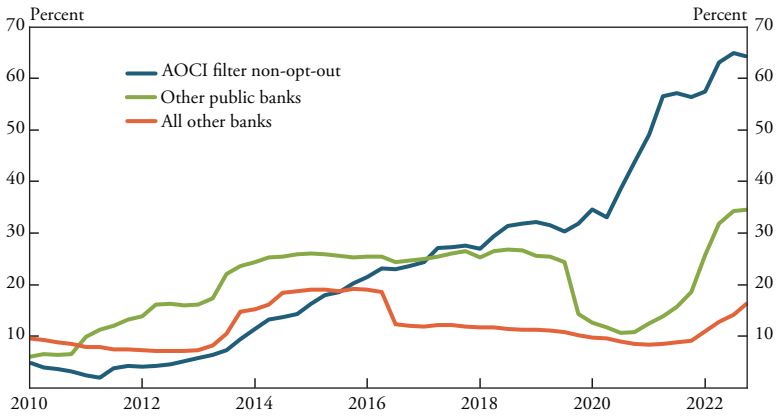
Unrealized Losses on Securities Have Reached Record Highs



Note: Tier 1 capital has been adjusted to exclude unrealized changes in the value of AFS securities reported in AOCI.
Source: FFIEC Call Reports.

Chart 5

Banks Have Increasingly Relied on HTM Accounting to Minimize Equity Losses



Notes: AOCI reporters are banks that must report AFS market value changes recorded in AOCI as part of regulatory capital. Public banks are defined as those with any other bank holding company that has 1) a listed permanent company number (PERMCO) in the Federal Reserve Bank of New York's PERMCO-IDRSSD crosswalk, 2) a Committee on Uniform Securities Identification Procedures (CUSIP) number in the National Information Center's (NIC) bank structure database, or 3) are listed as Securities and Exchange Commission (SEC) filers in the NIC structure database. All other banks are banks that do not include AOCI in regulatory capital and are not public banks.
Source: FFIEC Call Reports.

incentive to classify securities as HTM on acquisition, minimizing the effect of changes in their market values on regulatory capital levels.

Chart 5 shows that banks have indeed classified more securities as HTM. Banks that cannot opt out of reporting AOCI in regulatory capital—necessarily, large banks (blue line)—now hold more than 60 percent of their total securities as HTM. Publicly traded banks that are not subject to reporting AOCI in regulatory capital also have incentives to classify securities as HTM, namely because unrealized losses on AFS securities reduce book equity for all banks. Debt and equity investors, such as Federal Home Loan Banks (FHLB), closely track book equity measures because investors' losses in the event of failure are lower if the bank holds more equity (see Berry 2022a, 2022b). More generally, better capitalized banks should receive more favorable equity and bond pricing because the risk of investor loss is lower. Consistent with these incentives, Chart 5 shows that HTM reporting at smaller public banks (green line) has been increasing since 2020. However, even small banks that do not have

public equity or debt issuances have increased HTM reporting (orange line) albeit to a much lesser extent than larger banks, possibly due to the negative effects of unrealized losses on FHLB borrowing.

Since the start of the pandemic, banks have sharply increased the size of their securities portfolios while also increasing the average maturity of their securities holdings. Many of these securities are issued or backed by the U.S. government, suggesting bank balance sheets have become safer from a credit risk perspective. However, longer-duration securities have made banks more exposed to interest rate risk.

III. Potential Effects of Unrealized Losses on Bank Behavior

Unrealized losses have increased substantially since the pandemic due to both the sharp increase in interest rates and an increase in duration risk at banks. Whether these losses will influence bank behavior, though, is an open question. We assess the potential effects by discussing four channels through which unrealized losses might influence bank lending decisions: equity prices, debt prices, loan growth, and M&A activity.

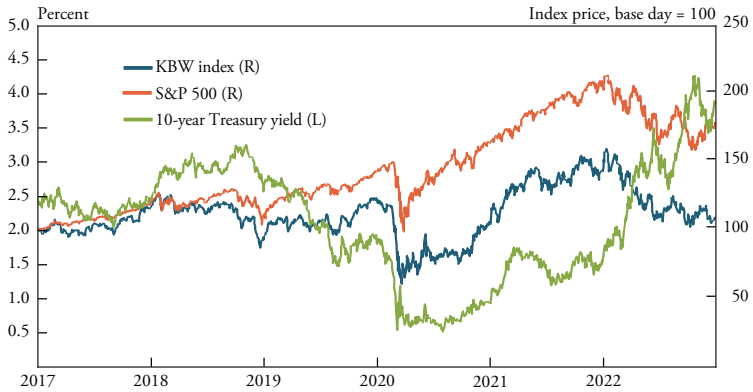
Effect of unrealized losses on equity prices

Unrealized losses can reduce the total market value of a bank, thereby lowering equity prices. Typically, when benchmark interest rates rise, deposit costs increase slowly, while loan rates increase more rapidly, allowing banks to generate higher earning margins (Driscoll and Judson 2013). By that logic, higher interest rates should typically boost bank equity prices because profitability is expected to improve. Chart 6 shows this is generally true historically, but the relationship broke down in 2022, when bank equity prices moved lower while interest rates rose. In particular, the chart shows the recent path of bank equity prices, as captured by the KBW bank equity index, against yields on 10-year Treasury securities—a common benchmark interest rate that has historically tracked unrealized gains and losses closely.[6] On net, bank equity prices (blue line) declined about 30 percent in 2022, while interest rates (green line) and unrealized losses climbed.

One reason for the more persistent declines in bank equities could be lower asset valuations resulting from unrealized losses. Declines in

Chart 6

Bank Equity Prices Fell More Sharply as Interest Rates Rose



Note: Data are through December 13, 2022.
Source: Bloomberg.

securities prices lower total firm value, and market equity prices typically decline in turn. Lower valuations also reduce bank liquidity by reducing the amount of cash that can be raised in a sale or reducing the amount of collateral that can be pledged in a repo transaction. This makes the bank riskier, all else equal, and should raise the cost of equity. As costs rise, banks will have to issue a greater number of shares to generate the same level of new equity should the bank need to recapitalize itself.

Effect of unrealized losses on debt costs

Lower securities prices increase the risk of losses to holders of bank debt should the bank be forced to liquidate when asset prices are low.[7] Declining securities prices make banks more reluctant to sell securities at a loss, increasing demand for debt funding at banks as unrealized losses rise. Lower securities valuations also provide less collateral at market value for banks to use when raising secured funding, possibly enhancing liquidity strains. Debt investors will require a higher return to offset both increased insolvency risk and greater funding demand, thereby increasing interest rates on bank debt.[8]

Chart 7 shows interest rate spreads on bank debt compared with similarly rated corporate debt issued by non-financial firms. Both

higher-rated (blue line) and lower-rated (green line) investment-grade banks have seen their debt funding costs rise in 2022 relative to the cost of funding at similarly rated non-financial firms. Interest rate spreads at higher-rated banks have increased more than 20 basis points above those of high quality, non-financial firms, while interest rates at lower-rated investment-grade banks have peaked more than 60 basis points above similarly rated non-financial firms. Notably, the increase in interest rates in 2022 has been associated with a widening gap between spreads on the lower-rated investment-grade banks and their higher-rated peers, possibly reflecting increased liquidity and credit risks at lower-rated banks.

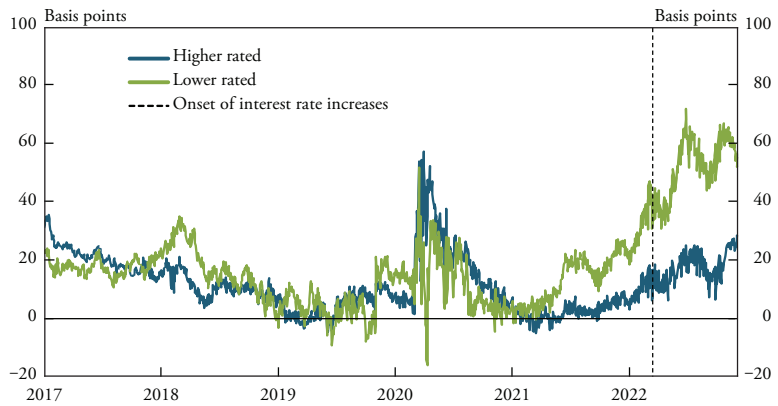
Effect of unrealized losses on loan growth

Although lower securities prices alone do not imply any effect on lending, they may have indirect consequences on loan growth through lower equity and bond prices. For example, lower securities prices may make a bank reluctant to sell their securities (and thus realize the unrealized loss), forcing them to make fewer new loans or raise external funding to accommodate new loan growth. If banks opt to raise new external funding to support such a balance sheet expansion, expenses will increase as liabilities expand. New lending that increases the size of the balance sheet may also require banks to hold additional capital to meet regulatory minimums at a larger asset size, increasing equity funding demand. Due to these potential costs, banks may elect to slow loan growth rather than increase their expenses and capital buffers.

On average, loan growth in 2022 was robust, implying unrealized losses did not constrain overall lending in any meaningful way. However, across all banks, the share of unrealized losses is correlated with slower loan growth, suggesting that banks with fewer unrealized losses expanded loan growth more than their peers with more unrealized losses. Indeed, Chart 8 shows that unrealized losses had a negative correlation with loan growth during the last year. The horizontal axis shows the average ratio of unrealized losses on AFS securities to Tier 1 capital based on percentiles. The vertical axis shows average loan growth for banks with losses to Tier 1 capital in those percentile bins. Although this correlation does not necessarily imply that unrealized losses dampened lending, other researchers have found similar relation-

Chart 7

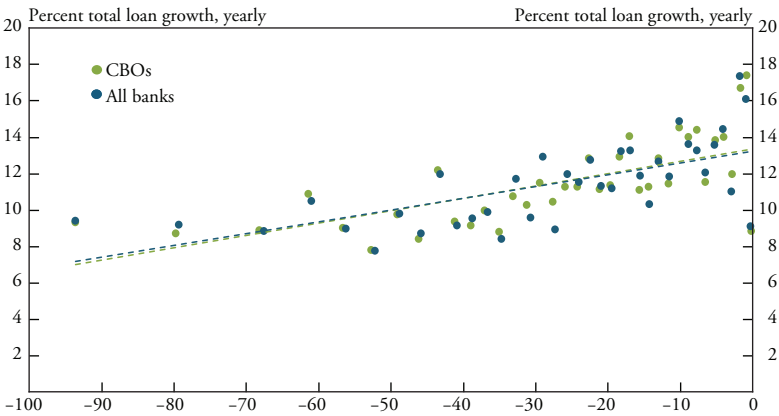
Bank to Non-Financial Firm Debt Spreads Have Increased



Notes: "Higher rated" refers to bank bonds rated between AA+ and A–. "Lower rated" refers to bank bonds rated between BBB+ and BBB–. Data are through Dec 9, 2022.
Source: Bloomberg.

Chart 8

Average Loan Growth Is Lower for Banks with Larger Unrealized Losses



Note: Chart shows average of percentiles for unrealized AFS losses to Tier 1 capital (less the numerator for AOCI filter removed banks) on the x-axis and average loan growth by AFS loss bin on the y-axis.
Sources: FFIEC Call Reports and authors' calculations.

ships between mark-to-market losses and lending (see, for example, De Marco 2019).

Effect of unrealized losses on mergers and acquisitions

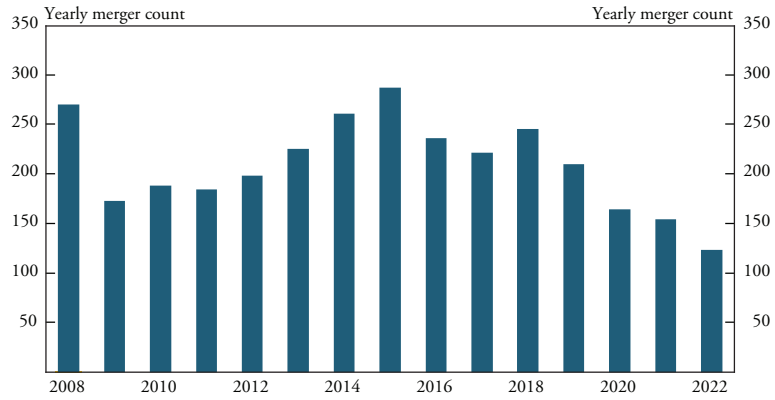
Unrealized losses could also reduce M&A activity through two channels. First, because unrealized losses reduce firm value, they are also likely to reduce the premiums paid by acquiring institutions. These lower premiums could, in turn, reduce the number of banks available for sale. Sellers will be less likely to solicit offers if they believe that asset prices are temporarily depressed or if they feel they can hold their securities to maturity and realize interest income that potential buyers may be overly discounting. Second, potential buyers may be wary of institutions with large unrealized losses because they increase bank liquidity and default risk. In other words, investors may be reluctant to purchase institutions with large unrealized losses if they are concerned that those losses might be realized in the future.

Recent commentary from bankers suggests that unrealized losses have indeed depressed M&A activity (Rocha 2022). Chart 9 shows that unassisted merger activity has fallen considerably since 2020 compared with annual averages since 2008. Moreover, the trend seems to be worsening: merger activity in 2022 fell about 20 percent compared with 2020 and more than 40 percent compared with pre-pandemic averages.

Overall, unrealized losses reduce the value of banks' assets and erode their capital levels. Higher bank risk can lead to higher equity and debt funding costs and lower profitability. Increased riskiness can encourage banks to limit their balance sheet growth, possibly by reducing the amount of new lending. Because both asset growth and profitability can be strained when risk is high, the ability of a bank to market itself to potential buyers will also be impaired. Reduced merger activity can increase banking system inefficiencies, leading to less productive lending by banks and less efficient economic investment.

Chart 9

Commercial Bank Mergers Slowed in 2022



Note: Chart shows number of banks, thrifts, and holding companies involved in mergers that did not receive FDIC assistance per year.
Source: National Information Center.

Conclusion

Rising interest rates have reduced asset prices substantially in the last year, including prices of securities held on bank balance sheets. Unrealized losses reduce a bank's total value and may negatively influence capital and other financial ratios, with broader implications for banks and the economy.

We discuss four ways that declining securities valuations may influence bank behavior. First, higher unrealized losses threaten the solvency of the bank, increasing firm risk and driving up equity funding costs. Second, the inability or reluctance of banks to sell securities in loss positions can increase debt usage, further raising funding costs. Debt investors can also drive up funding costs as they demand higher spreads to compensate for increased insolvency risk. Third, as funding costs increase, banks may raise the cost of lending or tighten lending standards because they are reluctant to sell securities to generate loanable funds. And fourth, banks with large unrealized losses may be reluctant to market themselves for acquisition if they believe underwater securities have temporarily depressed offer prices. Similarly, bank buyers may be reluctant to engage in acquisitions if they are wary of the risks underwater securities pose to acquisition targets.

Our analysis has implications for both monetary policymakers and bank regulators. As unrealized losses increase, lending constraints can tighten, reducing economic growth—and potentially motivating monetary policymakers to adjust their policy stance. Bank regulators, on the other hand, may face growing concerns about bank risk as interest rates rise. Current accounting practices may not fully account for those risks, suggesting regulators may need to reassess how interest rate risk is publicly disclosed. Accounting rules that properly recognize interest rate risk may better align bank decisions with both shareholder and regulatory goals, ensuring greater financial system stability in the process.

Endnotes

[1]More technically, the unrealized gain or loss is the difference between a security's market value and its amortized cost. That is, the unrealized gain or loss accounts for changes in a security's market value after amortizing any premiums or discounts.

[2]Advanced-approach banks are those that are subsidiaries of global systemically important bank holding companies or subsidiaries of other advanced-approach institutions, use advanced-approach regulations to calculate regulatory capital, or are considered Category II institutions for systemic risk purposes. See Federal Financial Institutions Examination Council (2022) for additional details. Less than 1 percent of banks report AOCI as part of regulatory capital.

[3]Current expected credit losses (CECL) accounting rules, which banks will broadly adopt in 2023, require periodic assessments of fair value losses on HTM securities due to impairment. If an HTM security's fair value declines below amortized cost due primarily to firm-specific credit factors, the unrealized loss is reported in retained earnings, reducing book equity.

[4]Market value accounting also has potential drawbacks, including encouraging asset sales should prices fall below fundamental values. Commentors have pointed to market value accounting as a proximate cause of the decline in asset values during the global financial crisis. For a discussion of that debate, see Laux and Leuz (2010).

[5]The breakdown of securities by maturity date is only available at fair value for AFS securities. This means that changes in the share of securities with maturity greater than five years can be related to both shifts in the portfolio to shorter-maturity securities or changes in market value due to interest rate changes. Given that the amortized cost of securities only fell slightly in 2022, as shown in Chart 2, lower market prices are likely driving the decline in the share of securities maturing in five or more years, shown near the tail end of the series in Chart 3. Similarly, the pandemic-era increase could be due to securities held prior to 2020 repricing higher as rates fell.

[6]The correlation between the 10-year Treasury rate and a weekly series of unrealized gains and losses from the Federal Reserve's H.8 release was 0.92 between 2018 and March 2022, when the series was discontinued.

[7]Bond holders typically receive more protections should a bank fail than equity investors. However, losses are possible for debt holders should a bank fall into receivership.

[8]The Federal Reserve's Bank Term Funding Program (BTFP), introduced on March 12, 2023, has the potential to mitigate some of these negative effects by allowing participants to borrow against their security holdings at par value, alleviating the need for realized losses via sales and improving liquidity by boosting collateral value (Board of Governors of the Federal Reserve System 2023).

Although this facility is likely to decrease some of the negative effects discussed here, particularly in regard to liquidity, it is unlikely to fully offset all of the channels discussed.

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The Shifting Expectations for Work from Home

By Jason P. Brown and Colton Tousey

The COVID-19 pandemic shifted expectations of work from home for both employees and employers. Prior to the pandemic, only about 15 percent of workers over the course of a year performed any full workdays from home. The early stages of the pandemic led a much higher percentage of workers—nearly 40 percent—to work from home when businesses shifted toward remote work to slow the spread of the virus. Workers are returning to the office as COVID-19 moves to an endemic state, but many prefer to continue working from home a portion of time. In a tight labor market, employers may feel pressure to provide greater worker flexibility while wrestling with concerns about productivity and employee engagement, resulting in a gap between employee preferences for work from home and employer plans. Knowing who currently works from home a larger share of time and where this gap is narrowest across worker characteristics and locations helps explain where and for whom work from home is most likely to remain a permanent feature in the labor market.

We investigate who works from home more frequently and how expectations for work from home have changed for workers and their employers using a relatively new data source, the Survey of Working Arrangements and Attitudes (SWAA). We find that the share of paid working days from home is higher for workers with higher income, those

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who live in more densely populated areas, and those with faster internet connections. We show that workers report a desire to work from home "after COVID" a larger fraction of time compared with their expectations (or understanding) of their employers' plans for permitting work from home. Despite this difference, we show that over time, employer plans on average have moved closer to workers' expectations.

Although the gap in work from home expectations has narrowed, it is not the same for all workers and in all locations. We show that the gap varies with workers' income, age, urban environment, industry, occupation, and internet infrastructure. We find that the gap is the narrowest among higher income workers in more densely populated areas—that is, preferences are more likely to match employer work from home plans for these workers. We interpret these results as suggesting that a narrower gap in expectations correlates with a lower likelihood that employers will pull back on their work from home plans. Because higher population density, higher incomes, and better internet connectivity are associated with larger urban areas, our findings suggest that workers in larger urban areas will likely have a narrower gap in expectations and will be more likely to maintain the flexibility provided by work from home.

Section I investigates how work from home has changed over time and for which workers it is most prevalent. Section II documents where the gap between worker and employer expectations after COVID is the narrowest and estimates the relationship and robustness between key factors explaining the gap in expectations at the worker level.

I. Trends in Work from Home over Time and across Worker Characteristics

Prior to the COVID-19 pandemic, work from home was far less common for most U.S. workers in terms of both frequency and percentage of time spent at home. According to 2017–18 data from the American Time Use Survey, 29 percent of wage and salary jobs could be performed from home, and 25 percent of workers occasionally worked from home for a portion of the day. Although 15 percent of workers reported working a full day at home over the course of a year, only 14.5 percent of those workers reported working from home five days a week

or more. Thus, only around 2 percent of U.S. workers (14.5 percent of the 15 percent) worked from home full time.

The trends in work from home shifted abruptly with the onset of the pandemic. On March 13, 2020, the U.S. federal government issued a national emergency declaration in response to COVID-19. Many "nonessential" workers were told to work at home, and those working from home on an average day increased to 42 percent of U.S. workers in 2020. The percentage fell slightly to 38 percent in 2021 but remained well above pre-pandemic levels.

In the early stages of the pandemic, the plausibility of work from home was highly uncertain, as it was new for many workers; accordingly, much of the research from that time focuses on the feasibility of work from home. Dingel and Neiman (2020) use occupational data to estimate that 37 percent of U.S. jobs could be done entirely from home, which they call "teleworkable" jobs. However, they note significant variation across industries and cities. They also report that jobs that can be done at home pay more than those that cannot. Dingel and Neiman characterize their results as an upper bound on what might be feasible in the near term, as their estimates exceed the share of jobs that had been performed entirely at home in the years leading up to the pandemic.

Other research uses surveys to produce more timely measures of work from home. Brynjolfsson and others (2020) indicate that approximately 50 percent of the U.S. workers they surveyed were working from home during the first week of April 2020. Similarly, Bick, Blandin, and Mertens (2020) report that 35 percent of their U.S. respondents worked entirely from home in May 2020. One limitation of this earlier work is that it offers only a snapshot in time on the nature of work from home. Moreover, these measures were constructed in the early stages of the pandemic when more businesses were shut down or not allowing workers to come on site. In addition, the samples in these studies tend to provide limited socioeconomic information.

The SWAA has helped overcome the limited temporal and worker information of earlier data and provided an opportunity for more robust analysis of work from home trends. The SWAA is a collaboration by Barrero, Bloom, and Davis (2021), who have fielded the survey in the United States about once a month since May 2020. The target sur-

vey population is U.S. residents age 20–64 who earned at least $20,000 in 2019, with over 141,000 responses collected across waves of the survey through December 2022. The survey asks workers about working arrangements during the pandemic, personal experiences with work from home, and worker preferences and employer plans about the extent of work from home after the pandemic ends. Moreover, the survey collects a rich set of workers' demographic information related to their industry, occupation, annual income, location (state), and the population density of their home and work locations.[1]

We analyze work from home practices across all workers in the SWAA to better understand the recent prevalence of working from home. Our sample includes both people who report working from home and those who do not.

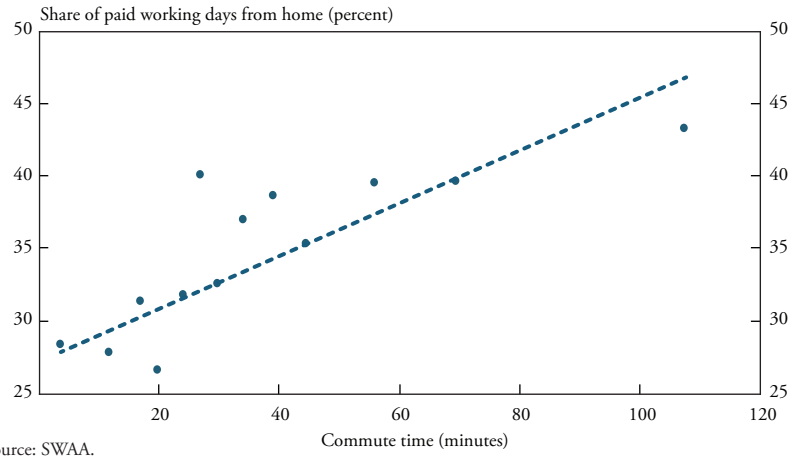
Unsurprisingly, we find that work from home was more prevalent in the earlier stages of the pandemic. Chart 1 shows that workers' share of paid working days from home in the week they were surveyed was around 35 percent in mid-2020 and around 27 percent by December 2022.

Although it is too early to determine whether these trends have fully stabilized, workers will likely continue to work a larger percentage of days from home than they did before the pandemic. Although the SWAA does not contain information on work from home practices pre-pandemic to help serve as a benchmark, the general trend seems to follow data from the less timely measures in the American Time Use Survey.

Even though people are more frequently working at home now than before the pandemic, higher income workers tend to report a higher share of days worked from home. Grouping observations by income quantiles between May 2020 and December 2022, Chart 2 shows that less than 25 percent of the paid working days are worked at home by individuals earning less than $40,000. In contrast, over 50 percent of paid working days are worked at home by those earning $100,000 or more. This finding is consistent with Dingel and Neiman (2020), who show that teleworkable jobs on average pay more compared with jobs that cannot be performed remotely a portion of the time. Similarly, Bick, Blandin, and Mertens (2020) argue that many more workers—especially those with higher incomes—expect to work from home in the future, consistent with increased work from home adoption. Felstead and Reuschke (2020) also find that the shift to work from home in the UK has been the largest among the highest paid and higher skilled workers.

Chart 1

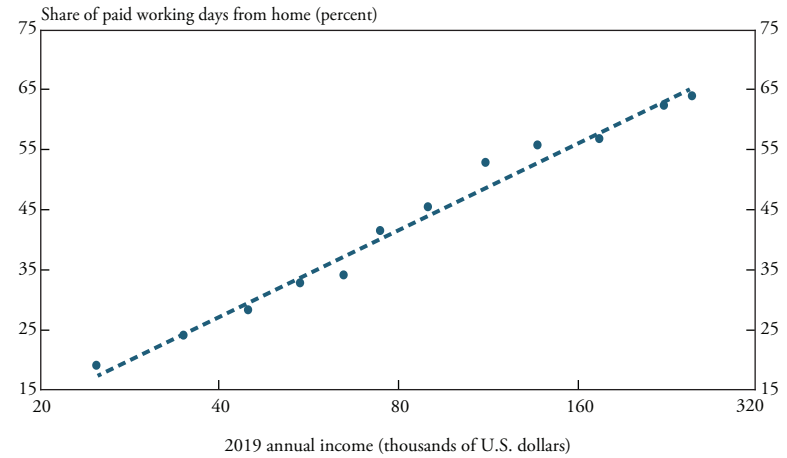
Work from Home Was More Prevalent Earlier in the Pandemic



Source: SWAA.

Chart 2

Workers with Higher Income Work More Days at Home



Note: Chart summarizes SWAA data from May 2020 to December 2022.
Source: SWAA.

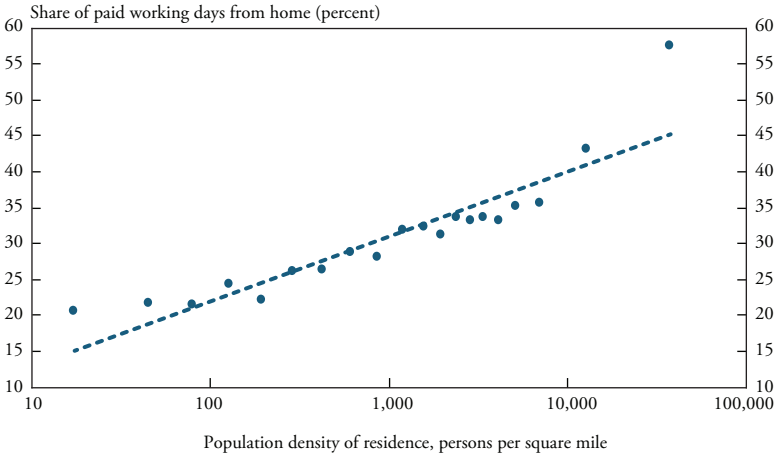
Workers who live in more densely populated areas and those with longer commute times also report higher shares of time worked at home. Chart 3 shows the relationship between population density and workers' reported share of days worked from home from August 2020 to December 2022.[2] Workers in relatively less dense areas report working from home around 30 percent of the time, while those in the most densely populated areas report working from home between 50 and 60 percent of the time.

One explanation for the positive relationship between population density and work-from-home may be that more dense areas also tend to have a higher share of teleworkable jobs (Dingel and Neiman 2020). We calculate the average population density for the set of metropolitan statistical areas for which Dingel and Neiman provide the share of teleworkable jobs. We find a high positive correlation (0.4) between an urban area's share of teleworkable jobs and its average population density, suggesting that as population density increases in an area, the fraction of jobs that are possible to work from home in that area also tends to increase.[3]

Because population density is positively correlated with urban area size (see Rappaport 2008, 2018), larger urban areas likely have more workers in general who work from home some percentage of the time compared with smaller urban areas. Alipour, Langer, and O'Kane (2021) have documented this phenomenon in Germany, showing that the share of job ads with a work from home option since the onset of the pandemic has increased in both urban and rural areas but is much more pronounced in urban areas. Longer commute times are also associated with larger urban areas, potentially strengthening this correlation (Shen 2000). Although the relationship between commuting time and work from home varies somewhat, Chart 4 shows that between May 2020 and December 2022, workers who reported a longer commute time on average tended to work from home more often. In the largest U.S. metro areas, the time savings from a hybrid work model with fewer commutes have been estimated at between 100–400 hours per year (Rappaport 2022). Moreover, Bachelet, Kalkuhl, and Koch (2021) investigate the effect of work from home on energy and transportation costs in Germany and find that workers with higher income who live farther from their workplace benefit the most from work from home through reduced commute time and cost.

Chart 3

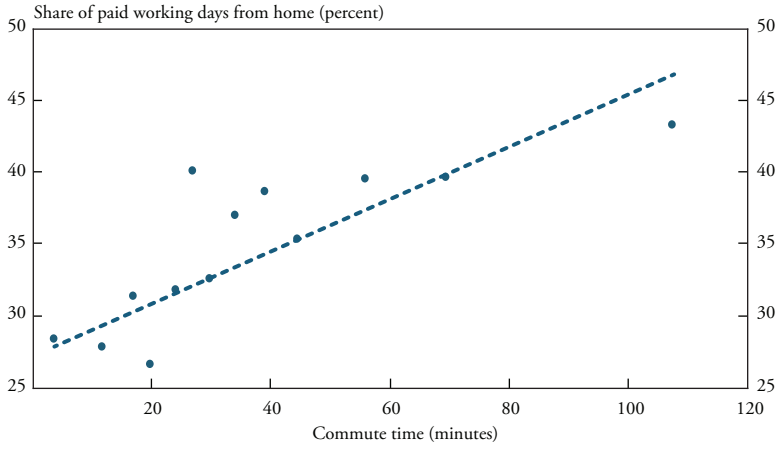
Workers Living in More Densely Populated Areas Work More Days from Home



Note: Chart summarizes SWAA data from August 2020 to December 2022.
Source: SWAA.

Chart 4

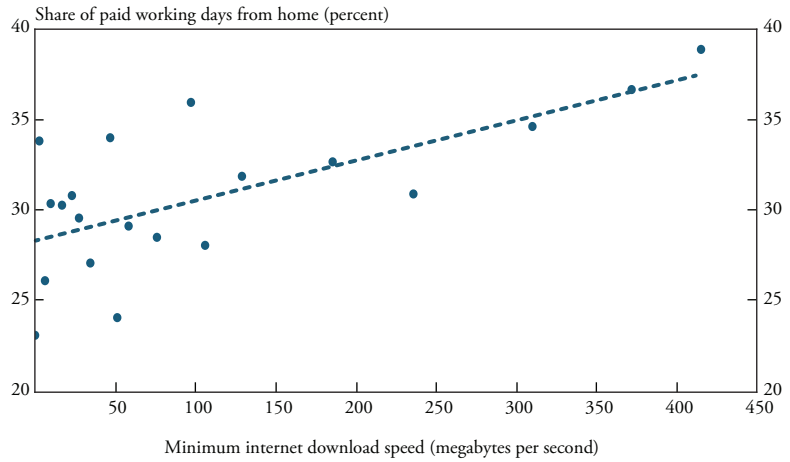
Workers with Longer Commutes Work More Days at Home



Note: Chart summarizes SWAA data from May 2020 to December 2022.
Source: SWAA.

Chart 5

Workers with Faster Internet Work More Days from Home



Note: Chart summarizes SWAA data from July 2021 to December 2022.
Source: SWAA.

Finally, workers in areas with faster internet speeds also report more time working at home. Beginning in July 2021, respondents to the SWAA were asked to report their internet speed at home. Chart 5 shows the average fraction of days worked at home between July 2021 and December 2022 grouped by reported minimum internet download speeds in megabytes per second. Workers with faster internet connections on average reported working from home a larger fraction of the time. Consistent with this result, McArthur and Hong (2022) find that faster internet connections are associated with an increase in the frequency of working from home and a decrease in traveling for work. In addition, Andreason and others (2020) suggest that areas without fast internet connections will likely fall further behind in terms of overall growth given the propensity for remote work accelerated by the pandemic.

Because worker income, population density, commuting time, and internet speeds are higher in larger urban areas, our findings suggest that work from home is also more prevalent in larger versus smaller urban areas. To explore whether work from home will remain more prevalent in larger urban areas over time, we next measure differences between employee preferences and their understanding about their employer's

plans—which we call the gap in work from home expectations—across the same worker and location characteristics.

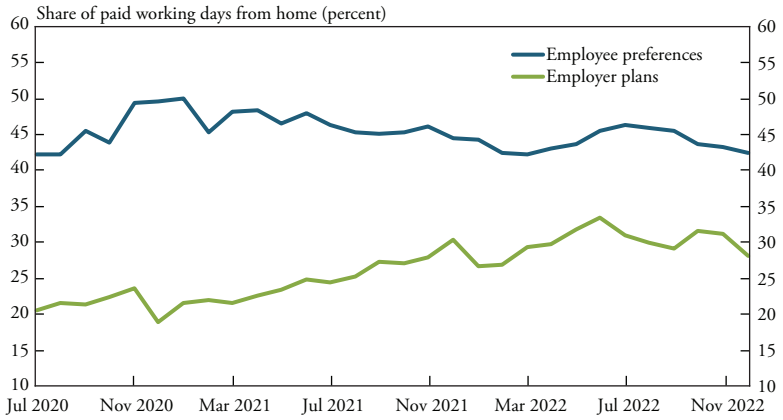
II. Factors Influencing the Gap in Work from Home Expectations

The SWAA is unique in that it asks workers about their preferences for work from home "after COVID" as well as their employer's plans for work from home after COVID, allowing us to measure changes in this gap in expectations over time.[4] Although the SWAA does not define what "after COVID" means, it is reasonable to assume that workers interpret this as when COVID-19 moves from pandemic to endemic status. Chart 6 shows that the average reported share of days that employees prefer to work from home after COVID (blue line) has held steady at around 45 percent over the entire sample. The chart also shows that workers believe their employers have increased the fraction of time they expect to allow employees to work from home after COVID (green line), from allowing work from home about 20 percent of the time in 2020 to around 28 percent as of December 2022. Although employer plans are interpreted and reported by the employees, the upward trend of employers' plans suggests three factors may be at play: employers may be becoming more comfortable with the idea of work from home, employees may be learning more about their employers' plans, or workers may have sufficient bargaining power to move employer plans closer to their preferences. This narrowing in the gap between employee preferences and employer plans offers additional evidence that work from home will likely continue to a greater degree once COVID-19 enters an endemic state.[5]

To examine where and for whom work from home is more likely to remain prevalent, we investigate which factors across individuals and locations have more influence in explaining employee preferences for work from home, employer plans for work from home, and the gap between them. The analysis in the previous section showed average tabulations of work from home over time or across various factors such as worker income, population density, commuting time, and internet connectivity. Although those comparisons are informative, they do not account for or control for other factors that might also influence work from home, such as the worker's industry and occupation, age, or

Chart 6

Average Gap between Employee Preferences for Work from Home and Employer Plans Has Narrowed



Source: SWAA.

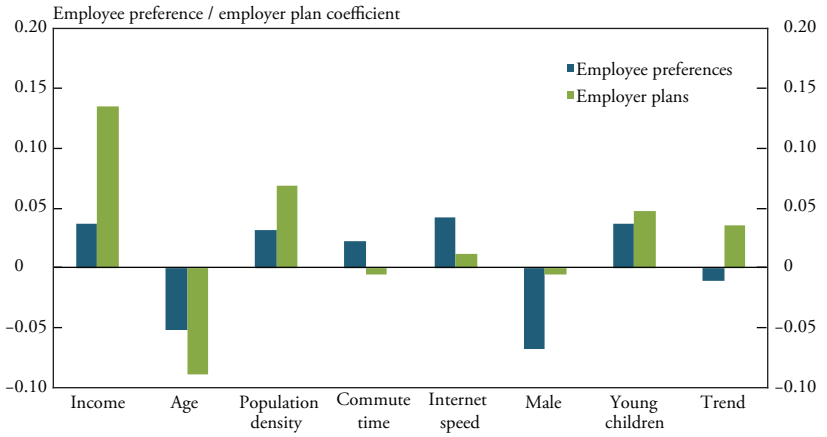
educational attainment. Moreover, previous research has shown considerable variation in work from home across industries and occupations (Bick, Blandin, and Mertens 2020).

We test whether controlling for job characteristics such as industry and occupation is sufficient to explain trends in work from home or whether income, age, presence of children, gender, and the urban environment are also important. We separate the results for worker preferences and employer plans, as the factors that help explain them may differ. In addition, we test whether our job and demographic factors influence trends in 1) the fraction of time workers prefer to work from home after COVID, 2) the fraction of time they believe their employers plan to allow them to work from home after COVID, and 3) the difference in fraction of days (employee less employer). Descriptive statistics of these measures are provided in Table A-1 of the appendix, as are details of the econometric model.

Chart 7 shows our estimation results for the relationship between each factor and employee preferences (blue bars) versus employer plans (green bars) over the SWAA sample between May 2020 and December 2022. We report standardized coefficients to make the results more comparable across factors. Each bar illustrates the correlation between a one standard deviation change in each factor and a one standard

Chart 7

Differences in Work from Home Coefficients, Employee Preferences versus Employer Plans



Notes: Chart shows standardized coefficients, which are reported in appendix Table A-3. Models include worker industry, occupation, and educational fixed effects.
Sources: SWAA and authors' calculations.

deviation change in employee preferences or employer plans for the share of work from home days. Positive coefficients indicate preferences or plans for more work from home, while negative coefficients indicate preferences or plans for less work from home. As such, a larger bar in the positive or negative direction in Chart 7 corresponds to a more important factor in explaining work from home preferences and plans.

Overall, our results are consistent with previous findings on the determinants of work from home. First, an increase in worker annual income is associated with increases in employee preference for share of days worked from home and an increase in their expectations of their employer's plans for days worked from home. Second, older workers prefer to work fewer hours from home, similar to their employer's expectations. One reason for this preference may be that older workers have more experience and may be in managerial roles that require more in-office work on the margin. Third, men prefer to work fewer hours from home compared with women, though employees do not believe their employers' plans differ for men and women. The difference in preference between men and women could be due to differences in time spent caring for children, as the presence of young children is associated with a higher share of worker preference for work from home.

We also find that factors in the urban environment help explain variation in work for home preferences and plans even when controlling for worker characteristics. An increase in population density is associated with a higher desired fraction of days working from home after COVID for workers in that location. The correlation is stronger for employers' plans, with a nearly one-for-one increase in standard deviations between population density and employers' plans for work from home. Additionally, commuting time and internet speed are also positively correlated with employees' preferences for work from home.

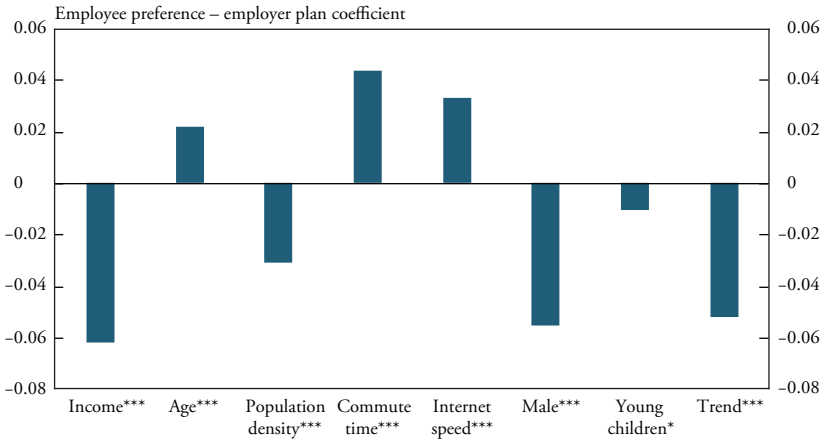
Finally, we find a small, positive, and significant coefficient on time trend, but only for employers' plans. This result indicates that employees' assessment of their employers' plans for the share of paid working days worked from home has steadily increased over time. This finding is consistent with the results previously illustrated in Chart 6, in which employees average preferred share of work from home after COVID remains stable over all waves of the sample, while the share of employer plans for work from home increases. Moreover, the positive trend coefficient on employer plans indicates that the planned share of days worked at home has increased over time. This increase might reflect employees becoming more knowledgeable of their employers' plans over time, employers being more willing to consider work from home in the face of a tight labor market, or a combination of the two.

Chart 8 shows which factors help explain variation in the gap between workers' preference for work from home and their employers' plans. We interpret the factors that are negatively (positively) correlated with the difference between employee preferences and employer plans as helping to close (widen) the gap. In particular, the negative measure of trend shows that the difference between preferences and plans is declining over time. We find that with each month, the gap in employees' preferred and employers' planned share of days worked at home decreases by 0.4 percentage points (see third column of Table A-2). The average gap in employee preferences and employer plans in December 2022 was 14.4 percentage points. If these trends continue, we expect this gap to close in about 36 months (14.4/0.4).

Our results highlight that the gap between employee plans and employer preferences varies widely based on worker and location characteristics. Higher income workers have a narrower gap between their

Chart 8

Factors Explaining the Gap between Employee Preferences and Employer Plans



* Significant at the 10 percent level
** Significant at the 5 percent level
*** Significant at the 1 percent level

Notes: Chart shows standardized coefficients, which are reported in appendix Table A-3. The model includes worker industry, occupation, and educational fixed effects.
Sources: SWAA and authors' calculations.

preferences for work from home and their expectations of their employers' plans. Workers in more densely populated areas also appear to have a smaller gap between their preferences and their employers' plans. Previous research has shown that remote work is adding to labor market tightness (Greene and Sly 2022). Although we do not have measures of labor market tightness or turnover in the SWAA respondents' locations, the labor market dynamics in more densely populated areas likely offer workers higher bargaining power compared with areas with less dynamic labor markets. Research has shown that smaller areas are less dynamic than larger areas in terms of business formation and population turnover (Brown 2018; Brown and Tousey 2020). We find that older workers, those with longer commute times, and those with faster internet have slightly larger gaps between their preferences and employer plans for work from home. We interpret these results as factors by which employers are less likely to shift their work from home plans. Moreover, these differences do not appear to be as economically significant relative to worker income. In contrast, we find that men

have a slightly narrower gap between their preferences and their employers' plans for work from home because on average, men prefer to work fewer hours at home (see Chart 7 and Table A-3).

Although Barrero, Bloom, and Davis (2021) argue that work from home will "stick," our findings suggest that it will likely not stick to the same degree for all workers in all places. These differences have important implications for the business cycle. To the extent that work from home offers greater worker flexibility, a narrower gap in preferences relative to employers' plans symbolizes less friction for those workers in the labor market. In the event of a labor market downturn, those who work from home more often may find it easier to shift to other jobs if necessary, as work from home relaxes the connection between workers' and employers' locations. Because more densely populated urban areas have a greater prevalence of work from home and a smaller gap in worker preferences and employer plans, it also stands to reason that larger urban areas will likely benefit more from the shift in preferences for work from home. It seems that work from home is yet another structural force playing out in the economy that offers greater advantage in larger versus smaller urban areas.

Conclusion

Prior to the COVID-19 pandemic, occasional work from home was common for some workers. However, with the onset of the pandemic, many workers were initially forced to work from home. This shift, along with additional investments employers made in technology, has accelerated the trend in work from home. We find that on average, workers in December 2022 worked from home around 27 percent of time, nearly double the pre-pandemic estimate. Moreover, the gap between workers' preferences for work from home and their expectations of their employers' plans has declined over the past two years. The gap appears to be closing due to upward movement in employers' plans. Our estimates suggest that if the trends in work from home continue, this gap may nearly close in the next three years.

Despite this shift in preferences towards work from home, our findings suggest that higher income workers in more densely populated areas are most likely to be affected by this shift. Although it is too early

to tell where work from home trends will settle, it is likely that workers with this flexibility and areas with a higher concentration of remote work will stand a better chance of weathering an economic downturn. Our findings suggest that work from home is more likely to stick in larger urban areas, potentially providing more economic flexibility and resiliency to these areas relative to smaller urban and rural areas.

Appendix

Estimating the Relationship between Urban Area Characteristics and Net Migration

We estimate the relationship between worker preferences for work from home, their employer's plans for work from home, and the gap between them using a repeated cross-section of sample waves from the SWAA. Specifically, we use the measures of the fraction of days workers prefer to work from home after COVID and their employers' plans for the share of paid working days from home after COVID. We also use information in the SWAA regarding worker industry and occupation, age, income, gender, presence of young children, population density of their home location, commuting time, and minimum internet download speed. Descriptive statistics of these measures, which we calculate using sample weights provided in the SWAA, are reported in Table A-1.

For each worker, we construct three dependent variables: the fraction of days workers prefer to work from home, the fraction of days they believe their employer plans for them to work from home, and the difference between the two. Let y_i represent one of these three measures for individual i such that:

$$\begin{aligned} y_i = \alpha &+ \beta_1 Log\ Income + \beta_2 Age + \beta_3 Log\ Population\ Density + \beta_4 Commute\ Time \\ &+ \beta_5 Internet\ Speed + \beta_6 Male + \beta_7 Children + \boldsymbol{\gamma}_s State_s + \boldsymbol{\gamma}_o Occupation_o \\ &+ \boldsymbol{\gamma}_j Industry_j + \boldsymbol{\gamma}_e Educational\ Attainment_e + \gamma t + \varepsilon_i, \end{aligned}$$

where $\boldsymbol{\gamma}_{s,o,j,e}$ contains state, occupation, industry, and educational attainment fixed effects and γ captures the time trend in work from home preferences, employer plans, or the gap between them. The beta coefficients measure the average correlation between those factors and the work from home measures. We use a high dimensional fixed effect estimator, where we absorb the state, occupation, industry, and educational attainment effects, as we want to control for them but are not interested in recovering the coefficients from them. Sample weights provided in the SWAA data are used in the econometric estimation. Additionally, we cluster standard errors at the state level.

Table A-1

Sample Individual Descriptive Statistics, May 2020 to December 2022

Work from home preferences, plans, and gaps	Mean	Standard deviation
Employee preferences	49.447	40.843
Employer plans	34.525	40.025
Preference – plans	14.693	38.386
Log(income)	4.140	0.716
Age	41.477	11.014
Log(population density)	7.162	2.021
Commuting time	26.425	25.562
Internet speed	109.564	125.576
Male	0.466	0.499
Young children	0.346	0.476

Note: Calculations are based on 127,181 observations.
Source: SWAA.

We estimate the above relationship over multiple waves of the survey from May 2020 to December 2022. After estimating the model, we report the results of standardized coefficients in Chart 8. We standardize them to make more of a direct comparison between the factors. For example, β_1 measures the relationship between a one standard deviation change in annual worker income measured in logs and their preference for work from home, their employer's plans, or the difference between preferences and plans. The full set of results are reported in Table A-2, and standardized coefficients of the same models are reported in Table A-3.

Table A-2

Determinants of Work from Home Preferences, Plans, and Gaps

Variable	Employee preferences	Employer plans	Preference – plans
Log(income)	2.332***	7.994***	–3.659***
	(0.561)	(0.504)	(0.356)
Age	–0.185***	–0.298***	0.073***
	(0.023)	(0.022)	(0.021)
Log(population density)	0.652**	1.366***	–0.602***
	(0.279)	(0.360)	(0.169)
Commute time	0.0412***	–0.0106	0.0743***
	(0.009)	(0.012)	(0.012)
Internet speed	0.0142***	0.00387	0.0104***
	(0.002)	(0.003)	(0.001)
Male	–5.575***	–0.479	–4.262***
	(0.572)	(0.458)	(0.538)
Young children	3.500***	4.137***	–0.893*
	(0.529)	(0.765)	(0.519)
Trend	–0.0848*	0.255***	–0.380***
	(0.044)	(0.049)	(0.053)
Intercept	103.3***	–189.8***	313.6***
	(33.167)	(37.607)	(39.511)
N	67999	60775	60775
Adjusted R^2	0.06	0.15	0.03

* Significant at the 10 percent level
** Significant at the 5 percent level
*** Significant at the 1 percent level

Notes: Robust standard errors are in parentheses. Models include worker industry, occupation, and educational fixed effects.

Table A-3

Determinants of Work from Home Preferences, Plans, and Gaps (Standardized Coefficients)

Variable	Employee preferences	Employer plans	Preference – plans
Log(income)	0.037***	0.135 ***	–0.062***
	(0.009)	(0.009)	(0.009)
Age	–0.052***	–0.089***	0.022***
	(0.006)	(0.007)	(0.006)
Log(population density)	0.031**	0.069***	–0.031***
	(0.013)	(0.018)	(0.009)
Commute time	0.022***	–0.006	0.044***
	(0.005)	(0.007)	(0.007)
Internet speed	0.042***	0.012	0.033***
	(0.007)	(0.009)	(0.005)
Male	–0.067***	-0.006	–0.055***
	(0.007)	(0.006)	(0.007)
Young children	0.037***	0.048***	–0.010*
	(0.006)	(0.009)	(0.006)
Trend	–0.011*	0.035***	–0.052***
	(0.006)	(0.007)	(0.007)
Intercept	103.3***	–189.8***	313.6***
	(33.167)	(37.607)	(39.511)
N	67999	60775	60775
Adjusted R^2	0.06	0.15	0.03

* Significant at the 10 percent level
** Significant at the 5 percent level
*** Significant at the 1 percent level

Notes: Robust standard errors are in parentheses. Models include worker industry, occupation, and educational fixed effects.

Endnotes

[1]The SWAA also contains population weights to calculate how many workers each respondent represents in the worker population. Individuals that represent more workers, meaning they are in more common occupations, have a larger weight, while individuals in less common occupations have a smaller weight. We use the sample weights in our analysis to construct more accurate sample means.

[2]The population density is recorded by Barrero, Bloom, and Davis (2021) in log scale at the zip-code level of residence beginning with the August 2020 survey.

[3]We use 2020 tract-level population density measures from the U.S. Census Bureau to calculate the average population density in Metropolitan Statistical Areas, following methodology described in Rappaport (2008).

[4]One question asks the desired share of paid working days to work from home after COVID (percent), while the other asks their employer's planned share of paid working days to work from home after COVID (percent).

[5]The likelihood of work from home remaining more prevalent is also supported by trends in office occupancy, which were below 50 percent compared with pre-pandemic levels as of early November 2022 (Kastle 2022).

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The Employment Effect of an Increase in the National Minimum Wage: Review of International Evidence

By Taeyoung Doh and Luca Van der Meer

The U.S. federal minimum wage has been fixed at $7.25 since 2009; meanwhile, the U.S. economy has been anything but static. A decade of modest growth, a seismic pandemic, and a recent period of high inflation have all combined to erode the spending power of a $7.25 minimum wage. Income disparity has also grown over the last decade: a standard index for measuring income dispersion, the Gini coefficient, has grown substantially. To address these problems, as early as 2015 U.S. legislators introduced a proposal to increase the federal minimum wage from $7.25 per hour to $15 per hour, but this proposal never reached fruition.

One challenge in implementing minimum wage increases is estimating the potential effect on employment. Although moving to a $15 federal minimum wage would not be as dramatic an increase in 2022 as in 2015 due to nominal wage increases over those seven years, such an increase would still be historically unprecedented. As a result, past modest increases in the U.S. federal minimum wage are unlikely to provide much insight into employment effects. One alternative is to examine minimum wage changes at the state or local level, as individual states and cities have instituted comparably large minimum wage changes. However, studies on state and local wage changes

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are not ideal for an analysis of national employment effects, either. Specifically, they are likely to understate the employment effects of a national minimum wage to the extent that they occlude differences in how a uniform minimum wage change might have variable effects on firms in different locations.

Instead, international experiences with large, federal minimum wage increases may provide more insight into the potential effects on employment by accounting for greater variation in firm exposure to the change. For example, Hungary and South Korea both implemented large, rapid shifts in their national minimum wages in recent decades. In addition, Brazil implemented a similarly large but more gradually paced increase, while Germany implemented a large change by instituting its first minimum wage in 2015.

In this article, we compare these countries' experiences with large minimum wage changes and summarize the effects on employment. Together, these international experiences suggest that both the pace and the size of the increase matter: large, rapid increases in the minimum wage have a more negative effect on employment than more gradual increases, especially in competitive sectors. The international evidence suggests that a gradual and steady increase of the federal minimum wage over the course of a few years is likely to generate a smaller employment effect than a one-time rapid increase.

Section I discusses current empirical studies of the employment effect of the minimum wage in the United States and the studies' limitations. Section II reviews international evidence on the employment effect of an increase in the national minimum wage and highlights the contrast between rapid, sizable changes and steady, modest changes. Section III draws implications for the United States from these studies.

I. The Employment Effect of Minimum Wages in the United States

Economic theory suggests that all else equal, an increase in a product's price will lead to a decline in demand for that product. For the same reason, an increase in the minimum wage can decrease demand for the labor of workers who are subject to the minimum wage. In practice, however, all else is not equal; labor demand might be influenced by several offsetting factors. For example, in imperfectly competitive labor

markets, employers have market power and may set their wage below the competitive level because they are not scared of losing employees to competitors. Hence, the market wage might be set below what is consistent with optimal labor utilization, resulting in the undersupply of labor. A minimum wage increase would force these employers to pay higher wages, leading more workers to be willing to work and thereby increasing employment.

Consistent with these offsetting factors, empirical studies find a wide range of employment effects from an increase in the minimum wage. For example, Card and Krueger (1995) find a small, positive effect on employment for fast food workers in New Jersey, which raised its minimum wage, compared with fast food workers in neighboring Pennsylvania, which did not. In contrast, Meer and West (2016) find that a minimum wage increase has a negative effect on the employment of teenagers (age 16–19), a group of workers disproportionately likely to be employed at the minimum wage. The lack of a clear consensus among empirical studies has led some researchers to call the negative effect of a minimum wage increase on employment "elusive" (Manning 2021).[1]

The ambiguous employment effect contrasts with the unambiguously positive effect of a minimum wage increase on average wages. For instance, Manning (2021) augments Meer and West's (2016) analysis by estimating wage changes among teenagers in addition to re-estimating employment effects. Although Manning finds that average wages increase in response to a minimum wage change across seven different empirical model specifications, the changes in employment are much more varied.[2]

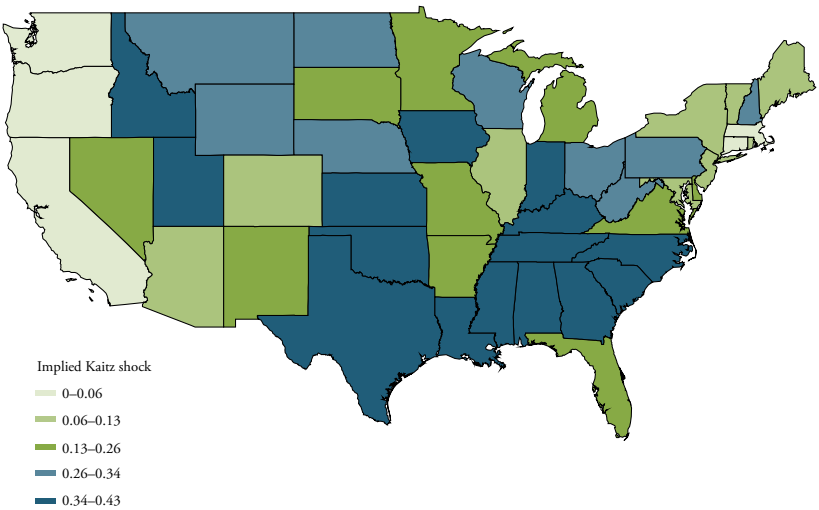
One complication in extracting the employment effect is that movements in the minimum wage vary in size. Kim and Taylor (1995) examine the effect of the 1988 minimum wage change in California on retail workers and find that California employment relative to the U.S. average declined, as the large change in the minimum wage led overall wages in California to increase faster than the U.S. average. The policy in California moved the minimum wage from $3.35 to $4.25, a 27 percent change and larger than that examined by Card and Krueger (1995) or by Meer and West (2016). However, a similar 27 percent change today may not be nearly as significant as it was in the case of Kim and Taylor:

the current federal minimum wage has remained unchanged for over a decade, and in its current state, likely does not apply to many workers.

Thus, our analysis requires a consistent way to measure what constitutes a "large" minimum wage shock as opposed to a "small" one. To do this, we measure minimum wage changes through the Kaitz index, constructed as the ratio of a region's minimum wage to the region's median wage. Measuring minimum wages using the Kaitz index has several benefits. First, examining this index over time allows us to gauge the intensity of the change in the minimum wage. A high Kaitz index suggests the median wage is close to the minimum wage. The likelihood that the minimum wage is greater than a worker's counterfactual market-determined wage goes up when the Kaitz index is higher. When measuring policy intensity, if a region's Kaitz index changes drastically before and after the implementation of a policy, we can assume that the minimum wage now affects a larger portion of the income distribution. Second, this index standardizes the denominations across countries, allowing us to consistently compare minimum wage changes in countries that use different currencies. Third, the Kaitz index accounts for wage growth and inflation, which simple level changes in the minimum wage do not. For example, the United States currently has a national minimum wage of $7.25 per hour. Although the most recent proposed minimum wage of $15 per hour is more than double the previous minimum, the former wage floor was set in 2009. Inflation has since pushed nominal wages up drastically, and fewer workers earn less than $15 per hour now than in the past. By using a region's Kaitz index, we can price in the effects of wage growth and inflation and better estimate whether employers will respond to a minimum wage increase by either raising wages or reducing employment, leading to the employment and wage effects central to our analysis.

As a first step, we examine Kaitz indexes for U.S. states to gauge the effect of a $15 minimum wage shock nationally. Map 1 shows substantial variation in the magnitude of the exposure to a hypothetical increase in the minimum wage to $15 across different states. In particular, the map shows the difference between each state's 2021 Kaitz index and their hypothetical Kaitz index should a $15 minimum wage be imposed. States with greater Kaitz differences are considered "more exposed" to a minimum wage shock, in that more firms are likely to

Map 1
Heat Map of State-Level Kaitz Indexes



Source: U.S. Bureau of Labor Statistics (BLS).

have to increase their wages (or decrease their demand for labor relative to what they would do without the minimum wage change) in response to the change. In Mississippi, for example, the current minimum wage is $7.25, while the current median wage is $16.86. Thus, an increase of the minimum wage to $15 would move the Mississippi Kaitz index from 0.43 to 0.89. In contrast, North Dakota has the same minimum wage of $7.25, but a median wage of $22.58. As a result, the same $15 minimum wage policy would move the North Dakota Kaitz index from 0.32 to 0.66 (a smaller difference than for Mississippi). In other words, the new policy would likely affect more workers in Mississippi than North Dakota. For states whose minimum wage already lies between $14 and $15, such as Massachusetts and Washington, a $15 federal minimum wage leaves the Kaitz index largely unchanged.

Although Map 1 illustrates the utility of Kaitz indexes in evaluating the effects of minimum wage changes, it offers limited evidence on how a $15 minimum wage would affect employment at the national level. Existing U.S. studies, which often examine local or state-level changes in the minimum wage, do not provide a definitive answer to the employment effects of minimum wage changes at the national level.

International evidence on the effects of a national minimum wage policy can complement existing studies based on state-level policy changes.

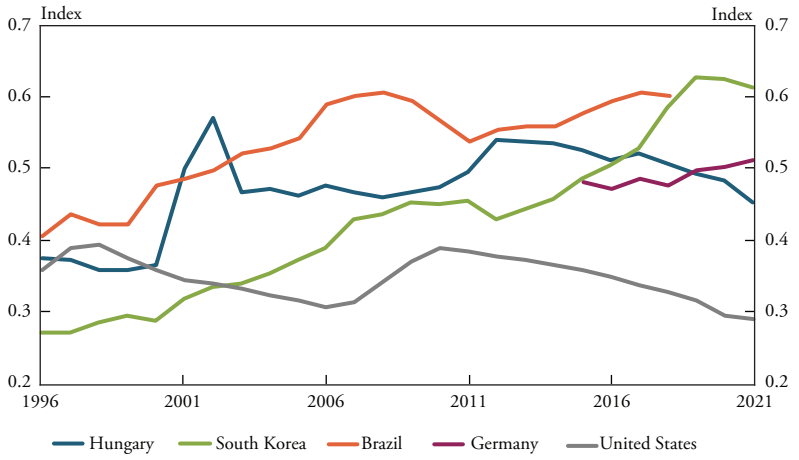
Estimating the elasticity of firm-level employment—the expected percent change in employment given a 1 percent movement in the minimum wage—with respect to policy changes at the national level better accounts for variations in different regions' degree of exposure to the minimum wage change.[3] Thus, examining international evidence may give additional useful insight into the ultimate employment effects of a national minimum wage policy.

II. International Evidence on the Employment Effect of the National Minimum Wage

To provide insight into the potential effects of a national minimum wage hike in the United States, we review the effect of minimum wage policies on employment in four countries: Hungary, South Korea, Brazil, and Germany. For each country, we consult a study that teases out the economic effect of the minimum wage shock by isolating different degrees of exposure to the national minimum wage change at the firm, state, or worker level. The elasticities for each country vary; however, countries with negative elasticities—implying that a minimum wage increase reduced employment—such as Hungary and South Korea, show clear and important differences to countries reporting no change or positive elasticities, such as Germany and Brazil.

In Hungary, the national minimum wage increased rapidly and substantially in the early 2000s, approximately doubling from 25,500 Hungarian forints (HUF) annually to 50,000 HUF annually over a two-year period. This change exposed more firms to the change and accordingly reduced employment. Chart 1 shows that from 2000 to 2002, an increase in the national minimum wage led the Kaitz index to jump from 0.35 to 0.55 (blue line).[4] Harasztosi and Lindner (2019) examine the effect of this minimum wage increase by comparing outcomes across firms that are more and less exposed to the minimum wage. They report a negative employment elasticity of –0.076, meaning that if a firm's share of workers affected by a minimum wage change increases by 10 percent, that firm would likely have to reduce its total employment by 0.76 percent relative to an otherwise identical firm where no worker is directly affected by the policy. This result is statistically significant given the standard

Chart 1
Time Series of the Kaitz Index



Sources: Organisation for Economic Co-operation and Development (OECD), Relação Anual de Informações Sociais, and Instituto de Pesquisa Econômica Aplicada.

error of 0.01. With this rapid and substantial increase in the minimum wage, firm-level exposure to the minimum wage increased substantially, thereby reducing employment. The authors also find that this negative employment effect was larger for firms that operate in a more competitive manufacturing sector, as these firms could not pass the increased cost from a higher minimum wage through to prices. Instead, they were more likely to absorb the cost increase by reducing employment.

The South Korean experience with a minimum wage increase mirrors these findings. Although South Korea introduced the minimum wage in 1988 and steadily increased it over time, minimum wage policy ratcheted up in intensity in 2018. Similar to the Hungarian experience, the South Korean Kaitz index (Chart 1, green line) increased from about 0.5 in 2017 to slightly above 0.6 by 2019. Following the empirical specification in Harasztosi and Lindner (2019), Doh and others (2022) measure the employment effect of this increase using manufacturing sector data in South Korea. They find a larger negative employment effect than in the case of Hungary: specifically, they estimate the employment elasticity to be –0.21, which is statistically significant given the standard error of 0.03.

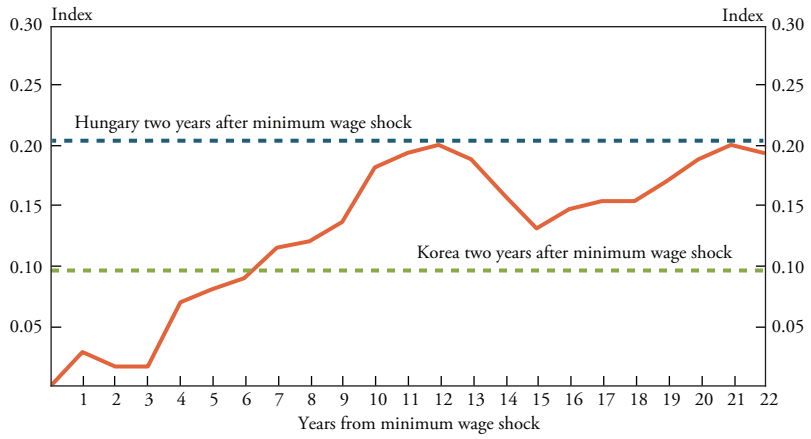
To better understand the mechanisms behind this employment effect, Doh and others (2022) decompose the change in employment into the extensive margin (that is, employment reductions due to plants closing or moving offshore) and the intensive margin (that is, layoffs within a firm). They find that the extensive margin adjustments account for at least one-third of the overall employment adjustment. For the manufacturing sector, foreign direct investment in low-wage countries such as Vietnam increased substantially from 2017 to 2019, suggesting offshoring may be partly driving the employment reduction.[5] Unlike Harasztosi and Lindner (2019), Doh and others (2022) also find a statistically significant negative employment effect of –0.21 in the non-tradable services sector, suggesting this sector may be as competitive as the mining and manufacturing sector, which displays a magnitude of –0.19 when isolated. Taken together, however, the results from both the Hungarian and South Korean experiences suggest that large, sudden minimum wage shocks are likely to result in negative and painful employment effects.

Like Hungary, Brazil also increased its national minimum wage substantially in the early 2000s; however, the wage increase was phased in more gradually, generating negligible employment effects. The gradual implementation might have played a large role because the increase in the Kaitz index was modest on average. Chart 1 shows that from 1996 to 2018, the Kaitz index in Brazil (orange line) increased from about 0.4 to about 0.6. Hence, on a per-year basis, the increase in the Kaitz index was less than 1.7 percentage points. To better illustrate the gradual nature of this increase relative to other countries, Chart 2 shows the change in Brazil's Kaitz index expressed over time, with dashed lines showing the levels of the Hungarian and South Korean minimum wage shocks after two years. The Brazilian Kaitz index takes about six years to arrive at the same level that the South Korean index reaches after two. Furthermore, the Brazilian Kaitz index never reaches the same level as the Hungarian shock but nears that level after about 12 years. This more modest increase in the Brazilian Kaitz index implies that the percentage of workers who would be subject to the minimum wage would not have increased substantially during any given year.

Engbom and Moser (2022) analyze the Brazilian data and find a negligible effect on employment. They calculate the Brazilian

Chart 2

Time Variation in the Brazilian Kaitz Index



Source: OECD.

employment elasticity based on a household survey from 1996 to 2012 and find a small, positive elasticity of 0.014, meaning a worker who is directly affected by the minimum wage shock is 1.4 percent more likely to be employed after the policy change than a worker unaffected by the minimum wage movement (though this elasticity is not statistically significant given the standard error of 0.015). This finding, coupled with the modest decline in the Kaitz index, suggests that the gradual nature of the increase in the Brazilian minimum wage minimized the effect on employment. When the minimum wage changes gradually, small firms with low productivity may only gradually exit the market, and large firms with high productivity are better able to absorb workers from exiting firms. This explanation is supported by Engbom and Moser (2022), who find a strong positive correlation between minimum wage and firm size that suggests larger firms are picking up workers affected by the closure of smaller firms.

Similar to Brazil, Germany also experienced no significant negative employment effect after a shift in minimum wage policy. In 2015, Germany introduced its first national minimum wage. Despite the relatively high initial Kaitz index, reflecting that the newly introduced minimum wage was 47 percent of the median wage (Chart 1, maroon line), the new minimum wage was binding only for a small percentage of workers. Because Germany had no minimum wage before the change, the shock

would initially seem quite dramatic, raising the Kaitz index from 0 to 0.47. However, Germany's history of prevalent workers' unions had led to a tighter dispersion of wages around the median. Thus, the number of workers affected by the new minimum wage was likely quite low. Furthermore, the bottom decile wage in Germany had been steadily increasing before the introduction of the minimum wage, and at the time of policy implementation had approximately reached the level of the new minimum.[6]

Dustmann and others (2022) provide further evidence for this interpretation using an employee-employer linked dataset to identify the overall employment effect and the magnitude of labor reallocation after the introduction of the national minimum wage in 2015. They find a small but positive employment elasticity of 0.008, which is statistically significant given the small standard error of 0.0005. This finding suggests that workers subject to the new minimum wage were in fact more likely to remain employed than workers earning a higher wage after the policy was put into place.[7] Together, the slow but significant minimum wage adjustment in Brazil and the moderate adjustment of the minimum wage policy in Germany suggest that gradual minimum wage adjustments and wage adjustments that affect a minimal share of workers have negligible effects on employment.

Although we find a range of employment effects across the four studies, the wage effects are much less ambiguous. Each study finds positive effects on wage growth after the policy shock using the previously specified estimation methods. The German study finds that being part of the treatment group yields an average 5.4 percent wage growth, while the South Korean study finds that a 10 percentage point increase in firm exposure to the minimum wage yields a 7.5 percent increase in wage growth. Although nominal minimum wage changes are passed through the economy, the lower end of the wage distribution is much more strongly affected than the upper end, leading to lower wage inequality. In Brazil, wage dispersion falls 19.3 percent in response to the 58.6 percent growth in the minimum wage over the sample period.

III. Implications for the United States

International evidence can be useful when considering the effects of a national minimum wage change in the United States, given the

lack of historical precedent in the United States for large national-level changes in the minimum wage. From our analysis of international evidence, we find first that a movement of the minimum wage to $15 an hour could have strong negative employment effects in some U.S. states where a shift to $15 would be a large and rapid change. Given that rapid movements in the Kaitz index of 0.1 in South Korea and 0.2 in Hungary led to negative employment effects due to differences in exposure to the change across firms, the more than 10 U.S. states where the Kaitz index would move at least 0.4 under this policy could see negative employment effects. Although higher minimum wages can be effective at raising wages for lower-income workers, these benefits have to be balanced against potential negative effects on employment. Evidence from Brazil suggests that regular revision of the national minimum wage, if done at a modest pace, may be able to raise the wages of lower-income workers without sizeable employment shocks.

Conclusion

Since 2015, U.S. lawmakers have contemplated increasing the federal minimum wage substantially to $15. Central to any consideration of a minimum wage hike are the potential effects on employment; however, these effects can be challenging to measure given the limited historical precedent for large, national minimum wage increases in the United States. International evidence may offer evidence on the potential employment effects of national minimum wage increases. These international studies allow us to examine large and rapid changes in minimum wage policy that also reflect various exposures to higher minimum wages across geographies.

We review empirical studies in four countries that have changed their national minimum wage. These studies suggest the pace of the minimum wage increase matters in determining the overall employment response. A rapid increase of the minimum wage relative to the median wage could be disruptive to firms operating in competitive sectors that cannot easily pass cost increases through to final consumers. Indeed, a rapid increase in the minimum wage (relative to a more gradual increase) is likely to expose more firms and workers to the minimum wage, resulting in a significant negative employment effect. The analysis of the Hungarian and South Korean minimum wage increases

in Harasztosi and Lindner (2019) and Doh and others (2022), respectively, support this view.

On the other hand, the experiences of Brazil and Germany suggest that a steady and modest increase in the minimum wage that in turn affects fewer workers in any given year may have no negative employment effects at all. Brazilian data analyzed in Engbom and Moser (2022) and German data examined in Dustmann and others (2022) show that labor reallocation to growing firms with high productivity is important in offsetting the negative employment effect from the conventional labor demand channel.

Endnotes

[1]Aside from offsetting factors related to the magnitude of minimum wage increases, a more gradual pace of minimum wage growth may less intensely affect employment through additional channels. Glover and Mustre-del-Río (2021) analyze the link between inflation and employment using a sticky-price model, in which prices react to movements in economic indicators with a lag. In this model, firms respond to a minimum wage shock and higher costs by reducing employment. However, if firms are instead allowed to pass higher prices through to consumers, then these price increases will, over time, offset costs and in turn offset the effect on employment. According to Glover and Mustre-del-Río, a central bank is likely to respond to this movement in inflation and react with a high nominal interest rate that can cause lower aggregate output and employment. Hence, a negative employment effect is more likely when the central bank can react to the pass-through of the cost increase to prices.

[2]Empirical specifications differ mostly in terms of the treatment of the state time trend and the interaction between the geographical fixed effects and time fixed effects. All specifications control for the prime-age unemployment rate, the percentage of teenagers in the population, and state and time fixed effects.

[3]In the studies we select, elasticity refers to a 1 percent movement in a group's exposure to the minimum wage rather than a 1 percent movement in the minimum wage itself. Although similar in spirit, the magnitudes of the elasticities we report cannot be thought of as the responses to percentage movements in the minimum wage itself. Based on the structure of the wage distribution, the same degree of change in the minimum wage may induce different degrees of exposure. Assessing the placement of the current U.S. minimum wage in the national wage distribution is beyond the scope of this article.

[4]As discussed previously, a national Kaitz index is likely to occlude variation in firms' exposure to the minimum wage relative to local or state-level indexes. We plot a national Kaitz index for the United States nonetheless to facilitate comparison across our countries: South Korea has a minimum wage only at the national level, and we do not have detailed data for state-level minimum wage variation for Brazil. However, the studies we consult do consider firm-level exposure to a binding minimum wage where possible—that is, if a state-level minimum wage (when available) is higher than the national minimum wage, the studies calculate firm-level exposure using the state-level minimum.

[5]Even in the United States, higher national wages may push companies to foreign countries with abundant low-wage workers. Using the case study of the 1994 Mexican currency crisis, Sethupathy (2013) finds that the depreciation of the peso decreased real wages in Mexico relative to the United States and led to positive and significant offshoring. Although a minimum wage shock would directly affect U.S. workers rather than Mexican workers, the effect on the relative wage would be parallel.

[6]Comparing the Kaitz index before and after Germany's wage implementation is difficult; however, it may be possible to proxy for the minimum wage using the 10th percentile wage. When we construct this alternative index (10th percentile wage / median wage), we see almost no growth in the two years after the implementation of the minimum wage, implying that low income wages did not grow relative to median wages as a result of this policy.

[7]The authors first split their sample into €1 wage bins based on individual's wage levels before the introduction of the minimum wage policy and estimate the marginal effect on employment before and after minimum wage implementation. They consider the three lowest wage bins as "treated," as their levels lie below the new minimum wage, and all other bins as "control." They then compare a weighted average of the two groups.

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Economic Review

Volume 108, Number 2

The *Economic Review* (ISSN0161-2387) is published quarterly by the Federal Reserve Bank of Kansas City, 1 Memorial Drive, Kansas City, Missouri 64198-0001. Subscriptions and additional copies are available without charge. Send requests to the Public Affairs Department, Federal Reserve Bank of Kansas City, 1 Memorial Drive, Kansas City, Missouri 64198-0001. Periodical postage paid at Kansas City, Missouri.
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