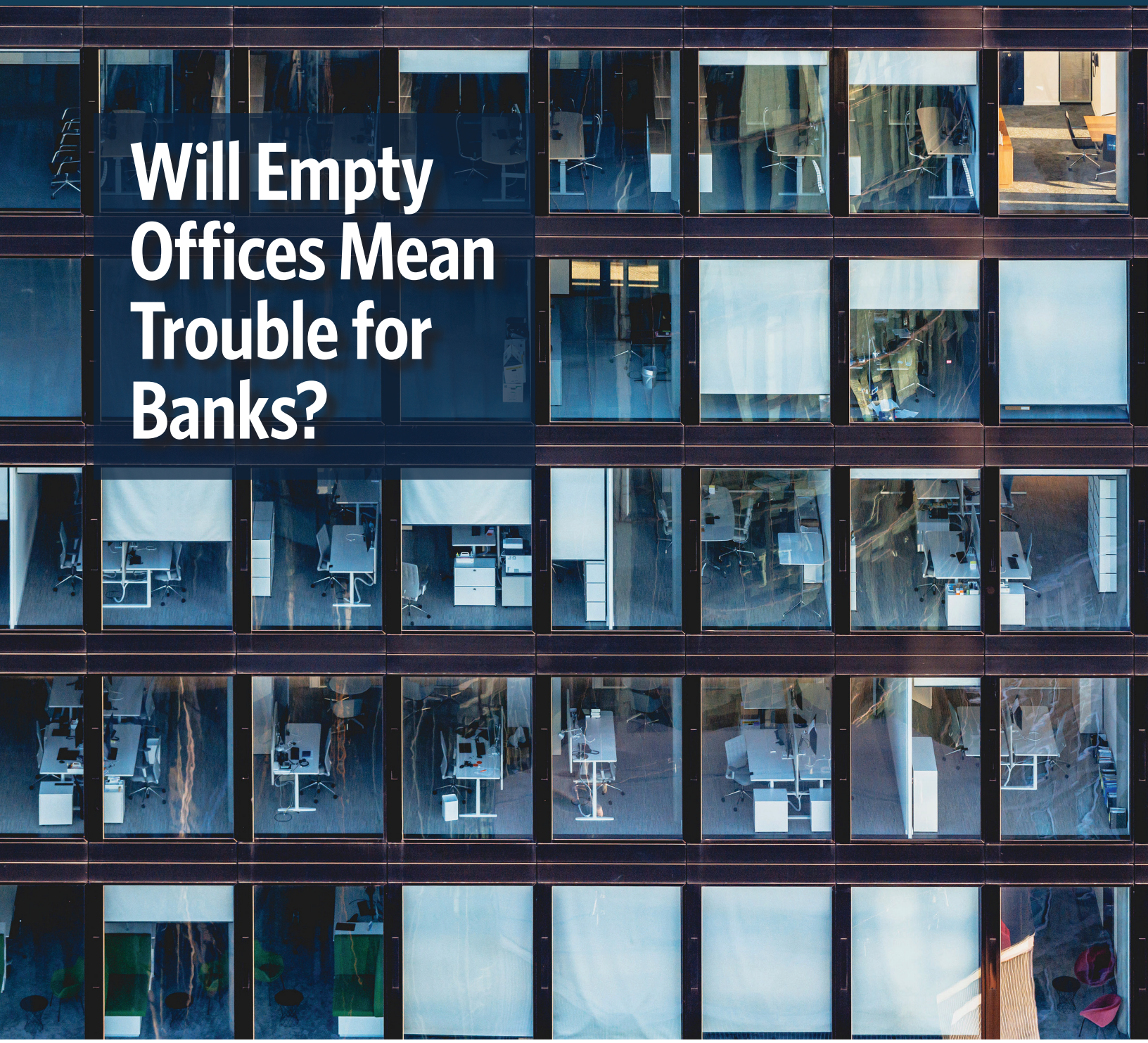
FEDERAL RESERVE BANK OF RICHMOND

SECOND QUARTER 2023

ECON FOCUS



Will Empty Offices Mean Trouble for Banks?

Bank Supervisors and AI

Data Centers and Economic Development

Interview with Daron Acemoglu

VOLUME 28 ■ NUMBER 2
SECOND QUARTER 2023

ECON FOCUS

Econ Focus **is the economics magazine of the Federal Reserve Bank of Richmond. It covers economic issues affecting the Fifth Federal Reserve District and the nation and is published by the Bank's Research Department. The Fifth District consists of the District of Columbia, Maryland, North Carolina, South Carolina, Virginia, and most of West Virginia.**

DIRECTOR OF RESEARCH
Kartik Athreya

DIRECTOR OF PUBLICATIONS
Renee Haltom

EDITOR
David A. Price

MANAGING EDITOR
Lisa Davis

STAFF WRITERS
John Mullin
Tim Sablik
Matthew Wells

EDITORIAL ASSOCIATE
Katrina Mullen

CONTRIBUTORS
Erin Henry
Stephanie Norris
Adam Scavette
Sam Louis Taylor

DESIGN
Janin/Cliff Design, Inc.

PUBLISHED BY
the Federal Reserve Bank
of Richmond
P.O. Box 27622
Richmond, VA 23261
www.richmondfed.org
www.twitter.com/RichFedResearch

Subscriptions and additional copies: Available free of charge through our website at www.richmondfed.org/publications or by calling Research Publications at (800) 322-0565.

Reprints: Text may be reprinted with the disclaimer in italics below. Permission from the editor is required before reprinting photos, charts, and tables. Credit *Econ Focus* and send the editor a copy of the publication in which the reprinted material appears.

The views expressed in Econ Focus are those of the contributors and not necessarily those of the Federal Reserve Bank of Richmond or the Federal Reserve System.

ISSN 2327-0241 (Print)
ISSN 2327-025x (Online)

FEATURES

4 OUT OF THE OFFICE, INTO A FINANCIAL CRISIS?
Remote work has left office buildings emptier. What does that mean for the banks that finance them?

14 VIRGINIA'S DATA CENTERS AND ECONOMIC DEVELOPMENT
The state's fast-growing data center industry continues to build on its early advantages

DEPARTMENTS

1 PRESIDENT'S MESSAGE
Learning From Our District

2 UPFRONT
New from the Richmond Fed's Regional Matters Blog

3 RESEARCH SPOTLIGHT
Marriage Is Extra Work

8 FEDERAL RESERVE
Artificial Intelligence and Bank Supervision

12 POLICY UPDATE
Debating the 2018 Banking Regulatory Bill

13 AT THE RICHMOND FED
Community Conversations

18 ECONOMIC HISTORY
The Bank War

22 INTERVIEW
Daron Acemoglu

27 DISTRICT DIGEST
Measuring Social Capital Across the Fifth District

32 OPINION
Why Do Bank Runs Happen?

Cover Image: Getty/iStock/Zoranm

Scan here to subscribe to *Econ Focus*

Learning From Our District

My Richmond Fed colleagues and I are on the ground in our district constantly, meeting and learning from community members. Last year, we had over 1,700 such engagements — with bankers, business and community leaders, workers, and public officials. These meetings take us to every corner of the states we serve.

But this kind of high-touch outreach requires time and effort. And it requires us to call upon the generosity of the people who share their time and observations with us. So why do I believe in this approach? Broadly speaking, there are three reasons.

First, while national numbers are vital, community members help us see what's beneath the data. Take consumer demand. Last fall, it looked solid overall, but conversations with retailers in our district gave our understanding more depth. Lower-price retailers told us their customers had pulled back amid inflation and recession fears. As lower-income consumers were squeezed at the gas pump and the grocery store, their demand for items like washing machines and TVs dropped. In contrast, higher-priced retailers were still seeing wealthier consumers spend.

Our conversations also help us see geographic differences more clearly. In the post-pandemic recovery period, for example, foot traffic was back in South Carolina long before it returned in the District of Columbia.

Second, these conversations help us move beyond *what* is happening to *why* it's happening. For example, why has the labor market stayed tight — even as rates have risen, sentiment has fallen, and the economy has slowed? On the demand side, employers tell us they are reluctant to let go of workers they fought for months to hire; they don't want to lose those workers if they can avoid it.

On the supply side, we hear about workers facing new challenges that keep them from working even as pandemic-related barriers fade. In a visit to southern Virginia as part of our Community Conversations event series, we learned that the escalating costs of gas, housing, and child care have raised these residents' barriers to working, even as wages have been increasing.

Third, conversations on the ground give us the chance to learn what's next, catching real-time turning points in the economy. The national data come with a lag and may be revised multiple times over the following year. It is far from definitive on what is happening in real time, so conversations with our contacts help us better understand how things are changing. For instance, we saw early signs of the housing market turn when contacts shared that furniture sales had started to recede. And we've heard about more projects in the commercial real estate space being put into "wait and see" mode and many being canceled outright.

But we aren't just relying on anecdotes. Our team fields rigorous economic surveys throughout our district, and those surveys help to identify shifts in activity. For example, our index of new orders for manufacturing started to show contraction in the spring of 2022, indicating a softness that didn't show up in national measures of manufacturing until months later.

This sensing process remains essential in these uncertain times. In my conversations and staff briefings, here's what I'm watching:

Is inflation calming? Are consumers slowing spending? What are business leaders' attitudes toward pricing?

Is the labor market cooling? Will we see layoffs spread? Will those on the sidelines finally come back into the workforce? Will compensation increases continue or slow?

Are we headed for a recession? Businesses seem to have pulled out and updated their recession playbooks. Banks have faced significant pressure from recent bank failures and may pull back. What happens next?

We will find answers to these questions — and learn of new ones — as we continue to meet with members of our community. Thanks to all of you who give your time and insights.

Tom Barkin
President and Chief Executive Officer

BY KATRINA MULLEN

New from the Richmond Fed's Regional Matters blog

Jason Kosakow. "Fifth District Firms Report Cautious Optimism Going Into 2023."
The Richmond Fed's monthly survey of business conditions asked firms in February about their outlook and strategies to prepare for possible economic outcomes. A majority of Fifth District firms were either somewhat or very optimistic about their own prospects this year, although business optimism varied by industry. For the overall U.S. economy, Fifth District firms were more pessimistic about the outlook for this year. This pattern of being more optimistic about one's own firm compared to the overall U.S. economy is also seen in The CFO Survey. Both own-firm and overall economy sentiment are connected to contingency plans: Among firms planning for a downturn, nearly all were reducing their discretionary spending, followed by canceling or delaying purchases and canceling or delaying capital expenditures.

Jason Kosakow and Adam Scavette. "Firm Price-Setting Behavior Amid Elevated Price Growth: Evidence From Our Surveys."
Each month, in the Richmond Fed manufacturing and service sector surveys, firms report the 12-month percentage change in prices charged for customers' goods or services as well as firms' expectations for those price changes. Prior to the COVID-19 pandemic, price growth in the Fifth District was relatively stable, but after a peak in mid-to-late 2022, growth has been rather slow or flat (though still above pre-COVID-19 levels). Because of these changes and the uncertainty of future prices due to inflation, firms have been adjusting prices more regularly. Moreover, most firms — particularly those in the service sector — think customer price growth will continue to rise faster in 2023 than it did before the pandemic.

Zach Edwards. "Are Capital Expenditures Getting Too Expensive?"
In both the Richmond Fed's monthly surveys of manufacturers and service providers and in The CFO Survey for the first quarter of 2023, firms provided their capital expenditures expectations, a strong indicator of future economic outlook. The monthly surveys gather whether firms' capital expenditures in the last month have increased, decreased, or stayed the same. The capital expenditures indexes for both manufacturing and services have been decreasing since the second half of last year and are currently at their lowest levels since the summer of 2020. The declines suggest that firms would rather keep capital spending steady than increase it, as fewer Fifth District firms want to start new capital investment projects.

Sierra Latham. "Rural Spotlight: Giving the Old High School a Second Life as Affordable Housing in Carroll County."
Following the 2013 closure of Woodlawn School in Woodlawn, Va., Carroll County's former county administrator connected with Virginia Housing, the state's housing finance agency, to determine whether the building was eligible for adaptive reuse — a process that repurposes existing buildings for new, productive uses. After a successful feasibility study, Carroll County and Virginia Housing chose developer Landmark Asset Services, Inc. in view of its specialization in rural areas and adaptive reuse. Landmark was not only instrumental in securing financing from various sources, but it also implemented accessibility measures and design features such as EarthCraft Gold energy certification. Financing was aided by both historic preservation tax credits and affordable housing tax credits. Construction finished at the end of 2021, and the repurposed school now features 51 units. **EF**

Enjoying *Econ Focus*?

Subscribe now to get every issue delivered right to your door.

Visit https://www.richmondfed.org/publications/print_subscription.

BY ERIN HENRY

Marriage Is Extra Work

Adam Blandin, John Bailey Jones, and Fang Yang. "Marriage and Work among Prime-Age Men." Federal Reserve Bank of Richmond Working Paper No. 23-02, January 2023.

An immense literature in economics is devoted to studying the labor supply of women and determining whether their supply differs by marital status or the presence of children. This literature has found, not surprisingly, that married women tend to have a lower supply of labor compared to women who have never been married. But there has been substantially less research on the relationship of marital status and labor supply for men. It turns out there is also a gap in annual hours worked between married men and men who have never been married, with married men working substantially more. Possible explanations and implications of this pattern are the subject of a recent working paper by Richmond Fed economist John Bailey Jones, alongside Adam Blandin from Vanderbilt University and Dallas Fed economist Fang Yang.

To deduce possible explanations for the gap, Blandin, Jones, and Yang first compared annual hours worked by the two groups to discover when it appears. They sought to answer whether men decide to spend more hours working after becoming married, or whether these men are already working more hours before they get married. Using data from the National Longitudinal Survey of Youth 1979 (NLSY79), the authors found that in the period starting 10 years before marriage and ending 10 years after, wages and hours worked increased 10 percent and 13 percent, respectively.

The authors studied whether these findings could be explained by the presence of children rather than the onset of marriage, which are highly correlated. To split out these effects, they separately evaluated men whose first child appeared before their first marriage against those whose first child appeared after their first marriage; they found that hours worked by both groups increased prior to their first marriage. Overall, the data revealed that the differences in labor market outcomes by marital status are primarily driven by a surprising source: an increase in hours worked in the five years prior to marriage.

Blandin, Jones, and Yang explored why married men work more. They first evaluated the role of selection into marriage, where men with higher wages and more working hours are more likely to marry. While they found that men with higher wages progressed in their relationships at a quicker pace, they determined that selection alone was not enough to explain the increase.

The authors considered two possible explanations for this increase in hours worked prior to marriage: events that increase both hours of work and likelihood of marriage, and a marriage-driven increase in work both after men marry and in anticipation of marriage. To investigate these hypotheses, the authors created a structural life-cycle model that seeks to reproduce men's marriage and labor supply decisions. The model features uncertainty over wages, family dynamics, income and taxes, and other factors affecting a man's labor supply. The authors adjusted their model in line with the NLSY79 data to accurately replicate the marriage and labor market dynamics found in the data.

Through this model, Blandin, Jones, and Yang explored why married men work more. They first evaluated the role of selection into marriage, where men with higher wages and more working hours are more likely to marry. While they found that men with higher wages progressed in their relationships at a quicker pace, they determined that selection alone was not enough to explain the increase in wages around the time of marriage.

The authors next considered the role of marriage and family structure and explored three possible effects on the labor supply of men. First, the presence of additional household members, such as spouses or children, limits the portion of total household consumption consumed by the husband/father. Second, altruism toward spouses and children implies that the husband receives utility from the consumption of other household members in addition to his own consumption. Finally, family members contribute positive or negative wealth effects, such as additional spousal earnings or child care costs. The authors referred to the sum of these three effects as the "mouths-to-feed" effect. They found this combined effect to be the primary driver in affecting the male labor supply, with the altruistic preferences of husbands being the most important factor.

The authors noted that their work provides insights into additional avenues of research on marriage rates, family structure, and male labor supply. Such research, they suggested, could shed light on the "potentially complex interactions between household formation and labor market outcomes" as well as policy reforms that affect these interactions, such as legislation surrounding divorce and child support or tax and transfer programs. **EF**

Remote work has left office buildings emptier. What does that mean for the banks that finance them?

BY TIM SABLIK

Out of the Office, Into a Financial Crisis?

For decades, the office has offered an alternative to the manual labor that defined work for most of human history. But it came with its own set of headaches for workers.

Those headaches have provided fuel for movies like *Office Space* and *The Devil Wears Prada* and TV shows like *Severance* and *The Office*. The COVID-19 pandemic gave many Americans the chance to live out their dreams of escaping their commutes and the annoyances of the modern workplace. In the initial months of the pandemic in 2020, most offices shut down. More than 60 percent of all paid full days were worked from home.

IMAGE: GETTY/ISTOCK

Now, three years later, workers are reluctant to go back. The share of remote work has come down from its high in 2020, but it remains around 28 percent — nearly six times the pre-pandemic level. In surveys, workers place a high value on many aspects of being able to work from home, including escaping the daily commute. A 2023 National Bureau of Economic Research (NBER) working paper found that workers saved an average of 72 minutes each day they worked from home by skipping their commutes. In the tight labor market that followed the initial lockdown period, many employers offered remote work opportunities to attract a larger pool of job applicants.

The persistence of hybrid work has left many wondering about the future of offices. With workers coming in less often, some companies have decided that they need less space than they did before the pandemic. What this downsizing means for the commercial real estate (CRE) sector as well as the broader financial system has become the focus of market watchers attempting to predict where the next crisis could emerge.

GAUGING OFFICE DEMAND

Getting a clear picture of how the pandemic has affected demand for office space is tricky. Most buildings are privately held, making data hard to come by. But what indicators are available all point to a slowdown in demand.

Kastle, an office security firm, began publishing weekly office occupancy rates during the pandemic using data from the 2,600 buildings it oversees. In its top 10 metro areas, office occupancy averages around 50 percent — higher in the middle of the week, and lower on Mondays and Fridays. According to Phil Mobley, national director of office analytics for CoStar Group, 12.9 percent of office space is vacant — a record high.

VTS, a CRE technology platform, produces a monthly index of office demand. The VTS Office Demand Index briefly surged in 2021 when the rollout of COVID-19 vaccines made a robust return to the office seem likely, but it fell again after the emergence of the delta variant quashed those hopes. Since mid-2022, it has remained stuck well below its pre-pandemic value.

Publicly traded office real estate investment trusts (REITs) provide another indicator of market demand for offices. The FTSE National Association of Real Estate Investment Trusts (NAREIT) U.S. Real Estate Index Series tracks the performance of U.S. REITs by property type. Its office index fell 37.6 percent in 2022 and was down another 15.9 percent at the end of March 2023. Offices owned by publicly traded REITs tend to be in higher demand, so they are often viewed as a leading indicator for the sector.

In a September 2022 working paper, Arpit Gupta of New York University and Vrinda Mittal and Stijn Van Nieuwerburgh of Columbia University used data from the NAREIT office index and CompStak, a data platform for CRE brokers, to estimate the effect of the pandemic on offices. They also looked at job postings on Ladders, a search platform that focuses on jobs paying more than $100,000 a year, to gauge supply and demand for remote work. They estimated that a 10-percentage point increase in a firm's share of remote job postings reduces its demand for office space by about 4 to 5 percentage points.

"In multiple large office buildings around the country, firms' leases are coming up, and many are renewing for half as much space or not renewing at all," says Van Nieuwerburgh. "So, in my mind, all the trends that we have been writing about since last September have been accelerating."

Not all office buildings are experiencing this sharp drop in demand, though. Digging deeper into the data, Gupta, Mittal, and Van Nieuwerburgh found that the highest-class buildings (A+ properties) performed better over the last three years. Similarly, a recent report from CRE firm Cushman & Wakefield paints a more complicated picture of office demand than aggregate numbers would suggest. According to the report "Obsolescence Equals Opportunity," office buildings that are more than half vacant account for just 7.5 percent of the market. Newly built, high-quality office buildings actually saw growing demand throughout the pandemic.

Still, the authors estimate that office supply will exceed demand over the next decade, resulting in 1.1 billion square feet of excess space. But they attribute only around 30 percent of that excess supply to the uptick in remote work. The rest is the result of natural shifts in supply and demand as some buildings age out of the market and as companies adjust their space needs according to changing business conditions.

"Remote work will continue to impact things, but it's not the key thing driving behavior right now," says Rebecca Rockey, global head of economic analysis and forecasting at Cushman & Wakefield. "We're now coming into what we think is more of a business-cycle driven downturn. Some of the recent weakening in the office market has been tied to the tech sector, which was very aggressive in leasing markets during the pandemic. Now they are scaling back. We are also seeing businesses attempting to cut costs in what is widely viewed as the most well-anticipated recession ever."

San Francisco-based software company Salesforce announced plans at the beginning of the year to lay off 10 percent of its workforce and reduce its office space in some markets. Meta, the parent company of Facebook, has also made job cuts and announced that it would reduce its office footprint in San Francisco by 435,000 square feet. And in March, Amazon said it would pause construction on its second headquarters in Arlington, Va.

Historically, there has been a tight correlation between employment growth for office jobs and demand for office space. During the recovery from the pandemic, that relationship broke down, as the labor market rebounded rapidly while the return to the office has been more gradual. The researchers at Cushman & Wakefield anticipate that this relationship will stabilize once employers settle on a mix of remote and in-person work, but the amount of space needed for each employee going forward is likely to be lower than it was before the pandemic.

THE NEXT SHOE TO DROP?

Whether firms are scaling back their office space needs due to remote work or weakening economic conditions, there are indications of an oversupply of office space in the near term.

The law of supply and demand predicts that this will lead to a drop in value for office buildings. Simulating various scenarios for the persistence of remote work, Gupta, Mittal, and Van Nieuwerburgh estimated that the office building sector will lose 39 percent of its value relative to 2019 by the end of the decade. But weak demand is not the only headwind facing offices. Rising interest rates reduce the value of all long duration assets, including real estate. Taking this into consideration, Van Nieuwerburgh says that some offices could be facing a loss of more than 60 percent.

"I think people underestimate the impact of higher interest rates on office values," he says.

Rising interest rates also raise the cost of refinancing debt. Like residential homes, office buildings are typically financed through some combination of equity and debt. The typical office mortgage has a duration of 10 years, meaning that many loans coming due were originated when interest rates were much lower. At the same time, lower demand from office tenants could also hurt landlords' ability to service their debt by squeezing their rental revenue. This has sparked concerns that a wave of defaults could be on the horizon, with serious repercussions for the financial system.

CRE mortgages — including loans for retail, multifamily apartments, and other commercial property types, in addition to offices — come from a variety of sources. Banks and thrifts hold the largest share, around 45 percent, according to a report by Rich Hill, head of real estate strategy and research for asset management firm Cohen & Steers. The number declines to less than 40 percent when excluding construction loans. The 25 largest banks hold about 13 percent of all CRE loans (both construction loans and loans on income-producing properties), and their exposure as a share of their total assets is small (less than 4 percent). Regional and community banks outside of the top 25 hold about 32 percent of all CRE mortgages, and in general those loans account for a much greater share of their assets.

The banking system has come under scrutiny after the failures of Silicon Valley Bank and Signature Bank in March. While neither failure seems to be the result of CRE lending, such loans did play a role in past banking crises, including the financial crisis of 2007-2008 and the savings and loan crisis of the 1980s and 1990s. According to Richmond Fed research, banks with high concentrations of CRE loans from 2008 to 2012 were about three times more likely to fail than all banks nationwide. And banks that made risky loans during the CRE construction boom of the 1980s were more likely to fail when property prices plummeted at the end of the decade.

The current risks to banks from office loans might not be as dire as in those past periods, however. The delinquency rate on CRE loans at banks is still less than 1 percent, far below the heights reached during the two previous crises. (See chart.) Many analysts expect that number to rise as more loans come due, but commercial lending standards are also more conservative than before the financial crisis of 2007-2008. The loan-to-value for office mortgages, which measures the ratio of debt financing to the value of the property, is typically between 50 percent and 60 percent — much lower than that of the average home mortgage. Additionally, offices are only one component of the CRE market. Cohen & Steers' Hill estimates that office loans make up less than 17 percent of the total CRE mortgage market and only 3 percent of regional and community banks' assets.

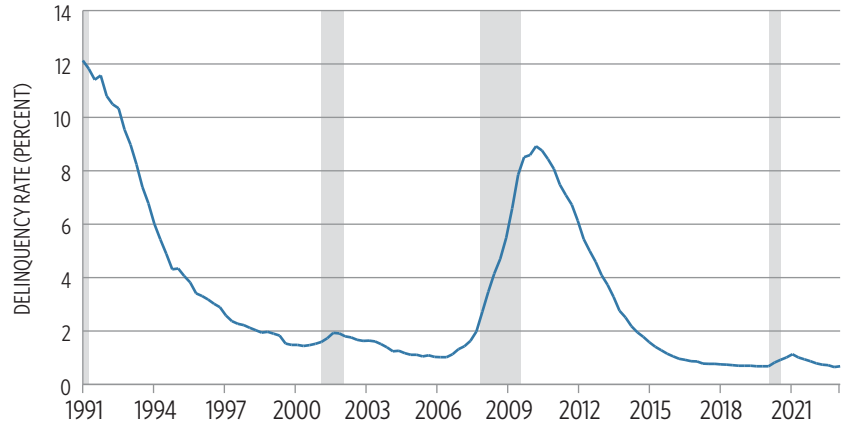
"Commercial real estate assets all have different fundamentals," says Hill. "While office is under pressure, other sectors are doing quite well right now."

Hill adds that it is also important to remember that although office property values are falling now, the value of all CRE rose by about 40 percent over the last decade. Since office mortgages have a typical duration of 10 years, office buildings that were last financed in 2013 may well have appreciated in value even after accounting for the recent decline. This suggests that current losses would need to be quite large before they wiped out a borrower's equity.

"There are real headwinds, particularly for any property that was financed over the past couple of years at peak valuations," says Hill. "But we dealt with this 30 years ago during the S&L crisis, and I don't expect this to be as bad as that."

CRE Loan Delinquencies Still Low

Delinquent CRE loans remain well below the peaks of prior banking crises



SOURCE: Board of Governors of the Federal Reserve System
NOTE: Shaded areas denote recessions.

SILVER LININGS

The worst-case scenario for offices hinges on remote work arrangements continuing at elevated levels. Gupta, Mittal, and Van Nieuwerburgh's model includes scenarios where the economy shifts back to a state of more limited remote work, in which case office valuations recover. While even the most optimistic office champions don't necessarily expect in-person work to go all the way back to pre-pandemic levels, employers' tolerance of remote work is starting to show cracks.

As the labor market softens in some sectors, particularly tech, some employers are realizing that jobs that can be done fully remote by Americans could also be filled by remote workers in other countries for less. Others have started to increase the number of days that employees are expected to appear in person at the office. The Walt Disney Co. is asking its workers to come in four days a week, and JPMorgan Chase & Co. recently told its senior managers that they would need to be in the office all five days. And some employers, such as New York-based law firm Davis Polk & Wardwell LLP, have warned employees who fail to follow in-person requirements that they will see their bonuses cut.

In addition to having greater bargaining power, employers may be starting to reckon with the costs of allowing most of their employees to work from home. In the wake of Silicon Valley Bank's collapse, Tabby Kinder and Antoine Gara of the *Financial Times* reported that most of the bank's 8,500 employees were working from home. The lack of serendipitous "water cooler" conversations may have contributed to the bank's failure to spot its problems; Stanford University economist Nicholas Bloom, who has been researching remote work since prior to the pandemic, told Kinder and Gara, "Ideas like hedging interest rate risk often come up over lunch or in small meetings."

"I think we're definitely going to see more of a return to the office, but the way companies and employees want to use the office has changed," says Hill.

For office owners facing weaker demand, turning in the keys isn't the only option. Depending on the building's underlying characteristics, renovating the space with modern amenities and flexible workspaces designed for a hybrid workforce may be enough to woo tenants back.

"Commercial property owners in Rosslyn have been incredibly innovative in terms of reimagining their buildings, adding desired amenities and technology, and creating collaborative areas within the common spaces of the buildings," says Mary-Claire Burick, president of the Rosslyn Business Improvement District, a 17-block mixed-use area in downtown Rosslyn, Va., just outside of Washington, D.C. "They are also taking advantage of several zoning amendments Arlington County recently approved to accommodate new or expanded uses."

In the early stages of the pandemic, some also raised the possibility that abandoned offices could be converted to residential use, helping to solve the long-standing shortage of affordable housing in many cities. (See "Has the Pandemic Changed Cities Forever?" *Econ Focus*, First Quarter 2021.) This turns out to be far from straightforward. The layout of the typical office building is very different from the typical apartment when it comes to things like plumbing and window placement. In many cases, zoning would also need to be changed to allow for residential construction in offices. And lastly, most commercial properties are significantly more valuable than multifamily apartments, so the price of an office building would need to fall precipitously before such a conversion looked financially attractive.

Still, such repurposing is possible, particularly with support from local policymakers. During the office market collapse of the early 1990s, New York City officials introduced a tax incentive program to encourage the conversion of obsolete Manhattan offices into residential properties. The program led to the conversion of almost 13 million square feet of office space, or about 13 percent of the market in lower Manhattan, between 1995 and 2006. This resulted in the creation of nearly 13,000 new housing units, accounting for more than 40 percent of the growth in lower Manhattan housing between 1990 and 2020. The program was particularly effective at encouraging the conversion of older office stock built before 1945.

While offices face plenty of challenges over the coming year, the risks to the sector and to bank lenders in general don't appear widespread at this stage. Nevertheless, bank regulators seem to be keeping a close eye on these developments, mindful of past crises where real estate was at the center. In a March 6 speech to the Institute of International Bankers, FDIC Chairman Martin Gruenberg noted that the effect of office headwinds on bank balance sheets was "an area of ongoing supervisory attention."

"When it comes to managing the fallout, we want to make sure that banks are as well-capitalized as possible," says Van Nieuwerburgh. "One thing we learned from the subprime crisis is that you don't want to force all your banks to foreclose on nonperforming loans too quickly. But you also don't want to make the opposite mistake of extending loans that will never be performing. You want to thread a middle ground." **EF**

READINGS

Binder, Kyle, Alejandro Drexler, Emily Greenwald, and Sam Schulhofer-Wohl. "Bank Exposure to Commercial Real Estate and the Covid-19 Pandemic." Federal Reserve Bank of Chicago Essays on Issues No. 463, November 2021.

Corbett, Abby, Kevin Thorpe, and David Smith. "Obsolescence Equals Opportunity." Cushman & Wakefield, February 2023.

Gupta, Arpit, Vrinda Mittal, and Stijn Van Nieuwerburgh. "Work From Home and the Office Real Estate Apocalypse." National Bureau of Economic Research Working Paper No. 30526, September 2022.

Hill, Rich. "The Commercial Real Estate Debt Market: Separating Fact From Fiction." Cohen & Steers, March 2023.

BY JOHN MULLIN

Artificial Intelligence and Bank Supervision

Regulators are gathering information about how banks use AI

Artificial intelligence has come a long way since English mathematician, logician, and cryptographer Alan Turing's seminal 1950 essay, "Computing Machinery and Intelligence," which explored the idea of building computers capable of imitating human thought. In 1997, almost 50 years after Turing's essay, AI posted a historic breakthrough when the IBM supercomputer Deep Blue won a chess match against reigning world champion Garry Kasparov. Since then, AI's capabilities have improved rapidly, largely through advances in machine learning (ML), especially in ML models that use digital neural networks to classify text, images, or other data. (See "Machine Learning," *Econ Focus*, Third Quarter 2018.) ML is now commonly used in industrial applications, and it underpins a vast number of consumer services, from Google searches to Netflix movie recommendations. Of more recent note, ML technology is the basis of the new generative AI programs, such as ChatGPT, designed to, among other things, conduct useful conversations with human beings.

Financial institutions in the U.S. have hardly sat idle amid these developments. On the contrary, they have developed and implemented AI-based applications for a wide variety of purposes. Yet, overall, the financial industry appears to have taken a gradual approach to AI implementation. McKinsey and Co., in a 2019 survey of the financial services sector, found that only 36 percent of industry respondents reported that their companies had adopted AI for the automation of back-office processes, only 32 percent had deployed AI-based chatbots for customer service, and only 25 percent had deployed AI for detecting fraud or evaluating creditworthiness. The consulting firm Cornerstone Advisors reported even lower numbers based on its 2022 survey of bank and credit union executives. The firm found that only 25 percent of survey respondents had deployed AI for process automation and only 18 percent had deployed AI-based chatbots.

Whatever the current state of AI deployment in the banking industry, there seems to be little doubt that AI's role in banking has been growing and will continue to grow in importance. Anticipating this growth, U.S. bank regulators continue to monitor and assess banks' use of AI-based applications. In March 2021, the Office of the Comptroller of the Currency (OCC), the Fed Board of Governors, the Federal Deposit Insurance Corporation, the Consumer Financial Protection Bureau, and the National Credit Union Administration issued a request for information (RFI) to improve their understanding of current and prospective bank practices surrounding the new technology. Their efforts are continuing as the technology grows and evolves.

CUTTING COSTS, COUNTERING FRAUD

The most recent generation of chatbots can simulate human conversations and provide bank customers with information on account balances, credit card usage, and interest rates. Capital One, for instance, offers a virtual assistant called "Eno" that can answer client questions, pay routine bills, and deliver fraud alerts.

Such chatbots may offer benefits to both banks and their clients. For banks, the primary allure may be cost savings. According to a report by consulting firm Deloitte, the top 2,000 U.S. corporations spend roughly $250 billion annually on customer support (50 billion incidents at an average of $5 apiece). For bank customers, much of the upside may come from more rapid and convenient access to information, particularly when that information concerns potentially fraudulent charges against customer accounts.

Nevertheless, many banks appear to be wary of moving too quickly into the realm of automated customer service. Indeed, it appears that the deployment of chatbots has been less common in the banking industry than in other industries. This reluctance may reflect a disconnect between the technology's promise and its present reality. Despite improvements in recent years, surveys show that most consumers still view automated chatbots as sources of great frustration. Banks want to cut costs but are naturally hesitant to risk losing long-term customers.

While there are people who may not be looking forward to having more frequent encounters with chatbots instead of live people, some AI applications have been more unambiguously positive for banks and their customers. AI applications using pattern recognition, for instance, have allowed customers to deposit checks online and avoid extra trips to brick-and-mortar bank locations.

AI earns additional high marks for its contribution to fraud prevention.

"Fraud detection is one of the most common uses of AI models in banks, where they have been used for quite a while," says Tom Bilston, an assistant vice president of the Richmond Fed's bank supervisory team and former co-lead of the Fed's Working Group on Artificial Intelligence & Machine Learning. "Credit card fraud is the most common thing that comes up. It can happen when someone acquires a card number and uses it without authorization. But it also happens when people apply for cards using fake identities — this is one place where banks can use AI."

Bank anti-fraud efforts are an escalating game of cat and mouse. "Banks have an interesting reliance on some popular vendor AI solutions and consortium data, given that fraudsters tend to constantly innovate their attack paths," says Susanna Wang, a senior examiner of large financial institutions at the Richmond Fed.

AI technology has also been used by banks to help them comply with their obligations under the 2001 Patriot Act to deter money laundering and the funding of terrorist organizations. "The banking industry's use of AI to uncover unusual payment patterns goes well beyond fraud prevention," says Bilston. "Firms think that AI can help them with their anti-money laundering [AML] and know-your-client [KYC] programs."

Companies such as New York-based Socure have designed identity verification systems that use machine learning to analyze applicants' online, offline, and social data to determine whether they meet KYC standards. Symphony AyasdiAI of Palo Alto, Calif., has developed an AML alert system that uses machine learning to spot suspicious transactions while minimizing the number of false warnings. Data science company Feedzai uses machine learning to help banks monitor transactions; its tool raises red flags when it spots suspicious payment patterns.

AI AND CREDIT EVALUATION

In a matter of more immediate concern for bank supervisors, financial firms have been developing and implementing AI models to support their credit evaluation and loan underwriting processes. "Most of these applications are being developed in the retail space — in credit card and automobile underwriting," says Wang. "For such retail applications, the banks must justify their reasoning about credit decisions based on the Equal Credit Opportunity Act, so this is a hotly debated topic of how firms are able to explain their credit underwriting model results when they use AI applications, which are often opaque 'black box' models."

"As a general matter, U.S. bank supervisors have found it helpful to think about AI and traditional modeling approaches as being different points on a spectrum rather than as binary possibilities."

Most, if not all, banks still use traditional credit evaluation models — akin to the models used by the national credit bureaus to calculate consumers' credit scores. (See "Credit Scoring and the Revolution in Debt," *Econ Focus*, Fourth Quarter 2013.) With these traditional models, there is often a single formula used to calculate a credit score based on a relatively small group of indicators, such as an applicant's existing debt service burden and credit history. By contrast, AI models often have multiple layers of complicated analysis involving numerous quantitative and qualitative inputs. As a result, AI models can be much more difficult to understand and interpret than their traditional counterparts.

Bank regulators can leverage existing supervisory guidelines and principles when reviewing banks' use of AI models. In 2011, the Federal Reserve Board and the OCC jointly issued a document, "Supervisory Guidance on Model Risk Management," to provide banks with comprehensive guidance on how to manage the risks associated with their models, including the potential for adverse consequences due to poor model design or incorrect input data.

"That is generally the framework that banks and regulators point to when thinking about AI," says Wang. "As a general matter, U.S. bank supervisors have found it helpful to think about AI and traditional modeling approaches as being different points on a spectrum rather than as binary possibilities." This approach allows supervisors to bypass the semantic problem associated with defining what is or is not an AI model and to shift the focus toward banks' processes for managing the risks presented by credit evaluation models, whether they are AI or traditional.

The interagency guidance spelled out principles for model design, the monitoring of model usage, and the evaluation of model outcomes. Nevertheless, the guidance recognized that "details of model risk management practices may vary from bank to bank" and placed the ultimate burden on banks to maintain "strong governance and controls to help manage model risks."

As a practical matter, bank supervisors do not set out to dictate the particular risk model that a bank should be using. "When we go into a bank with our supervisory lenses, we don't necessarily say something like 'Oh, that algorithm is wrong. You can't use that,'" says Ray Brastow, an economist in the Richmond Fed's Supervision, Regulation, and Credit department. "Our processes are more focused on making sure that the risks associated with a bank's model are being appropriately monitored and controlled."

EXPLAINABILITY

Large AI models based on ML algorithms and trained on large datasets can be largely opaque to humans. While conventional statistical models have well-defined variables and coefficients that experts can interpret, many AI models do not: Under the hood, they're often just a sea of numbers that make up the neural network. Thus, it can be challenging to determine how an AI system arrived at its results. This problem is pervasive across applications that use digital neural networks, including image recognition programs, chatbots, and programs used by scientists to find predictive patterns in fields such as medical research.

Bank supervisors and market commentators are particularly concerned about the potential for AI-based credit models to unintentionally perpetuate human biases such as racism, running afoul of federal antidiscrimination law. In recent years, the Federal Trade Commission and the Consumer Financial Protection Bureau have issued warnings about the potential adverse effects of such "algorithmic biases."

To bank examiners at the Fed and the OCC, the potential for such hidden biases highlights the need for banks to expend the effort and resources necessary to understand the inner workings of their models and to be able to adequately explain model results. "As supervisors, we will evaluate the risks associated with AI models, such as explanatory power, and determine whether the controls are in place to support compliance with applicable laws, rules, and regulations," says the Richmond Fed's Wang.

The OCC's Kevin Greenfield expressed a similar view during his May 2022 testimony before the House Committee on Financial Services, arguing that a lack of model explainability can make it difficult for banks to comply with various regulations, including consumer protection requirements.

The question of explainability was at the top of the list of topics that bank examiners raised in their 2021 RFI, which cautioned that AI systems generally reflect the limitations of their datasets and may "perpetuate or even amplify bias or inaccuracies inherent in the training data."

The consumer advocacy nonprofit Consumer Reports, in its response to the RFI, emphasized the need to safeguard against algorithmic discrimination, arguing, "Claims of objectivity and proof notwithstanding, algorithms can and sometimes do exacerbate bias or have unexpected discriminatory effects, as numerous examples have demonstrated." The organization recommended that credit applicants should be made aware when credit decisions are based on AI algorithms and that such algorithms should be designed with fairness in mind.

In its response to the interagency request for information, the Bank Policy Institute (BPI), which conducts research and advocates for the banking industry, cautioned against excessive requirements for explainability that could stifle innovation. They argued against a one-size-fits-all approach, stressing that explainability should mean different things in different contexts. In their view, it is important to distinguish between explainability in the context of a bank's ability to understand its own models (and describe their workings to supervisors) versus explainability in the context of explaining credit decisions to individual credit applicants. "Consumers want easy-to-understand information on credit decisions," says Chris Feeney, president of BITS, the BPI's technology policy division. "Regulators want explanations and evidence concerning the model architecture and rationale, the sources of data used, the human role in the decision, and the resilience of those models."

Fed Board of Governors then-member Lael Brainard expressed a similar view in a 2021 address, noting, "An explanation that requires the knowledge of a Ph.D. in math or computer science may be suitable for model developers" but a less technical standard may be appropriate in the context of explaining credit decisions to consumers under U.S. consumer protection laws.

The BPI is also concerned that bank regulators may be holding AI-based models to an artificially high standard. "I think one of the concerns is that bank regulators apply stricter standards of explainability to AI models than to standard models," says Paige Paridon, senior vice president and senior associate general counsel of BPI. "There's a concern that banks maybe won't be given the flexibility to experiment with and implement some of these tools and that there's a heightened skepticism coming from bank regulators."

ALTERNATIVE DATA AND MODEL MAINTENANCE

Since AI methods such as machine learning are designed to find patterns by digesting enormous quantities of data, it is hardly surprising that banks would seek out new sources of data to feed into the new models. This possibility, however, has raised concerns in some quarters about the implications of banks' use of "nontraditional" data, which bank supervisors define as information not typically found in consumers' credit files at banks or nationwide consumer reporting agencies. Examples of nontraditional data include information about credit applicants' rent and utility payments as well as the cash flow patterns in their bank accounts.

Bank supervisors issued an "Interagency Statement on the Use of Alternative Data in Credit Underwriting" in 2019 in an attempt to better understand the relevant issues. While recognizing that the use of alternative data has the potential to lower costs and increase credit access, the agencies also pointed out that the use of such data raises questions about how it will affect banks' compliance with consumer protection laws. The 2021

RFI followed up by asking interested parties to provide additional information about their use of alternative data.

Consumer Reports expressed concern with financial firms' control policies with respect to alternative data, particularly in cases where banks may be able to glean sensitive information based on applicants' social media and internet browsing activity: "Not only does this raise privacy concerns that could lead to a chilling effect on free expression, but there is little evidence that these types of data are actually effective in calculating credit risk."

The BPI, in its response to the interagency request, emphasized that the risks of poor data are not unique to AI-based models. Moreover, it pointed out that the data monitoring processes banks use for AI models are consistent with those that they use for their traditional models.

Mortgage lender Quicken Loans, in its response to the RFI, noted that the questions about alternative data are something of a moot point for them, positing that there is little incentive for the mortgage industry to use alternative data sources since they are disallowed by the Federal Housing Agency, the Department of Housing and Urban Development, and the government-sponsored enterprises Fannie Mae and Freddie Mac.

In the interagency RFI, bank supervisors noted their concerns about banks' ongoing maintenance of AI-based credit models, arguing that, since the models evolve over time by "learning" from new data, they may present challenges for model validation, monitoring, and documentation.

Consumer Reports, in its response to the RFI, echoed the concerns of bank supervisors regarding model maintenance, arguing that banks' AI models should be monitored with vigilance to ensure that they do not evolve to incorporate indicators that serve as proxies for prohibited factors such as race.

Supervisors at the Richmond Fed are cautiously optimistic about banks' ability to leverage AI-based models for certain aspects of credit evaluation. "In the banks that we look at, model risk is something they take very seriously," says the Richmond Fed's Brastow. "So even 10 years ago, banks would update their traditional models when they got a bunch of new data. But they didn't just say willy-nilly, 'OK, we're scrapping the old approach.' Instead, banks would evaluate a new model by running it in parallel with its predecessor. And only then, after a lot of time and consideration, would they start making decisions based on the new model, while continuing to run the old model to see how differently the two models perform."

GUARDED OPTIMISM

The U.S. financial sector is still in the early stages of integrating AI into its operations, so there is much anticipation and conjecture as to what will come next. Bank supervisors, while noting many of the potential pitfalls of banks' use of AI-based applications, have conveyed optimism about the technology's potential benefits.

In his 2022 statement before Congress, the OCC's Greenfield emphasized AI's potential to help banks with their regulatory compliance programs, arguing that "AI has the potential to strengthen safety and soundness, enhance consumer protections, improve the effectiveness of compliance functions, and increase fairness in access to the financial services when implemented in an effective manner." He also expressed guarded optimism about banks' use of alternative data, advancing the idea that "alternative data in AI applications may improve the speed and accuracy of credit decisions and may help firms evaluate the creditworthiness of consumers who may not otherwise obtain credit in the mainstream credit system."

Brainard, while concerned about the potential for AI-based credit models to perpetuate biases, pointed to encouraging signs that AI researchers are making some progress toward increasing the transparency of their models, making their results more amenable to explanation. Nevertheless, Brainard argued for caution, stating that "Having an accurate explanation for how a machine learning model works does not by itself guarantee that the model is reliable or fosters financial inclusion. ... The boom-bust cycle that has defined finance for centuries should make us cautious in relying fully for highly consequential decisions on any models that have not been tested over time." **EF**

READINGS

Barefoot, Jo Ann. "The Case for Placing AI at the Heart of Digitally Robust Financial Regulation." Brookings Institution Center on Regulation and Markets, May 24, 2022.

"Global AI Survey: AI Proves its Worth, but Few Scale Impact." McKinsey and Co., Nov. 22, 2019.

"Request for Information and Comment on Financial Institutions' Use of Artificial Intelligence, Including Machine Learning." Office of the Comptroller of the Currency, Board of Governors of the Federal Reserve System, Federal Deposit Insurance Corporation, Bureau of Consumer Financial Protection, National Credit Union Administration, Federal Register Doc. 2021–06577, March 31, 2021.

Shevlin, Ron. "What's Going On in Banking, 2023." Cornerstone Advisors, 2023.

BY SAM LOUIS TAYLOR

Debating the 2018 Banking Regulatory Bill

The recent bank failures at Silicon Valley Bank, Signature Bank, and First Republic Bank have brought banking policy back into the forefront of the national policy debate. The law that is at the center of this current debate is the Economic Growth, Regulatory Relief and Consumer Protection Act, which was signed into law by then-President Trump in 2018. This law was the first major attempt to alter financial regulations since the passage of the Dodd-Frank Act in the wake of the 2008 financial crisis. While this law did address other issues related to mortgage lending, consumer protections, and student loans, the most controversial parts of the bill dealt with banking regulations.

The 2018 law was originally sponsored by then Senate Banking Committee Chairman Mike Crapo, R-Idaho, and a bipartisan group of 19 other senators to fix what they saw as flaws in the Dodd-Frank Act. Those sponsors saw the Dodd-Frank Act as creating a one-size-fits-all mentality for banking regulations, applying overly strict rules on smaller banks and credit unions that posed a much lower risk to the economy. They argued these regulations had led to the decimation of small and community banks across the country, citing research from the Federal Deposit Insurance Corporation that showed that the number of small banks had dropped by 14 percent since the passage of Dodd-Frank. Those supporters, such as Sen. John Tester, D-Mont., argued that this led, in turn, to an overall decline in lending and credit for small businesses and rural communities.

"Literally, from the night of the conference on Dodd-Frank, there have been discussions about the need to go in and make some fixes," Crapo stated in 2018. "We've been working toward those areas where we have been able to find consensus. This year it came together."

The legislation created new rules that supporters argued would right-size the regulatory burden on small and mid-sized banks. Those changes include exempting banks under $100 billion in assets from the strictest of stress testing and allowing regulators to tailor regulations for banks between $100 billion and $250 billion. This means that, in principle, regulators could create appropriate tests and rules for banks based on their size, management practices, and risk to the economy. The law also cut reporting requirements for the smallest community banks, allowed for less frequent regulatory examinations if those banks demonstrated responsible behavior, and exempted them from other regulations intended for large Wall Street banks.

While there are other factors that shape how legislation like the 2018 law affects the financial system — for example, the approaches taken by regulators in carrying the laws out — these laws do set the framework for how banks and other institutions can do business.

Despite its bipartisan support, the 2018 law was not without significant opposition, particularly from within the Democratic caucus. Those opposed to the bill, such as Sen. Elizabeth Warren, D-Mass., argued that the bill's focus on small bank relief was a smoke screen to hide deregulation for some of the largest institutions in the country. Better Markets, an advocacy group that supports stricter oversight of the financial sector, stated that the bill would deregulate all but 13 of the largest banks in the United States. Better Markets also argued that those institutions between $100 billion and $250 billion in assets are not, in fact, community banks and do pose a risk to the overall financial sector and should be regulated accordingly. Industry critics also argued that the bill would accelerate consolidation in the banking industry since it removed regulatory disincentives against the growth of mid-sized institutions.

"Telling a bank that's a quarter of a trillion dollars [in assets] that it can be regulated like some tiny, little community bank makes no sense at all," Warren said in 2018. "This bill will increase the likelihood that American taxpayers will be on the hook for another bailout."

While there are other factors that shape how legislation like the 2018 law affects the financial system — for example, the approaches taken by regulators in carrying the laws out — these laws do set the framework for how banks and other institutions can do business. Congress is now debating how this framework should be set up to prevent future bank failures. Regulators have released initial reviews, such as the report by Michael Barr, the Fed's vice chair for supervision, to assess the causes of the collapses and recommend how regulating agencies can better address those issues.

Supporters of the 2018 law see the responsibility for the current problems as lying with bank management as well as with the regulating agencies such as the Fed, not with the underlying law. Critics of the 2018 law see their original concerns as prescient, stating that the law set the stage that allowed bank management to push the bounds of safe operations and led to regulators failing to act at the appropriate time to prevent the crisis. Though the current partisan divide in Congress may make passing new regulatory legislation difficult at this time, the legislative response to the current bank failures is still in its infancy. **EF**

BY TIM SABLIK

Community Conversations

When Tom Barkin became president of the Richmond Fed in 2018, he made it his goal to spend time in every part of the Fifth District to stay well-informed about its communities. (See "Learning From Our District," p. 1.) One of the ways the Richmond Fed's research department supports this goal is through an event series known as Community Conversations. These are one- or two-day road trips to visit with business and community leaders and learn about an area's challenges and successes.

For example, at the end of last year, Barkin, Regional Executive Matthew Martin, Community Development Manager Erika Bell, and Senior Regional Economist Laura Ullrich visited York and Chester counties in South Carolina. Both counties were once home to major textile manufacturers but have had to reinvent themselves following that industry's decline. They learned more about Rock Hill, a city in York County, which purchased vacant textile mills and resold them to new businesses to reinvigorate its downtown. During another visit in March, Barkin, together with Regional Executive Renee Haltom and Community Development Regional Manager Jarrod Elwell, met with business, housing, and community representatives in Northern Virginia to learn how downtowns are coping with the continued prevalence of remote and hybrid work. They learned that some employers are collaborating with local government leaders to create amenities that will attract more workers back to the office. Some business districts are also exploring different ways to use empty office space. (See "Out of the Office, Into a Financial Crisis?" p. 4.)

"Developing relationships with leaders in these communities is extremely important. Through these relationships, we can help promote investment in issues critical to economic and community development, such as broadband, community colleges, housing, and community development finance."

The regional executives aim to hold at least one Community Conversation a month. When deciding where to visit next, they take into account where they haven't been yet and the Richmond Fed's research focus on understanding small towns and rural places. Martin, the regional executive for North and South Carolina, says his team looks for places that have an interesting story to tell. Once his team identifies such a location, he usually travels there to meet with potential partners and draft plans for a Community Conversation.

"Maybe they are doing something different, and we can see if it would be applicable to other places," says Martin.

For Andy Bauer, the regional executive for Maryland, the Greater Washington metropolitan area, and West Virginia, population trends can offer a clue that a community has found success worth learning more about.

"A lot of the places we visit have experienced decades of population decline," says Bauer. "If I find somewhere that has stabilized population or is even experiencing growth, I definitely want to go there and talk to them."

The regional executives are assisted by regional economists and analysts to pull together data about the places they visit. Anne Burnett and Sean O'Hara, regional economic outreach analysts, help craft the schedule for the visit, a process that begins several months in advance. The Richmond Fed's community development team also plays a role in developing the agenda for Community Conversations. Visits involve more than just learning about driving economic forces. The team is keen to learn about all of the challenges confronting a community.

These conversations give Barkin and the regional executives insights that can be hard to see in aggregate data. By visiting multiple communities and building up a network of contacts, patterns start to emerge, making it easier to identify common challenges across the district. The conversations also raise the visibility of the Richmond Fed's work and priorities.

"For us to accomplish the work we want to do in small towns and rural, we have to show up," says Bauer. "Developing relationships with leaders in these communities is extremely important. Through these relationships, we can help promote investment in issues critical to economic and community development, such as broadband, community colleges, housing, and community development finance."

The program quickly proved so valuable that the team found ways to keep it going throughout the COVID-19 pandemic. Scouting locations for potential conversations became highly difficult, made more complicated by the fact that each state had its own set of responses to the virus. Often, organizing an event necessitated some creative workarounds, such as visiting communities but holding remote meetings to maintain social distancing.

As life has returned to normal, the team has increased the frequency of Community Conversations. They now organize some shorter, one-day visits to coincide with Barkin's travels for speeches and other events. The regional executives plan to visit more places they haven't been yet, and the pace of conversations shows no signs of slowing down. **EF**

Virginia's Data Centers and Economic Development

The state's fast-growing data center industry continues to build on its early advantages

BY JOHN MULLIN

Data centers are essential to cloud computing and its ability to give users remote access to data, applications, and computing power over the internet. Yet they typically possess few of the ethereal qualities evoked by the term "cloud." With high concentrations in Northern Virginia's Fairfax and Loudoun counties, data centers are often housed in nondescript buildings whose stark forms resemble massive rectangular cubes. The buildings' interiors are packed with rows and rows of computer servers, vast quantities of cables and switches, and the considerable electrical power and HVAC hardware necessary to keep it all working.

In many ways, data centers are like utilities, where the main interest for outsiders often lies in what the utility makes possible for its customers rather than in the functioning of the utility itself. But, as with water and electrical power utilities, a lot of things in the economy simply cannot happen without data centers. As the authors of a 2020 article in the journal *Science* pointed out, "Data centers represent the information backbone of an increasingly digitalized world."

For Virginia, data centers have been a consistent contributor to economic growth. Leveraging some of its natural advantages, the state has encouraged the industry's development over the years through tax incentives and other initiatives. These efforts put Virginia in a position to become a major player in the data center industry and to take advantage of a global boom in the demand for cloud computing services.

Virginia now is home to hundreds of data centers. Much of the growth has occurred in Northern Virginia's "Data Center Alley." It is home to the data centers operated by public cloud providers such as Amazon Web Services (AWS), social media companies such as Meta, and financial firms such as Capital One.

The industry's outlook appears bright, but it is not without challenges. Its further expansion in Northern Virginia has become more difficult due to a diminishing supply of suitable new locations, and it continues to face pressure to mitigate its heavy use of electrical power and water resources.

REMOTE COMPUTING AND DATA STORAGE

Offsite data storage and computing services have been around since at least the late 1950s. At the time, corporations and public institutions were becoming increasingly reliant on mainframe computers. Big companies would often purchase their own mainframes and house them onsite in dedicated rooms. Soon, however, computer "bureaus" began to sell computing services on their mainframes to companies that could not afford to buy and maintain the massive machines.

The trend toward offsite computing received further impetus from the rise of the personal computer. When PCs became increasingly available during the 1980s, users began to link them to remote servers to access offsite data. The trend accelerated during the dot-com boom of the late 1990s, which saw a proliferation of new e-commerce sites and a huge increase in internet traffic. This period saw the emergence of a new type of data facility called internet exchange points (IXPs), which are important locations for the routing of internet traffic among major internet service providers.

More recently, data center growth has been spurred by an explosion in the demand for cloud computing services to support activities ranging from online gaming to the storage of social media profiles. Cloud computing arose from

technological developments that allowed users to remotely access multiple physical locations at once. According to a 2017 account from IBM, the term "cloud computing" became favored because it served to help visualize an environment in which a user could access resources across a "nebulous blob of computing resources." Amazon, through its AWS subsidiary, was the first company to market cloud computing services in their present form.

"As things now stand, there are now two types of data centers," says Josh Levi, president of the Data Center Coalition, which advocates on behalf of the industry. "Owner-occupied data centers, which are run by companies for their own purposes, and multi-tenant facilities."

Multi-tenant data centers — often referred to as "co-location" facilities — have faced increased competitive pressure in recent years. Cloud service providers, which have historically been major tenants at co-location centers, have increasingly been building their own data centers and using their market power to obtain more favorable terms for the space that they continue to lease at co-location centers.

VIRGINIA SEIZES ITS ADVANTAGES

To borrow an old phrase from real estate, Virginia's initial allure as a site for data centers was all about "location, location, location." The state's proximity to Washington, D.C., and the seat of the U.S. federal government gave it a decided advantage.

A major door was opened in the early 1990s when Metropolitan Area Exchange, East (MAE-East), one of the first IXPs, began operating in Washington, D.C., and soon extended into Northern Virginia. As one of the National Science Foundation's four network access points, MAE-East's presence generated a lot of activity and attracted other firms. In 1998, Equinix built its first large data center in Ashburn, Va. — in the heart of what would later be called Data Center Alley. Firms ranging from dot-com startups to established telecommunications companies were increasingly locating their facilities in Northern Virginia. The region's network of fiber optic cables grew rapidly as a result.

"In the beginning, there was the internet," observes the Data Center Coalition's Levi. "Those fiber conduits gave Virginia some very early running room in terms of bringing in data centers, investment, and connectivity."

The early investments in fiber optics created a virtuous circle. Increased bandwidth caused a decline in what is known as "latency" — the amount of time it takes for data to travel between its origin and destination. The decrease in waiting time, in turn, attracted additional firms and additional investments in fiber capacity.

"It's something of a snowball effect," says Levi. "There are some applications where latency does not matter much. But there are some applications where it is essential. For example, Visa, the credit card company, has a data center in Loudoun County that processes many thousands of transactions per second."

In 2008, Virginia provided further inducements for the industry by establishing a sales tax exemption on computer equipment. The state expanded the exemption in 2010, after losing a bid to attract Apple, which instead built a $1 billion data center in Maiden, N.C. "Virginia became the sixth state to enact a sales tax incentive for data centers, where you qualify for a sales tax exemption if you invest at least $150 million and create 50 jobs with wages that are at least 150 percent of a county's average," says Levi. "The reason that is so critically important is that the equipment inside a data center must be regularly refreshed and replaced at substantial cost."

"In the beginning, there was the internet. Those fiber conduits gave Virginia some very early running room in terms of bringing in data centers, investment, and connectivity."

But the industry's growth in Virginia was supported by factors above and beyond its first-mover advantage and tax incentives. According to economics consultant Fletcher Mangum, "Virginia also offered a large high-tech workforce, proximity to end users and corporate headquarters, relatively low electricity prices, power companies that could deliver new service on aggressive timelines, and local governments that aggressively courted data center companies by streamlining the development approval process."

Virginia has continued to make major infrastructure investments to help maintain its advantage. Some of the largest investments were made to build landing facilities in Virginia Beach for two subsea trans-Atlantic cables: MAREA and BRUSA, which connect Virginia with Europe and South America, respectively. This created opportunities for Henrico County, which adjoins Richmond and is located roughly halfway between the cable landings in Virginia Beach and Data Center Alley. Numerous firms have been attracted to the area to take advantage of its access to the high-capacity, low-latency international cables.

"The cable landings are definitely correlated with the stunning growth of the data center industry in Virginia," says Mangum. "The rapidly expanding Facebook and QTS data centers are in Henrico County to take advantage of MAREA and BRUSA."

All of this has added up to rapid growth. Today, the data center market in Northern Virginia is bigger than the next five largest markets in the United States combined. Its perceived importance to the global economy is highlighted by the oft-cited, but difficult to verify, claim that some 70 percent of the world's internet traffic travels through Data Center Alley each day.

DATA CENTERS AND LOCAL ECONOMIES

When people think about an industry's local economic effects, their initial focus is often on job creation. As highly capital-intensive businesses, however, data centers require relatively few workers. In 2021, for example, Virginia's data centers directly employed only 5,500 workers in their

"I think local awareness is extremely important. Communities need to make sure that they properly account for a data centers' short- and long-run water footprints before they issue construction permits."

operations — a figure scarcely greater than 0.1 percent of the state's workforce of more than 4 million people.

The flip side of the story is that the jobs that data centers do create tend to be highly productive jobs that require elevated skills and pay high wages. In 2020, the average private sector employee in a Virginia data center earned an estimated $134,308, which was more than double the estimated $62,250 earned by Virginia's average private sector employee. This wage gap has been growing for roughly the past two decades, as wage hikes in Virginia's data industry have outpaced those of other industries in the state on average.

In addition to creating high-paying jobs, data centers also support local economies through their demand for services. "Data centers purchase unusual amounts of services such as security and HVAC maintenance, so their impact through business-to-business purchases tends to be disproportionately large," says Mangum. The industry has also employed a lot of construction workers. In 2021, there were almost twice as many people employed in the construction of new data centers as in operations of preexisting centers.

Mangum's firm, Mangum Economics, recently conducted an economic impact study of Virginia data centers on behalf of the Northern Virginia Technology Council. The study estimated the ripple effects that data centers create as their expenditures — both on operations and new construction — work their way through Virginia's economy. Taking these effects into account, the study estimated that data centers supported 45,460 jobs and $15.3 billion in economic output in Virginia in 2021. Those figures corresponded to roughly 1 percent of Virginia's jobs and 2.5 percent of its economic output.

Mangum's study also included estimates of data centers' effects on the budgets of the counties in which they operate. Although Virginia offers sales tax incentives to qualifying firms, the data center industry has paid substantial amounts in state and local taxes over the years. But they have also used state and local resources. To estimate data centers' overall fiscal cost to Virginia's counties, Mangum's analysis focused on the main costs that businesses impose on local governments — the costs of providing primary and secondary education as well as other services to the business' employees.

Mangum estimated that, in 2020, Loudoun County received $424.7 million in tax revenue from data centers — more than thirteenfold their estimated budgetary cost of $32.3 million. The figures for Prince William County were smaller but in similar proportion, with revenues estimated at $64.2 million and costs of $4.8 million. Mangum views his estimates as conservative. "The benefits only take into account the direct local revenue generated by data centers as reported to us by the localities themselves," says Mangum. "They do not include any local tax revenue generated by employees."

In 2019, Virginia's Joint Legislative Audit and Review Commission published a report in which it evaluated the effectiveness of the state's tax incentive program for data centers. Looking at the period between fiscal years 2010 and 2017, the study noted, "The data center sales and use tax exemption is by far Virginia's largest incentive in terms of forgone revenue, representing more than one-fifth of Virginia's total spending on economic development incentives during this period." Despite the program's cost, however, the report found that it had been relatively effective, stating that it had "a sizable influence on data center decisions to locate or expand in Virginia." The report, which found that the incentive program had yielded positive net benefits, asserted that it is reasonable for the state to continue the program.

ENERGY AND POWER USAGE

While many localities appreciate data centers for their fiscal benefits, the centers have received a lot of scrutiny over their voracious use of electrical power and water. According to a 2021 article in *Environmental Research Letters*, "Data centers require a tremendous amount of energy to operate, accounting for around 1.8% of electricity use in the United States." They also use large amounts of water, ranking among the top 10 U.S. industries in terms of water use. Some of the water is used directly by liquid-based cooling systems; some of it is used indirectly, as when utilities draw power from electrical grids supplied by hydroelectric generators.

While not denying that there are valid reasons to be concerned about data centers' use of electricity, a 2020 article in *Science* by researchers at Northwestern University, Lawrence Berkeley National Laboratory, Koomey Analytics, and the University of California, Santa Barbara pushed back against some of the more dire scenarios that have been advanced about the industry's energy footprint. The article took particular issue with how "several oft-cited yet simplistic analyses claim that the energy used by the world's data centers has doubled over the past decade and that their energy use will triple or even quadruple within the next decade." These scenarios are too pessimistic, according to the article, because they are based on extrapolations of trends in demand for data center services and, crucially, do not account for countervailing trends in energy efficiency.

Between 2010 and 2018, according to the researchers, traffic increased more than tenfold, while storage capacity increased about twenty-five-fold. But the same period saw substantial improvements in data centers' computational and storage efficiency. The energy required to power a single computation was quartered, while the energy used per terabyte of installed storage capacity declined by an estimated factor of nine. Energy consumption has also been dampened by the migration of users from older, less efficient data centers to newer centers that use servers more efficiently and devote a much higher percentage of their total energy usage to powering servers as opposed to keeping them cool.

Combined, the efficiency improvements and migration have had a huge countervailing effect. Despite the explosive growth in data center services between 2010 and 2018, their overall energy usage increased by only 6 percent cumulatively (less than 1 percent annually), according to the researchers.

Data centers' heavy use of water has also raised concerns. One of the issues is that many operators find that they can cut costs by using water-based evaporative cooling systems instead of systems that rely solely on electricity. While the water usage problem is most glaring in the drought-prone West, it also exists in the East. Several years back, for example, Google made a permit request to remove 1.5 million gallons of water daily from a depleted aquifer to cool its growing data center operations in Goose Creek, S.C. The permit was opposed by the South Carolina Coastal Conservation league, which was concerned about the plan's effect on local groundwater supplies. After two years of negotiation, Google got the go-ahead for a substantially scaled back usage plan.

The data center industry has taken notice of concerns about its resource usage. Microsoft's Suzie Adams has touted the firm's new facility in Boydton, Va., and its proximity to "green-friendly" hydroelectric and nuclear power feeds. AWS has entered into a long-term agreement with Dominion Energy to purchase energy from several solar energy projects. The largest firms — AWS, Google, and Microsoft — have also made steps toward reducing their water usage through new cooling technologies, including free-air and immersion cooling.

From an economic perspective, these stories raise a big question: What is the role of market prices? Economic theory says that resources such as power and water will be used efficiently if they are priced to reflect the resources' marginal costs to the society. Yet, historically, water has been underpriced in the United States, according to Newsha Ajami, chief development officer for research at the Lawrence Berkeley Lab's Earth & Environmental Sciences Area.

As Ajami sees it, progress toward more efficient water usage will require action by localities to make sure that their water resources are allocated in a manner that reflects the resources' true marginal costs. "I think local awareness is extremely important," she says. "Communities need to make sure that they properly account for a data centers' short- and long-run water footprints before they issue construction permits."

NEW OPPORTUNITIES FOR RURAL AREAS

There are some good reasons to think that data centers will be increasingly built in some of Virginia's less densely populated areas. Indeed, the industry is starting to feel some constraints on its growth in Loudoun and Fairfax.

One of the destinations of new investment has been Prince William County, Va., which is further from Washington, D.C., than Loudoun and Fairfax counties. "Prince William County is the beneficiary of a whole lot of investment," says Levi. "Loudoun is running out of land suitable for data center projects, and costs are getting high."

The industry's efforts to seek alternative energy sources may also prove to be a boon for rural areas. According to Levi, "Solar farms are being developed to provide power for data centers. You can't build many solar farms in Loudoun County with any scale, there's just not enough land, it's too expensive."

Microsoft, for one, has been making major solar and data center commitments in rural Virginia. In 2018, it announced the purchase of 315 megawatts of energy from two solar facilities in Spotsylvania County, known as Pleinmont I and II, in what has been described as the largest corporate purchase of solar energy in U.S. history. More recently, the company filed for permits to further expand its data center footprint in Mecklenburg County.

Rural Virginia has also benefited from firms' investments in facilities to manufacture capital equipment for the data center industry. A prime example is Airedale by Modine, which built a manufacturing plant in Rockbridge County in the Shenandoah Valley to produce air chillers for data centers. "Our clients around Data Center Alley really value the fact that we are close by," says Robert Bedard, the firm's general manager for data centers in North America.

This sort of spillover effect comes above and beyond the benefits that data centers can provide through their high-paying jobs and tax payments. Of course, that does not mean that data centers are going to be welcomed in every community. Neighbors in Manassas, for instance, complain about the constant humming sound from the facilities' cooling systems, while some residents of Prince William County are pushing for a pause in new data center development pending a study of its effects on the Occoquan Reservoir, which supplies drinking water to over 2 million people. For appropriately situated locales with ample water resources, however, their allure is likely to continue. **EF**

READINGS

"Data Center and Manufacturing Incentives: Economic Development Incentives Evaluation Series." Report of the Joint Legislative Audit and Review Commission, JLARC Report 518, June 2019.

Masanet, Eric, Arman Shehabi, Nuoa Lei, Sarah Smith, and Jonathan Koomey. "Recalibrating Global Data Center Energy-Use Estimates." *Science*, Feb. 28, 2020, vol. 367, no. 6481, pp. 984-986.

Siddik, Md Abu Bakar, Arman Shehabi, and Landon Marston. "The Environmental Footprint of Data Centers in the United States." *Environmental Research Letters*, May 2021, vol. 16, no. 064017, pp. 1-11.

"The Impact of Data Centers on the State and Local Economies of Virginia." Northern Virginia Technology Council, March 2022.

BY MATTHEW WELLS

The Bank War

In 1832, President Andrew Jackson triggered the demise of America's second central bank with a stroke of his veto pen

In his July 1832 veto message of the bill rechartering the Second Bank of the United States, President Andrew Jackson didn't hold back. Beyond characterizing the bank as hopelessly corrupt, he argued "the powers conferred upon [the bank were] ... not only unnecessary, but dangerous to the Government and the country." He went on, warning that if it continued to operate, "great evils... might flow from such a concentration of power in the hands of a few men irresponsible to the people." He argued that its power would only grow, as its leaders could "put forth their strength to influence elections or control the affairs of the nation." For Jackson, vetoing the rechartering of the bank was necessary to prevent the "prostitution of our Government."

The question of a central bank's constitutionality persisted for years after the nation's founding. After all, the Constitution reflects a series of compromises among a wide range of viewpoints and interests, and as such, it provides little guidance on topics where the framers may have disagreed. The establishment of a central bank is one such topic. In the final days of the Constitutional Convention in the fall of 1787, they debated the idea of explicitly giving Congress the ability to grant charters to corporations (which would include banks), but it was ultimately rejected. Earlier in the Convention, on the other hand, the delegates did grant Congress the power "to coin money [and] regulate the value thereof." But in the absence of any clearly articulated directives, the door was left open with respect to whether a central bank could exist, as well as what structure it might have and what functions it might serve.

Despite this uncertainty, Congress would charter a central bank for the first time in 1791 and again in 1816. When the matter of rechartering the Second Bank of the United States arose in the 1830s, President Jackson and the bank's president, Nicholas Biddle, waged what is now known as the Bank War, fighting over what role, if any, it should have in the American experiment. Their actions — and their consequences — highlighted both the benefits of a central bank and the dangers that can arise if it is left either unchecked or free to align itself with partisan or personal interests. It would only be after the failures of the First and Second Banks of the United States and the instability that characterized the periods without a central bank that Congress created the Federal Reserve System in 1913 and extended its charter indefinitely in 1927.

THE FITS AND STARTS OF EARLY CENTRAL BANKING

Congress and President George Washington granted a 20-year charter to the Bank of the United States in 1791. Designed by Treasury Secretary Alexander Hamilton, it had the power to make commercial and personal loans that would be used to fund the new country's growth, print and issue a common paper currency backed by gold, loan money to the government when needed, and collect revenues and make payments, such as the debts from the Revolutionary War. Thomas Jefferson, the secretary of state, opposed it, however, seeing the potential for too much centralization of power in an entity not even mentioned in the Constitution.

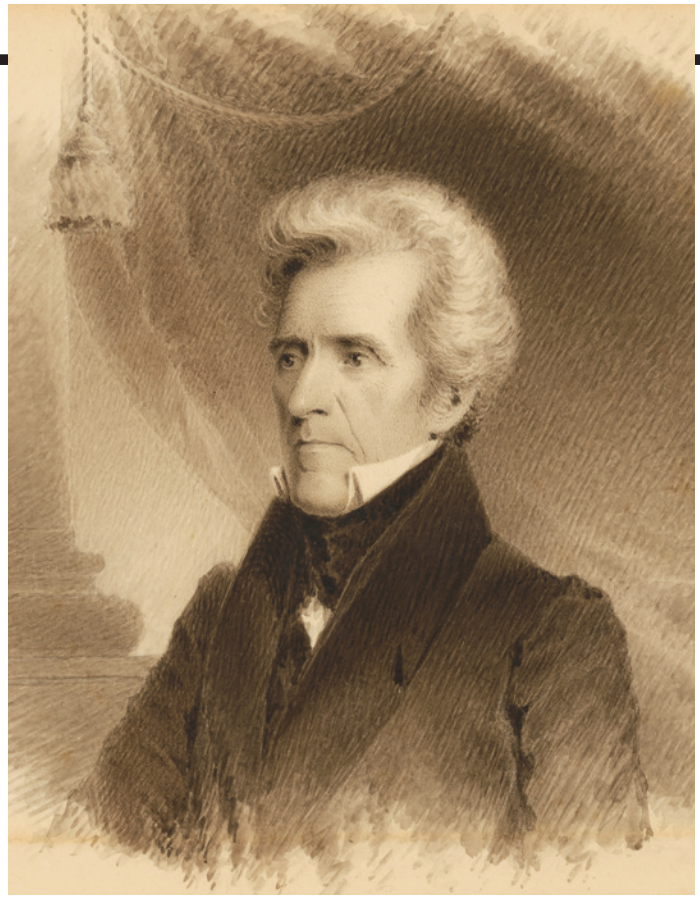
Twenty years later, in 1811, the bank's charter was not renewed. Hamilton had been killed in a duel with Aaron Burr in 1804, and his (and Washington's) party, the Federalists, had lost power to James Madison's (and Jefferson's) Democratic-Republican Party, which viewed the bank as both unconstitutional and unnecessary, as outstanding debts from the Revolutionary War were largely repaid at that point.

Instead of a national bank, the American economy relied on a system of independent state-chartered banks during this period. They served many of the same functions, including issuing their own paper currencies, which could be redeemed at their own counters for gold and silver specie, or coins, at the same convertibility standard.

But as the costs of the War of 1812 escalated, these banks suspended specie payments in 1814 because the notes used to pay those debts increased faster than the volume of specie reserves. (In other words, there was not enough specie in the banks to exchange for all the notes they had issued.) This inflationary practice destabilized the economy and convinced a reluctant Madison that, despite any misgivings he might have about the constitutionality of a central bank, it was once again needed to establish a stable national currency. In addition to printing its own notes, it would also exert control over the other banks by threatening to redeem their notes for specie if it had reason to believe that they had issued too many of them.

The bill chartering a Second Bank of the United States passed both houses of Congress and in April 1816, Madison signed it into law. The decision was

Nicholas Biddle, president of the Second Bank of the United States



President Andrew Jackson

CREDIT: BOTH IMAGES NATIONAL PORTRAIT GALLERY, SMITHSONIAN INSTITUTION; JACKSON PORTRAIT IS A GIFT OF THE SWEDISH COLONIAL SOCIETY THROUGH MRS. WILLIAM HACKER

widely welcomed by New York-based businessmen, including the financier John Jacob Astor, whose interests would most certainly benefit from monetary stability and the end of wild inflationary swings. As for popular opinion, Vanderbilt University economist Peter Rousseau says that, in contrast to wealthy eastern bankers, most people throughout the country were paying attention to the debate about the bank only insofar as it affected their ability to do business. "I don't think people were thinking too much about the control structure, but those who were more aware of what was going on saw a constriction of credit" because of a centralized banking system, Rousseau notes. "There just weren't enough banks."

A GATHERING STORM

Like the First Bank of the United States, the Second Bank would act as the federal government's fiscal agent, issue a common currency, and make direct commercial and individual loans. It was this last function that perhaps would be the most controversial. In the absence of any meaningful oversight, many of these loans were large and nonperforming and made to insiders and friends. This left the bank on the brink of bankruptcy just two years into its existence. Such behavior typified the problem that concerned Jefferson and other early opponents — it could be used for corrupt purposes, funneling money to political allies to the detriment of the broader population. A century later, in 1913, Congress would learn from these experiences and permit the Fed to lend only to banks and other financial institutions. (In 1932, Congress allowed for exceptions to be made in "unusual and exigent circumstances.") But in the more immediate future, it would also be one of Andrew Jackson's chief complaints about the bank when he assumed the presidency in early 1829.

After this initial instability, prominent Pennsylvania financier and politician Nicholas Biddle took over as president of the bank in 1823 and ushered in a sustained period of tremendous stability and growth. By 1828, it was the largest corporation in the country. Headquartered in Philadelphia, it had 25 branches around the country — the First Bank of the United States had only eight — and issued paper currency that could be exchanged for gold at a fixed price. It also held one-third of the banking system's deposits and specie. It made many of the loans that aided in the country's rapid expansion, accounting for 20 percent of the total loans made to the country's businesses and farmers. Finally, it processed the government's receipts and payments efficiently and lent out the government's balances such that it was able to provide 7 percent dividends to its shareholders.

While the bank's strength was viewed positively by its supporters, others grew concerned about its growth and prominence in American life, as it operated free from any government oversight while it redistributed funds around the country to whomever Biddle so desired. Jackson was one such skeptic, declaring in

his first annual message to Congress in 1829, "Both the constitutionality and the expediency of the law creating the bank are well questioned by a large portion of our fellow citizens, and it must be admitted by all that it has failed in the great end of establishing a uniform and sound currency."

Jackson's negative sentiment toward the bank possibly stemmed from his experience in a land deal two decades earlier, when he accepted paper notes as a form of payment. The buyers who had issued the notes would later go bankrupt, leaving the notes worthless. He also found the idea of credit — another essential function of banks — highly problematic, thinking that people should only make purchases with money they already possessed.

Biddle was surprised by Jackson's hostility at this point, as the bank's charter wouldn't expire until 1836. Nevertheless, he believed that Jackson's views were "the honest tho' erroneous notions of one who intends well," noting that "the currency issued by the Bank [is] more sound and uniform than that of any country of the world." Jackson himself also appeared to leave the door to compromise open on numerous occasions. Ultimately, the president would ask for 10 reforms; the rechartering bill that would ultimately pass Congress contained seven of them.

Jackson's intentions with respect to the bank's future remained hidden from Biddle, who felt that he had to force Jackson to decide the bank's fate prior to the 1832 election. "What security is there that when his election is over, he will not negative [veto] the bill?" he wondered. "I see none. [Jackson] would be ten times more disposed to negative it then than now." Biddle submitted the rechartering application in January 1832. The final bill passed both the House and Senate and, as noted above, met most of Jackson's demanded reforms. These efforts proved fruitless, however, as Jackson's opposition to the bank remained firm even in the face of pressure from many in his own party. He vetoed the rechartering bill in July 1832.

WAR ERUPTS

Jackson's belief that he could veto the bank's recharter and still win the election was correct, as he went on to win over four times as many electoral votes as his opponent, Henry Clay. "Jackson staked his whole reelection campaign on destroying the bank," says Eric Hilt, an economist at Wellesley College, "and his victory is a sign that sufficient numbers of Americans shared his fear and skepticism of the institution."

The concerns Jackson voiced in his veto message were also echoed by his then-attorney general and soon-to-be Treasury secretary, Roger Taney. (Taney, in 1836, would become chief justice of the United States and later wrote the infamous pro-slavery *Dred Scott* decision.) He claimed that unless the bank was destroyed rather than reformed, "In another fifteen years, the President of the Bank...would have more influence...than the President of the U[nited] States." Almost immediately into his second term, Jackson, Taney, and their allies set to work dismantling the bank.

Any questions about whether a national bank *could* exist within the limits of the Constitution were settled in 1819, when the Supreme Court found in *McCulloch v. Maryland* that Congress did, indeed, have the authority to charter the Second Bank of the United States, as it was "necessary and proper" under its authority to tax and spend. But in late 1833, now Treasury Secretary Taney ordered that the government's deposits be removed from the bank, hampering its ability to carry out what the court had found to be acceptable and even crucial bank activity. He drew justification from the text of the bank's 1816 Act of Incorporation, which stated that the "deposits of the money of the United States... shall be made in said Bank or Branches thereof, unless the Secretary of the Treasury shall otherwise order and direct..." The withdrawal was significant: The bank held $7.5 million in deposits in November 1833 but only around $2 million in March the following year.

Biddle had hoped Congress would intervene and stop the administration's removal of deposits. He wrote in February 1834 that if it did not take action to restore the bank's capabilities, "the Bank feels no vocation to redress the wrongs inflicted by these miserable people... This worthy President thinks that because he has scalped Indians and imprisoned Judges, he is to have his way with the Bank. He is mistaken."

In an episode known as "Biddle's Contraction," Biddle responded to the deposit removal by drastically cutting the bank's lending operations and calling in its outstanding loans. From 1824 to 1831, perhaps in an effort to curry favor with influential actors in the run-up to the rechartering debate, he had dramatically increased the bank's lending activity. But following Jackson's veto and subsequent removal of deposits, the Second Bank's loans fell from a high of 53 percent of assets in 1832 to around 40 percent in 1835. Because of his decision to curtail the bank's lending activity, historian Edward Pessen described Biddle as "a man fighting fire with fire, ready to drive banks to their knees and bring economic activity to a halt, if to do so might compel the government to reconsider its policy."

The issue drew attention across the country. Harvard University political scientists Daniel Carpenter and Benjamin Schneer found in a 2015 paper that between December 1833 and June 1834 more than 700 petitions were submitted to Congress about the deposit issue. Seventy percent of those petitions, some of which contained hundreds or even thousands of signatures, were in favor of returning deposits to the bank. But the petitions weren't enough. Even though constituent input appeared to favor action, Congress ultimately did

not rescue the bank and force Jackson to return the deposits.

While some of the reduction in lending was because there was less government money in the bank to be lent out, Biddle's actions created a minor panic. According to Carpenter and Schneer, "Biddle's plan massively backfired, generating resentment in the business community and all but proving President Jackson's point that the powers of finance were not to be entrusted to a single incorporated institution." At this point, Biddle realized that the game was up and relented. To not cause further damage, he soon increased the bank's provision of credit back to its previously elevated level near 50 percent of assets.

THE AFTERMATH

Andrew Jackson had railed against the use of the national bank for political purposes by his opponents, but he was more than willing to grant special privileges to state-chartered banks, particularly those that were, according to Treasury Department official and influential "Kitchen Cabinet" member Amos Kendall, "in hands politically friendly." Perhaps surprisingly, and in contrast to his efforts to portray himself as hostile to wealthy eastern elites, Jackson had Taney initially transfer the deposits that had been removed from the Second Bank to seven large banks all located on the East Coast, including the Union Bank of Baltimore, where Taney was a stockholder. He would later order that they be redistributed to "pet banks" throughout the country that had close relationships with Jackson and his administration.

Under this new system, the federal government paid off its debts in January 1835, thanks in large part to the sale of public lands in the Midwest, Mississippi, and Louisiana, as well as an increase in customs duties. The financial position of the United States was so strong, in fact, that its surplus in June 1836 had soared to $34 million. State-chartered banks also flourished during this period.

But the good times would be replaced by the Panic of 1837. While a number of domestic and international factors contributed to the downturn, the absence of a central bank played a key role as well. Economist Jane Knodell of the University of Vermont argued in a 2006 paper that the ending of the Second Bank created a mismatch between the supply of and demand for commercial banking in different parts of the country, especially in the Northwest and Southwest. The shift to a system solely comprised of state-level banking altered the lending behavior of those banks, which now carried obligations to the state governments that chartered them, as well as their shareholders. As a result, they invested more heavily in land development and state public works projects, which the Second Bank had avoided.

Further, when there isn't deposit insurance, depositors tend to monitor the banks where they put their money to make sure they aren't engaging in overly risky lending behavior. In the case of the pet banks, however, many of which were in the western states, the federal government just parked its vast sums of money and stopped paying attention. "Huge deposits from the federal government were coming in, and there was no discipline," says Hilt. "Instead, there was a totally safe source of funding that protected the banks from the usual pressures that depositors would bring." This lack of oversight allowed the banks to make dangerous bets even as land and commodity prices plummeted, and by 1837, the economy had ground to a halt and would remain depressed until the mid-1840s.

The events surrounding the Bank War provided future policymakers with some important lessons. In a 2021 paper, Rousseau argued that "the legacy of the Second BUS [Bank of the United States] is the principle that a central bank should be independent but not excessively so, and must stand ready to monitor its members." Central banking in the United States has evolved in those two directions. With respect to the latter, the Fed is among the agencies explicitly tasked by Congress with supervising the country's banks to ensure they operate prudently. Regarding the former, the Fed's activities are in the hands of a board — nominated by the president and confirmed by the Senate — and of regional Reserve Bank presidents, under the oversight of Congress. And for over a hundred years, it has helped manage the country's financial system as it continues to grow and evolve. **EF**

READINGS

Carpenter, Daniel and Benjamin Schneer. "Party Formation through Petitions: The Whigs and the Bank War of 1832-1834." *Studies in American Political Development*, October 2015, vol. 29, no. 2, pp. 213-234.

Knodell, Jane. "Rethinking the Jacksonian Economy: The Impact of the 1832 Bank Veto on Commercial Banking." *Journal of Economic History*, September 2006, vol. 66, no. 3, pp. 541-574.

Morrison, James A. "This Means (Bank) War! Corruption and Credible Commitments in the Collapse of the Second Bank of the United States." *Journal of the History of Economic Thought*, June 2015, vol. 37, no. 2, pp. 221-245.

Rousseau, Peter L. "Jackson, the Bank War, and the Legacy of the Second Bank of the United States." *AEA Papers and Proceedings*, May 2021, vol. 111, pp. 501-507.

Daron Acemoglu

On Henry Ford, making AI worker-friendly, and how democracy improves economic growth

Daron Acemoglu is one of MIT's nine university-wide Institute Professors, the university's highest faculty rank. One of his predecessors, Robert Solow, developed a pathbreaking mathematical model of economic growth in the 1950s. Today, Acemoglu says hurray for economic growth — but is also concerned that choices made by policymakers and companies are channeling the gains from that growth away from workers. And as he sees things, the powerful AI technologies that have come to the fore in the past several years, embedded in products such as ChatGPT, should be regulated with the economic interests of workers in mind.

Acemoglu's research on the role of technology in economic growth, the decline in labor's share of income, and other topics has made him, according to Research Papers in Economics, the third most-cited economist in the world. He is also the author or co-author of six books, including the 2012 bestseller *Why Nations Fail*, in which he and James Robinson argued that differences in affluence between countries are mainly driven not by differences in natural resources or climate but by their economic and political institutions. His latest book, published in May, is *Power and Progress: Our Thousand-Year Struggle Over Technology and Prosperity*. Among his numerous professional awards is the American Economic Association's 2005 John Bates Clark Medal, recognizing the American economist under the age of 40 who is judged to have made the most significant contribution to economic thought and knowledge.

He is married to an MIT computer scientist, Asu Özdağlar, a frequent co-author of his who is an expert in optimization theory, game theory, and social network theory. He credits her with helping him understand the new generation of AI technology as well as giving him an insider's view of her field — as he puts it, "how the computer science discipline works inside and outside academia."

David A. Price interviewed Acemoglu by phone in April.

IMAGE: COURTESY OF CODY O'LOUGHLIN

EF: How did you become interested in economics?

Acemoglu: I became interested in economics when I was in high school and coming of age in Turkey, which was under a military dictatorship at the time. The country was having a lot of economic problems, including widespread poverty. So I started becoming drawn to these issues and also wondering about the linkages among dictatorships, democracy, economic growth, and the things that came to occupy my research decades later.

What I thought was economics at the time turned out to be not quite exactly economics, and what I thought I was going to do changed quite significantly when I went to college and graduate school. But I liked what I saw — trying to approach the questions of social science and, really, of humanity's existence using empirical, mathematical, and conceptual tools.

EF: In your new book, *Power and Progress*, you and Simon Johnson argue that the degree to which workers share in the gains from new technologies depends on the legal rules and informal expectations governing management. The rules governing management have obviously changed over time — have the expectations also changed? Does our society expect something different from CEOs than it used to?

Acemoglu: A large chunk of my work focuses on economic growth. My early work within that followed what many economists do, which is to look at growth — the growth of GDP — with the expectation that as the economy grows, that's going to be beneficial for all segments of society, including workers. *Power and Progress* is a culmination of

my research over the last 15 years, which has made me less certain about that. It has certainly worked out fine during certain episodes; for example, in the decade that followed World War II, U.S. GDP grew rapidly and so did wages. Inequality remained stable. So this was a classic period of shared prosperity. But during different episodes in history and even today, there's a variety of evidence suggesting that this doesn't always work so seamlessly.

Power and Progress tries to approach these questions, putting emphasis on three things. One is the nature of the technology of the time; the second is the institutions that shape the bargaining power of workers; and the third is expectations and norms.

And on the last one, yes, I think expectations and norms are particularly important, especially in the modern world. We are in the midst of a big transformation in which new technologies, new organizations, new ways of living are spreading around the world, and who is going to get the benefits of these is very much up for grabs. The expectations and views about what is acceptable are going to play a very important role.

One sneak peek at that comes from the research I've done recently with Alex He, who is at the University of Maryland School of Business, and Daniel le Maire, who is at the University of Copenhagen. What we find is that business-school-trained managers in Denmark and the United States significantly cut wages relative to their competitors; they don't give enough of the gains from productivity improvements to workers. Our evidence suggests that that's because they subscribe to the view that it's more efficient and more just to look after the interests of shareholders and try to make the corporation leaner. That shows one small part of a much bigger whole, which is that the visions or expectations or ideas of powerful actors are playing and will continue to play a major role.

EF: Looking at all the forces that you just outlined, what do you think they mean for the way AI is likely to be adopted in the workplace and its likely effects on workers?

Acemoglu: All of these forces, I think, are important during every period, but they become particularly critical during transformative eras when organizational technologies are changing. We're in the midst of one of those because of the rapid spread of AI — including large language models — and other digital technologies. It's also happening because the business community in the industrialized world has subscribed to a vision of relying more and more on these tools instead of on humans.

"There isn't much AI-related hiring activity as late as 2013 or 2014. But around 2015 to 2016, you see almost an inflection point where many establishments in many different industries start looking for AI-related workers. So that would be our best estimate of when AI technology really started spreading in the U.S. economy."

The issue of these norms and expectations is going to become particularly important because the direction of technology is open. We could use these tools for eliminating workers, sidelining them and thus not using their unique skills. Or we could find ways of creating new tasks and new opportunities for workers.

EF: You were able to look at this question empirically in some recently published research of yours that measured the effects of AI on jobs based on online job postings. What did you find out?

Acemoglu: There was very little evidence of how quickly AI is being adopted and what its effects are. We're not doing a great job in general in the economic profession of measuring technologies. That's doubly true for AI.

So the idea that David Autor, Jonathon Hazell, Pascual Restrepo, and I had was to look at the near universe of online vacancies in the United States, which comes with detailed information about what types of tasks workers are being sought for and what kinds of skills they have to bring. We're looking at the level of an establishment like a store rather than a firm; for instance, a Burger King store rather than the whole Burger King firm. With this data, we were able to pinpoint which kinds of establishments are adopting AI and hiring AI-related skills and what else these establishments are doing in terms of their hiring.

We get a very interesting picture. First of all, there isn't much AI-related hiring activity as late as 2013 or 2014. But around 2015 to 2016, you see almost an inflection point where many establishments in many different industries start looking for AI-related workers. So that would be our best estimate of when AI technology really started spreading in the U.S. economy.

Second, we look at what are the kinds of establishments that are doing this hiring. And the answer seems to be that they're the ones that have fairly simple tasks that can be replaced by AI technology. So you don't see the creative tasks or firms that require very complex functions going to AI; it's more simple IT security, simple clerical jobs, and so on that are going big-time AI.

This, then, sort of confirms our suspicion on the basis of the prior waves of automation technologies that these technologies, especially when they spread rapidly, are destroying some jobs and not always increasing wages or demand for workers.

I should add that this research was several years before large language models, so it isn't informative about ChatGPT or GPT-4, which may have different effects. And in fact, I believe they will do different things in some dimensions.

EF: Based on all this, how would you recommend that workers adapt to the changing demands of the labor market that AI may bring?

Acemoglu: Well, that's a very natural question. And obviously, it's a good question from the point of view of a worker. But let me push back and say it's not the only question or even the right question. Because that question, when you ask it from the society's point of view, buys into the narrative that AI is an already-happening avalanche with a given direction and the only thing we can do is adapt to it.

Of course, we have to adapt to all new technologies. But I think that the question you ask has to be coupled with or even preceded by a different question: What type of AI do we want? What are the technologies of the future that would be most beneficial to society, particularly workers? I cannot imagine any technology that would be harmful to workers for a long period of time and yet would be beneficial for society.

And therefore, my view is that right now we are going in the wrong direction in the AI community. We are going in the wrong direction in the tech community, because there is no regard paid to what these technologies are doing to workers' jobs, democracy, mental health, all sorts of issues. So we really need to ask, can we redirect these technologies?

But coming back to your question, of course workers need to adapt as well. And I think workers who have skills or choose to specialize in things that one way or another are going to be done by machines are not going to do well. So I think social skills, social communication, teamwork, adaptability, and creativity are going to be rewarded by the labor market. The way that machines augment humans, humans should also augment machines.

But make no mistake, it's not just those skills. Today, and I believe in the next 10 years, the United States economy is going to need a huge number of carpenters, electricians, plumbers, lots of people who do very valuable, very meaningful skill-requiring, expertise-requiring combinations of manual and cognitive work. It's a mistake for us to think everything is going to be digital. And it could be very beneficial for us if we tried to make new machines, including AI, in such a way that they complement electricians, plumbers, carpenters. I think that complementarity is really critical.

Daron Acemoglu

PRESENT POSITION

Institute Professor, Massachusetts Institute of Technology

SELECTED ADDITIONAL AFFILIATIONS

Member, National Academy of Sciences; Fellow, American Academy of Arts and Sciences; Research Associate, National Bureau of Economic Research

EDUCATION

Ph.D. (1992), London School of Economics; B.A. (1989), University of York

EF: Arguments for regulating AI along economic lines seem uncommon now. More usually, one sees arguments about AI and alignment, about AI and long-term threats.

Acemoglu: Those arguments really confuse the debate. I'm not worried about artificial general intelligence coming and taking over humanity.

EF: Why do you think economic policy arguments about AI aren't more salient?

Acemoglu: There are many reasons. I think one of them is Hollywood and science fiction. I love science fiction, don't get me wrong, but it has conditioned us to think about the scenario in which the machines become humanlike and compete against humans.

But second, even more importantly — and this is, to me, a foundational mistake in the AI community, going back to Turing's work and to the [1956] Dartmouth Conference on AI — it was a mistake framing the objective as machines being intelligent, developing humanlike capabilities, doing better than humans. I think we should have framed the question from the beginning as a machine that's useful. We don't want machine intelligence in itself; we want machines that are useful to us having some high-level capabilities and functions.

Today, still, the way you get status in AI research is by achieving humanlike capabilities. On top of that prestige, the biggest sources of funding right now for engineering, computer science, and AI are companies like Google and Microsoft. Put the two effects together and you have an amazing bias.

And then the third is the economics profession. You know, economists are right: We owe today's prosperity to technology. We would not be 30 times as prosperous as our great-great-grandparents who lived 250 years ago if it wasn't for the huge breakthroughs of industrialization, of communication, of improvements in pharmaceuticals, all of these things. Yet that does not imply that technological change is always good for workers or always good for society. So we really need to develop a perspective of how can we harness technology for the better. But if you subscribe to the view that technology is always and everywhere good, it's like a sin to ask questions about regulation of technology within the economics profession. And if you put that together with the ideological disposition of the AI community, I think you get the current picture.

EF: Objecting to the effects of new technology on labor is sometimes

casually linked with the Luddites. As you know, the Luddites were a group of 19th-century English textile workers who responded to automation by destroying textile machinery. Setting aside their methods, what were the Luddites right about and what were they wrong about?

Acemoglu: There's a debate about Luddites, and I think the public almost always sees one aspect of the Luddites — that of the rabble-rousers who went around creating trouble. There was that; it's not deniable. But Luddites were part of a broader nascent working-class movement that was trying to articulate ideas about worker rights, worker participation in decision-making, and how work could be organized in a way that was beneficial for workers. So the Luddites had some ugly parts and some forward-looking elements as well.

But specifically in the context of the weaving machines, which is what animated the Luddites, they were right that those weavers were the losers out of technological progress. Their high wages got destroyed. They were shifted into much worse working conditions for longer hours, for lower pay in factories, or lost their jobs.

What they did not do is that they did not articulate a coherent view about how we could harness and leverage technological change in a way that would be beneficial for workers as well. But that's probably asking too much from them.

EF: In contrast, in your new book, you describe the adoption of electrical machines by factories in the late 19th century and early 20th century as highly beneficial economically to workers. Why did workers share in these gains?

Acemoglu: Why is it that electrical machinery was so beneficial and the textile machinery of the late 18th century wasn't? That brings me to the key concept of the framework that I developed in academic work with Pascual Restrepo: new tasks. If you want to think about workers benefiting, you have to think about what new tasks they can perform. And the key thing about electrical machinery — and the Ford factory in the early 20th century is a great exemplar of this — is that it generated a whole series of new tasks.

"I am one of the signatories of the declaration that we should pause, until we understand where we're heading, the further training and the development of large language models for a period of six months or longer. Because I think right now this rollout is speeding ahead of our understanding in the regulatory framework and it's locking in a particular direction."

With the introduction of electrical machinery, production became more complex. So you needed workers to attend to the machinery and then you needed a lot of supporting occupations: maintenance, design, repair, and a whole slew of engineering tasks as well as many other white-collar occupations. So what really was beneficial both from the point of view of the workers and from the point of view of productivity wasn't the fact that those factories were substituting electrical power for some other kind of power. They were completely reorganizing work in a way that made it more complex and thus created more gainful activities for workers.

Not everything was rosy. It was hard work. Compared to today, workers were worn out. They found it very difficult to keep up with the pace. It was still much noisier than the kind of factories that we would see later.

And Henry Ford himself, especially later in his career, became zealous for anti-union activity. So it's not like saying Ford was a visionary in every dimension. But Ford exemplified a new type of industrialization, which created new tasks and thus opportunities for workers.

EF: What policy choices might be made to see to it that AI is adopted in a worker-friendly way?

Acemoglu: Well, that's a very difficult question. I think there is no silver bullet. But let me give you several answers.

First of all, I do not argue that we should stop AI or even stop large language models, but I do strongly believe that we should regulate how they are developed, how they are rolled out, and how they are used.

For example, in the case of large language models, I am one of the signatories of the declaration that we should pause, until we understand where we're heading, the further training and the development of large language models for a period of six months or longer. Because I think right now this rollout is speeding ahead of our understanding in the regulatory framework and it's locking in a particular direction.

Likewise, in the case of the technologies that, for example, Facebook uses to promote certain kinds of content and monetize it on the basis of digital ads, there's again a question of how the technologies are going to be used. Are we going to allow Facebook to play on the insecurities of teenagers to get them more hooked or is there a better regulatory framework? I don't have all of the answers to these questions, but those are questions that we need to ask.

In my thinking, there are a couple of levers that are highly important in doing this. First of all, we need to deal with data control. All of these tech models that we're talking about with their pernicious effects are predicated on free collection and control of data by large companies. I think that's

something we need to revisit.

We also need to worry about whether the business model of the tech industry, especially in the communication area, is leading to highly negative effects; the core of that business model is digital ads. So I am in favor of policies giving alternative business models — for instance, based on nonprofits, such as Wikipedia, or on subscriptions, such as Netflix — room to emerge and become more of a viable alternative across the tech industry.

But I think most importantly, we need to change incentives of the research community and the leading firms such as Microsoft, Google, OpenAI, and so on, such that they divert their attention away from automation and control toward things that are human-friendly, meaning increased worker productivity, empowered citizens.

EF: You've argued that by various measures, the position of the median U.S. worker has become worse since the late 1970s. You suggest that automation and globalization have been synergistic in driving this trend. Please explain.

Acemoglu: Yes. I think the data show that median wages in the United States increased from 1980 or the mid-1970s onward, but only slightly. So if you exaggerate a little bit, you can say median wages are stagnant. Average wages in the United States have increased; that's partly because workers have become more skilled in the United States, so the educational achievement of workers is quite a bit higher than it was in 1980.

And if you look at some large demographic groups, such as a man with a high school degree or a man without a high school degree, you see that their real wages have actually declined significantly since the late 1970s or early 1980s. All of that is to highlight that this has not been a good labor market for workers on the whole.

There are some groups that have benefited. If you are very highly skilled, if you have a postgraduate degree — especially in engineering or one of the other disciplines that has benefited from the tech boom — you have done very well. If you are a skilled surgeon, you have done very well. People with specialized skills have done quite well. But the majority of the workforce hasn't benefited much, and some people have lost out.

Why is that? I think technology is a major part of it, and globalization is a major part of it. Both technology and globalization have hit workers who used to be in manufacturing or who used to be in nonmanufacturing but earned a decent living. So you see this pattern of workers in the middle of the income distribution being particularly badly affected by these forces.

What we argue in our book is that the effects of globalization and technology were not inevitable. In both cases, the specific choices that we made were quite important. And particularly in the case of technology, it's about where we started — whether we are going to use these technologies for automation or for creating new tasks. And once you increase productivity, how are you going to share this productivity?

And in the case of globalization, there was the rapid flow of cheap Chinese imports and offshoring, which happened as a result of excessive attention on cost-cutting. These choices have not worked out well for working people.

EF: Shifting topics a little bit, in your 2019 article "Democracy Does Cause Growth," you and your co-authors found that democratic institutions are associated with economic growth. Why is that? What are the mechanisms behind this?

Acemoglu: I'm proud of that paper because, for some reason, there was an emerging consensus within political science and economics that democracy was not a good system for dealing with economic problems. I think it was fueled in part by China — people seeing China's tremendous leap and saying look how well autocracy works, and at the same time also witnessing gridlock and economic problems in various democracies.

We were very suspicious of this, which is the reason we started this project. As soon as we started, we realized if you organize the data in the most neutral way, it is amazingly apparent that democracies actually grow quite a bit faster. And one way of doing that is just to look at the same country before and after becoming democratized. Before, when they are under a dictatorship, they have a lot of economic problems. And then after democracy, it takes a while for stability to set in, but after a while a rapid growth experience exists.

Why is that? Well, one of the things that democracies do is they increase taxes; democracies raise more revenue and spend more money.

And where do they spend it? Well, some would say waste, of course; it's the nature of bureaucracy. But a lot of it goes to health, education, and public infrastructure. That's part of the answer. But also contrary to the conventional wisdom, we find that democracies are better at doing reform. They are much better than dictatorships at dealing with monopolies. They are better than dictatorships at increasing the capabilities of the workers, especially low-income people in the community. So there are a number of dimensions to the link behind democracy and growth. **EF**

BY STEPHANIE NORRIS AND ADAM SCAVETTE

Measuring Social Capital Across the Fifth District

How cliquey is your community? How often do people from different income groups in your area befriend one another? Do your neighbors volunteer their time to charitable causes? Social scientists have long studied social capital — the strength and value of social networks within communities — as well as its effects on economic, health, and political outcomes. Political scientists have linked higher civic engagement with the strength of democratic institutions, while economists have studied the role that friendships across socioeconomic statuses might have in fostering economic mobility.

Social capital can be measured along several different dimensions and compared across geographies. Identifying measures of social capital can be challenging for researchers since it is not directly observed and is largely conceptual in nature. Researchers have traditionally measured social capital with proxy variables (such as membership in volunteering organizations) or survey results (such as measures of trust, obligation, or solidarity within a community) to compare its intensity across time and place. This resulted in time-consuming fieldwork for researchers and inconsistent measures of social capital across studies due to choice of time, geography, and measurement method.

Recently, however, researchers at Opportunity Insights — a research group based at Harvard — have compiled a dataset using data from over 70 million Facebook users in an attempt to quantitatively measure social capital across the United States for a given time period. This dataset, the Social Capital Atlas, offers a consistent, comprehensive resource to assess U.S. counties and ZIP codes along various degrees of social capital, which may provide value in guiding policymaking and studying various social outcomes. This article explores the Social Capital Atlas dataset at the county level to assess how three measures of social capital vary across the Fifth District: economic connectedness, cohesiveness, and civic engagement.

Social capital is a desirable community characteristic in and of itself, as individuals tend to benefit from high levels of social interaction through better mental health, subjective well-being, and some physical health outcomes. While it is not easily evaluated in monetary terms, research suggests that individuals regard social capital like any other amenity that improves the desirability of a community.

WHAT IS SOCIAL CAPITAL?

Social capital is the value derived from networks of relationships among people who live and work in a society. Harvard political scientist Robert Putnam suggests that some forms of social capital are formal, such as a parent-teacher association, labor union, or other civic organization with established membership and executive responsibilities. Other forms are less formal, such as neighbors keeping watch over one another's homes or other reciprocity norms (picking up litter, friends vouching for one another). Both types of social capital facilitate information flows and normalized behaviors that provide mutual aid for society members.

Economist Matthew O. Jackson of Stanford University and the Sante Fe Institute further distinguishes among several different functional types of social capital held by individuals within an overarching social network. For example, Jackson refers to leadership capital as being connected to people who may not typically interact with each other (such as people of different socioeconomic statuses), which aids the ability to coordinate behavior. Reputation capital is the collective community belief that "a person or organization is reliable and/or provides consistently high-quality advice, information, labor, goods, or services." The former should facilitate the latter as the spread of information among disparate community members reinforces the reputation of individuals and organizations within a community.

WHY DOES SOCIAL CAPITAL MATTER TO ECONOMISTS?

Individuals seem to place high value on social capital as a community resource. Social capital is a desirable community characteristic in and of itself, as individuals tend to benefit from high levels of social interaction through better mental health, subjective well-being, and some physical health outcomes. While it is not easily evaluated in monetary terms, research suggests that individuals regard social capital like any other amenity that improves the desirability of a community, such as

low crime, good weather, or proximity to a world-class art museum. The amenities are capitalized into local housing prices and rents such that their perceived values are reflected through individuals' willingness to pay for them. Studying relationships among neighbors within an area might provide a window into how social capital influences migration decisions.

A 2018 Pew Research Center Survey finds that friendships with neighbors influence community attachment, while both factors are linked to one's desire to relocate. "Adults who say they know all or most of their neighbors are more than twice as likely as those who don't know any of their neighbors to say they feel very or somewhat attached to their community (77% vs. 32%)." Moreover, "people who say they are not too or not at all attached to their community are about five times as likely as those who feel very attached to say they would like to move to a new community (50% and 11%, respectively)."

Moreover, the benefits of social capital extend beyond its value as a conventional amenity, as it has been found to be a positive predictor of several life outcomes such as socioeconomic success in early adulthood, educational attainment, and financial behavior.

Lastly, of particular interest to economists, social capital may facilitate the American Dream. Research suggests that social connections make a difference in labor market outcomes and might influence the career trajectories and economic paths of individuals through mentorship, job referrals, or information sharing.

THE SOCIAL CAPITAL ATLAS

Data limitations make quantifying social capital and understanding its impact on economic and social outcomes challenging. In a novel approach, Raj Chetty of Harvard University and the team at Opportunity Insights partnered with researchers to leverage privacy-protected data from the social network website Facebook.

The researchers studied the social networks of 72.2 million U.S. Facebook users between the ages of 25 and 44, an age bracket within which more than 80 percent of adults have used Facebook. They restrict the sample to users active at least once in the last 30 days with at least 100 U.S.-based Facebook friends and who have a non-missing ZIP code. Arguing that Facebook friendships often derive from in-person connections and that Facebook requires both individuals to confirm the relationship to form the connection, the researchers suggest these virtual connections are reasonable proxies for an individual's real-life social networks.

Chetty and his co-authors find that economic connectedness is a strong predictor of upward mobility even after controlling for poverty rates, income inequality, and racial segregation. ... [They also] find evidence that economic connectedness may improve intergenerational economic mobility.

The authors used the social networks formed by 21 billion friendship pairs from the Facebook sample to construct variables representing three key dimensions of social capital. First, economic connectedness represents the degree to which people of different socioeconomic status (SES) are friends with one another. This cross-type connectedness is a form of "bridging" capital. Research has shown that connections with highly educated or affluent individuals can facilitate the transfer of knowledge and resources and can ultimately affect economic and employment outcomes. In the Facebook user sample, Chetty and his co-authors identify the characteristics of individual Facebook users (such as location, education, and age) and combine them with the average income in that user's area to produce a SES index. Then, they use this index to rank users nationally in relation to other users in their birth cohort. This allows the researchers to divide the population in each county into above-median (high-SES) and below-median (low-SES) groups.

The economic connectedness variable measures the relative share of low-SES individuals' friends that have a high SES. In other words, economic connectedness is the share of a low-SES person's friends who have a high SES divided by 0.5 — the share of high-SES friends if friendships were not dependent on income. A value of zero indicates that none of a low-SES person's friends have a high SES on average, indicating very low economic connectedness. A value of one indicates that 50 percent of friends in a low-SES individual's network are high income. Values that exceed one indicate that, on average, low-SES individuals have more high-SES friends than low-SES friends. For example, in the city of Richmond, the economic connectedness value is 0.72, indicating that Richmond has low economic connectedness — only 36 percent of low-SES individuals' friends are high income, and high-SES friends are underrepresented by 28 percent. Communities with low economic connectedness are areas where low-SES persons largely befriend one another, while high economic connectedness suggests that SES plays little role in determining friendships.

Second, cohesiveness represents the structure of a community's social networks — or the degree to which friendships are fragmented into cliques and whether friendships are supported by mutual friends. Research

suggests that cohesiveness can affect key outcomes like human capital accumulation and adherence to social norms. The researchers construct three measures of cohesiveness using individual social networks: clustering, support ratio, and spectral homophily.

The *clustering* measure represents the extent to which an individual's friends are friends with one another. The authors construct this variable using the locations of individual Facebook users and their friendship links across others within a community. They argue that higher rates of clustering may help reinforce social norms and pro-social behavior as friends can act together to sanction or pressure a mutual friend. Clustering values range from zero to one, with a score of 0.5 indicating that, on average, half of an individual's friends are friends with one another.

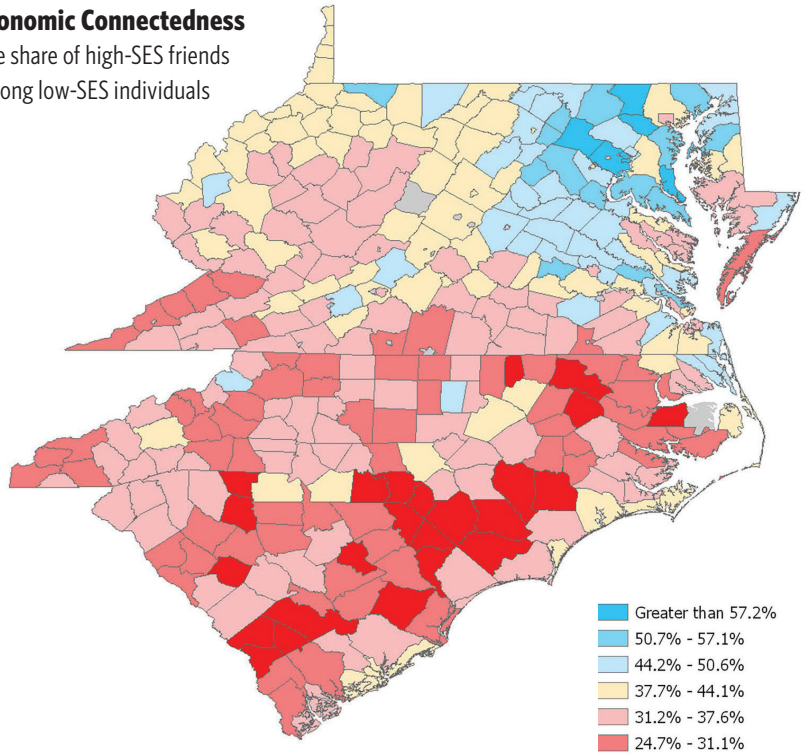
The *support ratio*, ranging from zero to one, measures the share of friendships in a network that are "supported." A friendship is supported if two friends have at least one other friend in common. Finally, *spectral homophily*, which also ranges from zero to one, measures how fragmented or cliquey a community is. A value of zero indicates that a member of the community is equally likely to be friends with any other community member, while a value of one indicates that the network is fragmented into insular groups.

Finally, *civic engagement* measures the rate at which individuals volunteer or participate in local organizations. This type of social capital does not rely on social networks and is linked in research to outcomes including economic growth and political accountability.

For each county, Chetty and his co-authors calculate a volunteering rate representing the share of individuals in that county who belong to at least one volunteering or activism group. The group volunteering variable is constructed using the locations of individual Facebook users and whether they are members of at least one volunteering group. A second measure of civic engagement is the density of civic organizations. A county's civic engagement score is the number of civic or "public good" organizations based in that county (indicated by relevant Facebook group pages) per 1,000 residents.

The size and richness of the dataset Chetty and his co-authors construct includes average values of economic connectedness, cohesion, and civic engagement estimates for counties, ZIP codes, high schools, and colleges across the United States. They have made these data publicly available via download and through a data visualization tool.

Economic Connectedness
The share of high-SES friends among low-SES individuals



NOTE: The national county median is 40.3 percent
SOURCE: The Social Capital Atlas, Chetty (2022a) and Chetty (2022b)

SOCIAL CAPITAL IN THE FIFTH DISTRICT

Economic connectedness varies significantly across U.S. counties. Nationwide, the share of high-SES friends among low-SES individuals ranges from 17.8 percent to 64.6 percent. In the Fifth District, the counties with the highest economic connectedness relative to the national median of 40.3 for low-SES individuals are in Maryland and northern Virginia. (See map.) South Carolina and North Carolina have comparatively low levels of economic connectedness among low-SES individuals.

Chetty and his co-authors differentiate between two determinants of economic connectedness. *Exposure* represents the frequency with which low-SES people interact with high-SES people and is measured by the share of individuals with above-median SES multiplied by two. *Friending bias*, the tendency of low-SES people to become friends with high-SES people with whom they interact, is measured as one minus the share of friends they make with high-SES individuals divided by the share of people in the group who have a high SES.

Economic Connectedness in the Fifth District

	Economic Connectedness	Determinants of Economic Connectedness	
Highest EC Counties		**Exposure**	**Friending Bias**
Arlington County, VA	64%	71%	-1%
Loudoun County, VA	61%	71%	3%
Carroll County, MD	60%	69%	5%
Calvert County, MD	60%	64%	2%
Fairfax County, VA	59%	69%	1%
Alexandria city, VA	58%	66%	-3%
Howard County, MD	57%	67%	0%
Rappahannock County, VA	56%	57%	-3%
Harford County, MD	55%	61%	3%
Stafford County, VA	55%	63%	3%
Lowest EC Counties		**Exposure**	**Friending Bias**
Vance County, NC	22%	23%	17%
Richmond County, NC	22%	23%	12%
Lee County, SC	22%	21%	11%
Marion County, SC	21%	24%	13%
Saluda County, SC	21%	28%	22%
Dillon County, SC	20%	24%	11%
Scotland County, NC	20%	23%	15%
Marlboro County, SC	19%	19%	9%
Robeson County, NC	18%	20%	15%
Allendale County, SC	18%	17%	9%

SOURCE: The Social Capital Atlas, Chetty (2022a) and Chetty (2022b)
NOTES: Higher values indicate more economic connectedness, more exposure to high-SES individuals, and decreased likelihood of forming friendships with high SES. Economic connectedness is the share of low-SES individuals' friends who have high SES, averaged over low-SES individuals in the county. The two determinants of economic connectedness are exposure and friending bias. Exposure is the average share of exposure to high-SES individuals through groups like workplaces, religious organizations, and schools for low-SES individuals in the county. Friending bias represents the tendency of a low-SES individual becoming friends with a high-SES individual, conditional on exposure. It is calculated as 1 minus the share of friends they make in that group who have high SES divided by the share of people in the group who have high SES.

In other words, if friendships in a group are formed at random, friending bias would be zero. Any friending bias greater than zero indicates a lower probability of making friends with high-SES individuals even after controlling for exposure.

Patterns in these determinants explain the variation in the Fifth District when comparing counties with the highest and lowest degrees of economic connectedness. (See table.) Low-SES individuals in counties with high economic connectedness have both higher rates of exposure to high-SES individuals and, conditional on exposure, less bias toward becoming friends with high-SES individuals. In Arlington County, Va., for example, an average low-SES individual has more high-SES friends than low-SES ones. By contrast, only 22 percent of the friends of an average low-SES individual in Vance County, N.C., have a high SES. Low-SES individuals have fewer opportunities for contact with high-SES individuals in Vance (23 percent compared to 71 percent in Arlington) and also are less likely to become friends with the high-SES individuals they do meet.

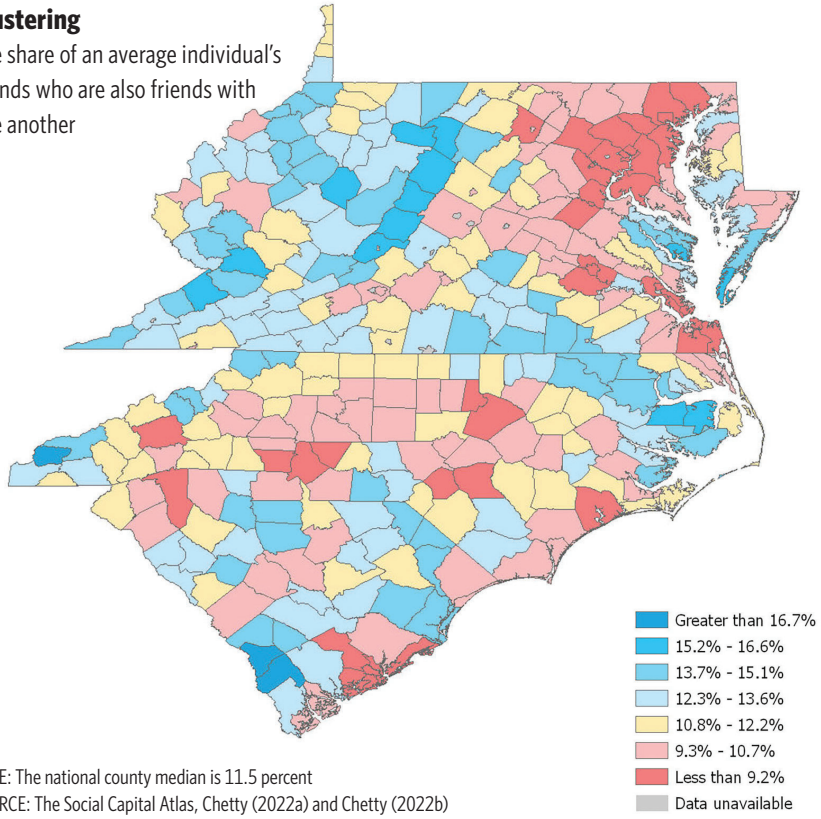
Conversely, counties in large metropolitan areas tend to have less cohesiveness than more rural counties. These counties often have lower support ratios and lower rates of clustering — indicating that an individual's friends are less likely to be friends with one another in these areas. In the Fifth District, counties in West Virginia have some of the highest rates of clustering, while counties in the Washington, D.C., and Raleigh-Durham areas have some of the lowest rates of clustering in the district. (See map.)

Nationally, county volunteering rates range from 1.4 percent to 27.1 percent. Most Fifth District counties have lower rates than the national median of 7.3 percent. Notable exceptions are Randolph County in West Virginia and Highland County in Virginia, where 20.3 and 18.8 of residents, respectively, are members of at least one volunteering or activism group. (See map.)

LINKING SOCIAL CAPITAL TO ECONOMIC MOBILITY

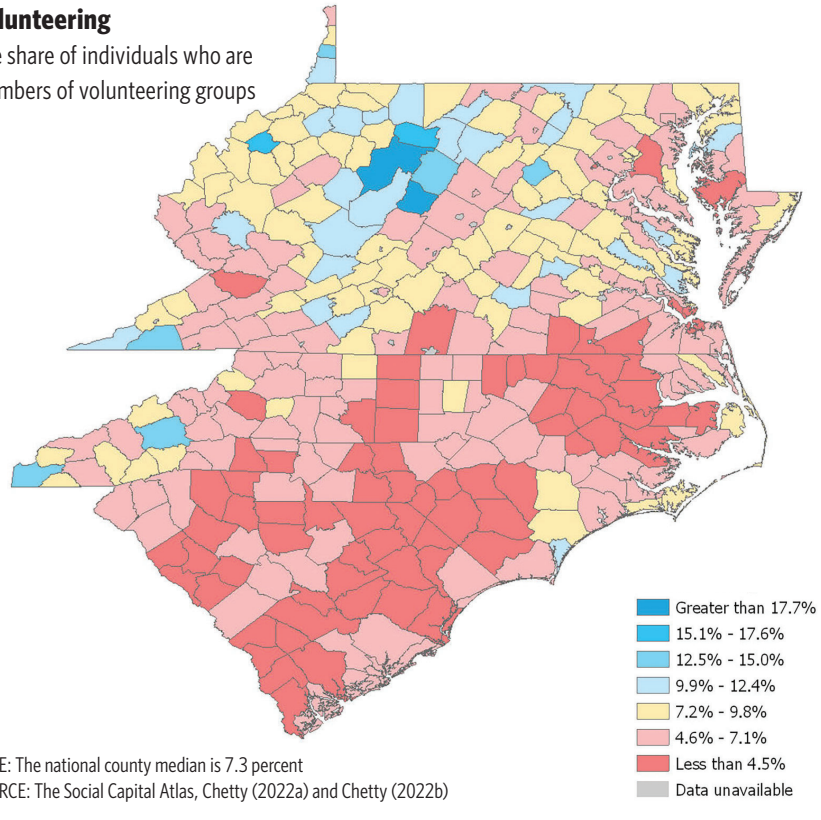
The researchers use these data to analyze the role that each form of social capital plays in economic mobility (defined as the average income in adulthood of children growing up in low-income families). Of the three types of social capital, they find that only economic connectedness is positively correlated with economic mobility. Chetty and his co-authors find that economic connectedness is a strong predictor of upward mobility even after controlling for poverty

Clustering
The share of an average individual's friends who are also friends with one another



NOTE: The national county median is 11.5 percent
SOURCE: The Social Capital Atlas, Chetty (2022a) and Chetty (2022b)

Volunteering
The share of individuals who are members of volunteering groups



NOTE: The national county median is 7.3 percent
SOURCE: The Social Capital Atlas, Chetty (2022a) and Chetty (2022b)

rates, income inequality, and racial segregation.

One explanation for this positive relationship is the influence of economic mobility on economic connectedness — ascending the socioeconomic ladder can lead to increased connections with high-SES individuals. To estimate the extent to which economic connectedness affects economic mobility, rather than the other way around, Chetty and his co-authors calculate connectedness scores for children in each county based on their parents' SES. They argue that economic connectedness scores for this population are not influenced by economic mobility because social connectedness formed in high school precedes workforce entry and the opportunity to advance economic mobility.

Chetty and his co-authors find evidence that economic connectedness may improve intergenerational economic mobility. In other words, children raised in counties where low-income individuals have more high-income friends then have higher incomes in adulthood on average. For example, individuals raised in low-income families in Minneapolis, where economic connectedness is high, have higher incomes when they are 35 years old than those raised in Indianapolis, where economic connectedness is low ($34,300 vs. $24,700). This research reveals the important role that social capital — specifically the type that connects low-SES individuals to high-SES peers — plays in helping people move out of poverty. **EF**

READINGS

Chetty, Raj, Matthew O. Jackson, Theresa Kuchler, et al. "Social Capital I: Measurement and Associations with Economic Mobility." *Nature*, August 2022a, vol. 608, no. 7921, pp. 108–121.

Chetty, Raj, Matthew O. Jackson, Theresa Kuchler, et al. "Social Capital II: Determinants of Economic Connectedness." *Nature*, August 2022b, vol. 608, no. 7921, pp. 122–134.

BY KARTIK ATHREYA

Why Do Bank Runs Happen?

The first half of 2023 has reminded us once again that banks are not immune from failure. In early March, Silicon Valley Bank (SVB) suffered a run on deposits and quickly collapsed. Its closure was followed by the failure of Signature Bank, a smaller bank, two days later. And even more recently, regulators exerted considerable effort to arrange the sale of First Republic Bank to a larger bank. The Fed was responsible for supervising and regulating SVB, and it recently issued its report examining what went wrong. I encourage you to take a look.

As the news is unsettling, it's worth taking some time to understand how bank runs happen. Doug Diamond, who is a longtime consultant at the Richmond Fed, and Philip Dybvig were awarded the Nobel Prize in economics last year for developing a model that sheds light on this question.

Their model tells us that banks can be seen as simultaneously doing two core things smartly for two groups of actors, savers and borrowers. It is anticipated that some savers, who can be firms or individuals, will need flexibility and hence need a place to deposit their cash and access it in case they have a sudden or unanticipated expenditure. Borrowers, on the other hand, often need financing for long-gestation projects – think capital investments for businesses or mortgages for homeowners. In normal times, banks provide intermediation, channeling savers' deposits to borrowers in need of long-maturity loans.

Diamond and Dybvig's model suggests value to deposit insurance, something that many societies have long instituted.

And this can all work: Since only a portion of savers are expected to need their cash quickly, those predictable withdrawals can be properly handled — just as with any insurance arrangement — as the bank can hold aside some liquid funds to meet those payment needs.

A problem arises, though: Can this all work when savers who do *not* have immediate liquidity needs withdraw their money simply because they think others will do the same? Plainly, no. The bank won't have all the cash because — and this is the idea — it parked the funds in the long-gestation projects. Also, should the bank call in the outstanding loans it made to the borrowers, those borrowers couldn't return the money quickly because it was tied up in those illiquid assets, ones that, if liquidated, would yield little value. (Think about "half a factory"; how much would you pay for that?!)

If this is the case, why put both functions under one roof? First, absent a run, this "banking" arrangement benefits everyone involved: The depositor who needs to withdraw early can actually enjoy part of the benefits that come from longer-maturity projects. There is risk sharing among depositors. Maturity transformation has social value. Two additional reasons are that first, banks can better monitor their borrowers and use this information to extend credit more cheaply, readily, and flexibly than more arms-length financing arrangements. Second, the inherent fragility of financing the long-term projects with deposits that can be withdrawn at a moment's notice may limit risk-taking in a bank's borrowing and lending practices.

Diamond and Dybvig's model suggests value to deposit insurance, something that many societies have long instituted. Once in place, there'd be no reason to fear a run — so long as "most" of a bank's deposits were indeed insured. Currently, the Federal Deposit Insurance Corporation insures individual deposits up to $250,000 per person per bank unless the government grants the failed bank an exemption that guarantees all their deposits.

But if savers with more than $250,000 deposited at smaller community banks feared that their money wouldn't be insured (or might simply become temporarily unavailable as the bank was wound down), what then? Run risk would remain, especially in the plausible case that they decide to move their money to larger banks they view as "too big to fail." (There is some evidence of this trend in recent months, although it has leveled off.) Unfortunately, if these depositors fled, the smaller banks would no longer be able to intermediate between savers and borrowers. That means tighter credit for those that rely on those banks for their long-term investment needs. And that would be problematic for the wider economy, given that the roughly 4,700 community banks across the country provide roughly 36 percent of all small business loans, and where smaller banks do a large share of all commercial real estate lending.

As for a solution to the more general problem of runs in banking, in the short run, extending the government's safety net can work to limit fears. But in the longer run, insuring more and more deposits isn't necessarily ideal, as it increases both the regulatory burden and banks' risk-taking incentives. So, more generally, avoidance of hard choices about which banks should be allowed to fail when depositors lose confidence will likely create expectations of greater public support of failing banks, with all the attendant distortions and pernicious incentives that come with it. **EF**

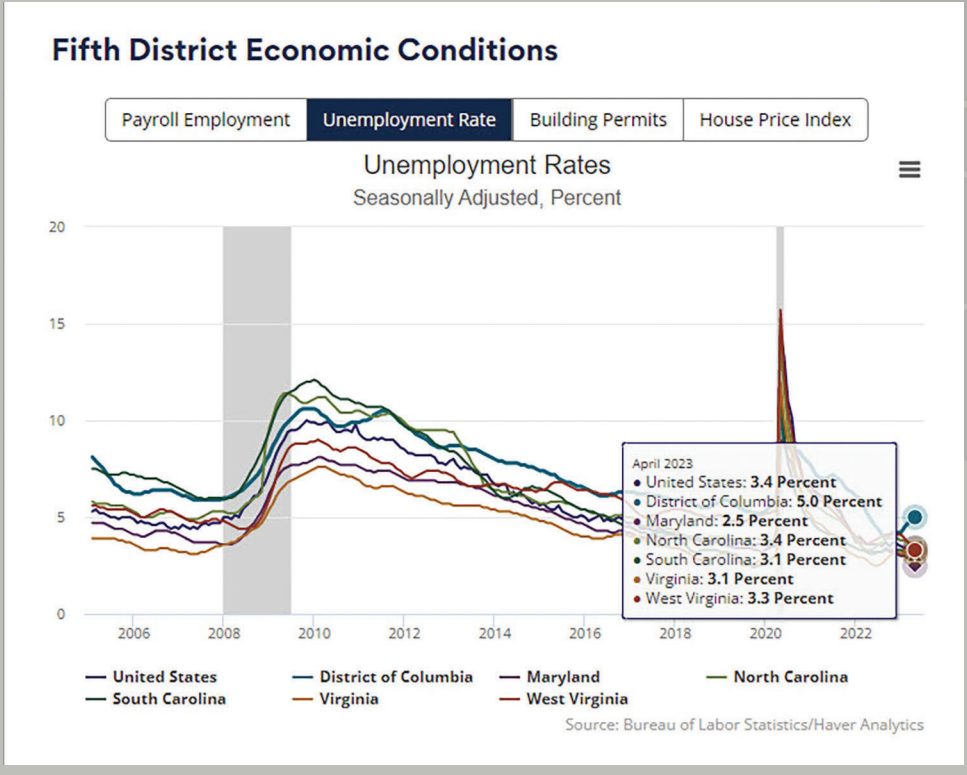
Kartik Athreya is executive vice president and director of research at the Federal Reserve Bank of Richmond.

Federal Reserve Bank
of Richmond
P.O. Box 27622
Richmond, VA 23261
Change Service Requested

To subscribe or make subscription changes, please email us at research.publications@rich.frb.org or call 800-322-0565.

Regional Economic Snapshot

Each month, the Richmond Fed releases an update on the economy — including analysis of the labor market, housing market, and more — at the state and metro level.



Explore interactive charts and detailed reports on our website, https://bit.ly/econ-snapshot