

SECOND/THIRD QUARTER 2019

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New thinking on the
global challenges



Workers' Shrinking
Share of the Pie

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Business Short-Termism and Monetary Policy

Complaints about short-term thinking by public companies have been with us for years. Policymakers and commentators argue that the pursuit of attractive quarterly results often takes precedence over building long-term value. As a consequence, companies might be cutting expenditures that could be important in the longer term, such as investments in research and development, marketing, or talent retention. There is evidence that these claims have merit — and that short-termism on the part of public companies has been increasing.

My former colleagues at McKinsey & Co. have conducted research on this issue over the years, and I've found it interesting to think about the implications of their findings in my current job. In a 2013 survey that McKinsey conducted of more than 1,000 C-suite executives and board members, three-fifths said that the pressure to generate strong short-term results had increased over the past five years. More recently, McKinsey researchers built a numerical index of short-termism based on financial data on 615 companies and found that it had risen markedly (though with some ups and downs along the way) since 1999. And in separate research at Duke University and the University of Washington, four-fifths of chief financial officers in a survey admitted that their companies had traded off long-term value in favor of short-term earnings.

Why do we see this behavior? Why do public-company executives seem to feel pressure from investors to focus on the short term?

One explanation may be the increasing role of activist shareholders, who acquire large ownership positions in public companies and, in many instances, press for short-term gains. By one estimate, the number of companies worldwide targeted with demands by activist investors increased from 607 in 2013 to 922 in 2018, more than a 50 percent increase.

Another factor could be the rise of firms' valuations and leverage. Both place downside pressure on public company executives, in an environment where potential acquirers (like private equity firms) are flush with capital.

CEOs have to be attentive, also, to the shrinking tenure of chief executive officers. The pressure from boards and markets is relentless; small wonder executives emphasize near-term performance.

Still another factor may be changes to executive pay that favor the use of performance-based compensation such as grants of stock and stock options. These are supported by the tax system but leave executives highly focused on the day-to-day performance of their stock.

I am not writing to advocate a policy response to

short-termism; that's a question for others, outside the Fed. But I do believe it's a part of the economic environment that monetary policymakers need to understand.

One notable macroeconomic effect of short-termism is that it could lead to underinvestment in areas such as research and development — and underinvestment hurts productivity growth. Some research shows that business investment has been low relative to measures of corporate profitability since the early 2000s; productivity growth has been slow over the same period.

Short-termism, in a low-rate environment, could create a bias in favor of mergers and acquisitions over organic growth. When a company embarks on building a new factory or adding to its sales force, it bears new costs right away, while the benefits only come later. In contrast, when the same company makes an acquisition, the one-time costs are written off and — if accretive — the benefits are visible immediately. This bias in favor of M&A can bring about greater market concentration and market power across the economy. And, in turn, greater market power could lead to lower productivity and pressure on prices, as I discussed in the Richmond Fed's most recent annual report.

Finally, short-termism makes business more sensitive to the sentiment of the moment. In principle, this greater sensitivity should be neutral in its economic effects over the long term as sentiment waxes and wanes. But corporate leverage has increased to historically high levels, and this leverage, combined with the long duration of the current expansion, may be causing firms to react more strongly to negative sentiment during this period, affecting hiring, investing, and pricing. Increased short-term focus may be making this reaction function more pronounced.

For all of these reasons, I watch short-term behaviors closely when thinking about monetary policy.

Thanks, and enjoy the issue.

EF



TOM BARKIN
PRESIDENT
FEDERAL RESERVE BANK OF RICHMOND





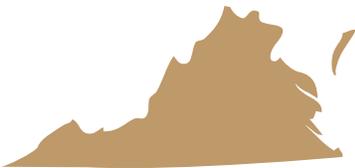
MARYLAND — In late July, Gov. Larry Hogan announced that the Port of Baltimore will be implementing a more cost-effective way to handle cargo thanks to a \$125 million federal grant. Maryland will partner with CSX to reconfigure the Howard Street Tunnel so that shipping containers can be double stacked for rail transport. This will ease bottlenecks, provide more direct routes, and increase annual throughput by about 100,000 containers. The project will create 7,000 construction jobs and roughly 7,400 jobs due to increased business at the port.



NORTH CAROLINA — Beginning in October, N.C. State will be the new headquarters of an agricultural research organization previously housed at Rutgers. The Inter-regional Research Project No. 4 (IR-4), funded in part by the U.S. Department of Agriculture, facilitates the registration of chemical pesticides and biopesticides for small-volume specialty food crops, including fruits, vegetables, herbs, spices, and some types of flowers. North Carolina has a wide range of specialty crops that account for more than 10 percent of the state's annual farm cash receipts, which some researchers say makes the state a logical home for IR-4. The move will take place over two years and will involve relocating the 27-person staff to Raleigh.



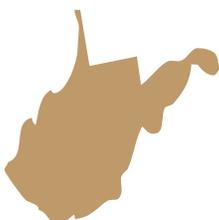
SOUTH CAROLINA — Starting this fall semester, Midlands Technical College in Columbia is offering a new scholarship program to residents of Richland, Lexington, and Fairfield counties pursuing certain manufacturing careers. The Pathways to Manufacturing Careers Scholarship offers full tuition for welding, mechatronics, machine tool, and basic electrical wiring academic programs as well as two training programs for welding and industrial electrical technicians. As part of the program, students can receive college credit for manufacturing courses taken in high school and will have access to internships and apprenticeships.



VIRGINIA — Virginia was named CNBC's top state for business for 2019; it is the fourth time in the 13 years of the list that the commonwealth has won the honor. CNBC cited factors such as a highly educated and STEM-heavy workforce, rising defense spending, and a minimal union presence as reasons for Virginia's win. CNBC's methodology measured 10 categories, including infrastructure, quality of life, access to capital, and cost of living, among others, to determine the rankings.



WASHINGTON, D.C. — The National Children's Museum will open in its new location in Federal Triangle in November, this time with a STEAM (science, technology, engineering, art, and math) focus. Incoming area resident Amazon has donated \$250,000 to develop a "Data Science Alley" installation that encourages data literacy; the donation will also fund free museum tickets for 200,000 low-income visitors. The museum, which closed its previous location in 2014, expects 500,000 visitors in its first year after reopening.



WEST VIRGINIA — The U.S. Department of Labor has awarded the West Virginia Development Office an \$803,000 grant to expand apprenticeships in the state. As of 2018, the state had 202 active apprenticeship programs serving about 4,000 apprentices. The state used a previous Department of Labor grant to draft a plan for increasing apprenticeships, and this new grant will put those plans into motion. The funds will be distributed in installments over a three-year period that began on July 1.

Banking, In and Out of the Shadows

BY JOHN MULLIN

Shadow banking encompasses a broad range of activities outside the traditional banking sector. Some of these activities are exotic and involve the creation of complicated special-purpose vehicles. But the bulk of the shadow banking sector is composed of more commonplace entities such as mutual funds and securities broker-dealers.

These institutions operate outside the safety net available to traditional banks, which includes deposit insurance and access to the Fed's discount window. In the absence of this protection, some shadow banks can be susceptible to runs — which occur when a bank's creditors attempt to withdraw more money than the bank can raise at that time by selling its assets. Indeed, the darkest hours of the financial crisis were marked by runs on Lehman Brothers (a broker-dealer) and the Reserve Primary Fund (a money market mutual fund) in September 2008.

The Financial Stability Board — an international body tasked with monitoring overall financial system risk — estimated that almost \$52 trillion in assets were held globally at the end of 2017 by nontraditional banks “involved in credit intermediation activities that may pose bank-like financial stability risks.” To put that number in perspective, it's well over half the amount of world GDP, which was roughly \$80 trillion in the same year.

While shadow banking is a concern in and of itself, it also raises important issues for the regulation of traditional banks, according to a study by Borys Grochulski of the Richmond Fed along with Yuzhe Zhang of Texas A&M University. Their research, published in the journal *Economic Theory*, suggests that the ability of market participants to shift assets from regulated banks into shadow banks can have important implications for bank liquidity regulation.

Grochulski, who joined the Richmond Fed in 2005, has done extensive research on public finance and optimal contracts. Some of the recent applications of his work have included studies of personal bankruptcy regulation and Social Security. His interest in optimal banking regulation was piqued by the global financial crisis, which broadened the recognition that under-regulated financial markets are potentially unstable.

“This gives rise to a natural impetus to regulation,” says Grochulski. “But one limit to regulation is that it has not been achieved in a globally unified framework, and there is competition among jurisdictions for regulating more lightly. Take the Cayman Islands, for example. Our article explores the limits placed on U.S. regulators by the lack of international regulatory coordination.”

The article builds on the Diamond-Dybvig maturity-mismatch model — a framework that is a long-standing

staple among economists for analyzing bank runs and liquidity regulation. A key feature of the framework is that banks desire the liquidity associated with short-term investments but also want the higher returns associated with longer-term, relatively illiquid investments. In the model's initial period, a bank must choose how to allocate its portfolio between short-term and long-term investments with the knowledge that, in a later period, it may be hit with a “liquidity shock” that forces it to sell its longer-term investments in a secondary securities market. Another key feature of the model is a lack of full transparency: Only a bank itself knows whether it has been hit by a liquidity shock, and secondary-market trading is anonymous.

In Grochulski's model economy, banks' ability to trade anonymously in the secondary market creates a “pecuniary externality.” An individual bank does not bear the cost of the effect of its trading on other banks. The externality drives a wedge between the market (or *laissez faire*) equilibrium and the socially optimal outcome. This inefficiency gives rise to a role for regulation.

In the absence of shadow banking, one optimal liquidity regulation consists of a tax on the illiquid asset and a subsidy on the liquid asset. (The latter can be thought of as interest on bank reserves.) This tax-subsidy combination tilts the asset allocation trade-off faced by banks in favor of more liquid assets. That, in turn, decreases the supply of illiquid assets in the secondary market and thereby increases their price.

Grochulski models shadow banking as an arbitrage-seeking activity. The shadow banking sector gives banks an alternative to the regulated banking sector. By shifting to the shadow sector, a bank escapes regulation but loses the benefits associated with the government safety net. In this setting, a regulated bank's incentive to shift activity to the shadow sector increases steeply with the secondary-market price of the illiquid asset. As a consequence, optimal liquidity policy changes with the introduction of shadow banking. In particular, Grochulski and Zhang found, the optimal tax and subsidy rates need to be reduced in order to reduce the secondary-market price of liquid assets and thereby limit the incentive for regulated banks to shift activity to the shadow banking sector.

For the researchers, this finding strongly suggests that bank regulators need to take shadow banking into account when designing optimal liquidity policy. In their words, “the option to move assets from regulated banks into shadow banks can potentially render bank liquidity regulations ineffective.”

EF

Do Budget Deficits Matter?

Some economists and policymakers have argued for increasing public spending. What might that mean for inflation and monetary policy?

BY TIM SABLİK

Whenever politicians propose a new project, a common question from opponents is: How are you going to pay for that? According to the standard view of government finance, any shortfall in tax revenue relative to expenses must be made up by borrowing. Over the last decade, the United States has borrowed a lot: Federal debt as a share of GDP is currently 79 percent, its highest level since World War II ended, and most forecasters predict that the debt will reach previously unseen heights over the coming decades. Annual deficits are set to exceed \$1 trillion very soon, according to the Congressional Budget Office. While that would be a record in dollar terms, deficits as a share of GDP are still within historical norms for now. (See chart.)

Nevertheless, some policymakers have voiced concern that mounting debt levels will constrain the government’s ability to borrow in the future. For example, Fed Chair Jerome Powell called the current debt path “unsustainable” during congressional testimony in February. Other prominent economists, including Lawrence Summers of Harvard University and Olivier Blanchard of the Peterson Institute for International Economics, have argued that the United States could and should actually borrow more. This view rests on the fact that the United States’ economic growth rate currently exceeds the interest rates on debt. If that persists, it should be possible for the United States to increase its borrowing without significant cost, as the economy will grow faster than the interest cost required to service the debt.

“My sense, having explored the issues analytically and empirically, is that, given the current configuration of growth rates and interest rates, most advanced countries have debt far below the likely critical level,” Blanchard said via email.

How much does the U.S. government need to worry about balancing its budget? The answer may have implications for the Fed’s ability to pursue stable inflation through monetary policy.

Balancing the Budget

The government’s budget has sometimes been compared to a household budget. In order to make room for something new, the government either needs to get rid of some existing spending or bring in new revenue.

But economists have long recognized that there are some important differences between the budgets of households and those of nations. Households must repay what they owe over their finite lifetimes. This places limits on how much they can repay and, thus, on how much creditors are willing to lend them.

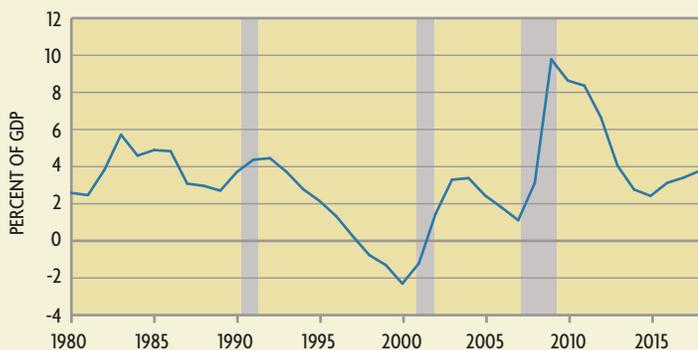
In contrast, a nation-state’s lifespan has no clear upper bound. While governments must repay what they owe over the long run, for a nation with a stable system of government, the long run could be far, far in the future. In the meantime, the government only needs to make interest payments on its debt to satisfy bondholders, which it can do without raising tax rates as long as the economy is growing at a faster rate than interest is accumulating on the debt (as Summers and Blanchard have argued).

But the type of debt a government issues affects how much it can borrow. For much of history, governments tied their currency to some commodity, most commonly gold or silver. Any time the government issued debt denominated in its commodity-backed currency, it was in effect pledging to pay bondholders some real resources in the future. If bondholders decided they wanted gold instead of dollars when redeeming Treasury securities, for example, the government had to supply the gold from its reserves or raise taxes to purchase the gold needed to pay bondholders.

Today, of course, the dollar is no longer tied to gold. President Roosevelt ended the gold standard with respect to private citizens in 1934, and President Nixon did so with respect to foreign governments in 1971. Most U.S. debt today represents a nominal claim to some number of dollars in the future rather than a claim to a commodity

Tracking Federal Borrowing

U.S. Federal Deficit as a Share of Gross Domestic Product



SOURCE: U.S. Office of Management and Budget via Federal Reserve Economic Data (FRED)

like gold. (The U.S. Treasury does also issue debt that is indexed to inflation. But these inflation-indexed bonds make up only about 9 percent of outstanding federal debt held by the public.) Some economists have argued that this change means the government does not face a budget constraint in the same way it did under the gold standard.

“If we are talking about nominal debt, it is not a constraint. It’s just an equilibrium condition that determines what the value of debt is,” says Eric Leeper of the University of Virginia.

Leeper is one of a handful of macroeconomists who have advanced a theory that the government’s fiscal behavior ultimately drives the value of debt and money more generally. According to this theory, prices are equal to the ratio of current nominal debt relative to the expected present value of future surpluses. If the government issues more debt but promises to repay it with higher taxes or reduced spending in the future, then prices will remain unchanged. But if the government issues new debt and makes no commitment to repayment, then prices will go up as people seek to exchange debt (including currency, another kind of government liability) for other goods.

“A constraint means that if you sell one more dollar of debt, then you have to raise taxes,” explains Leeper. “But if it’s nominal debt, then the value of that debt can adjust to be consistent with whatever taxes are currently in place.”

John Cochrane of the Hoover Institution has used the example of corporate stock to make a similar argument. At a simplified level, the value of a company’s shares are proportional to the company’s expected future earnings. If the company doubles the amount of its shares without changing expectations about its future profitability, such as through a stock split, share prices will fall by half. Likewise, he argued, if the government issues more debt with no change in expected future revenues, the value of the debt, and the value of currency in general, will fall.

Adopting Constraints

In order to prevent inflationary spending, modern governments have adopted commitment devices to help ensure that public spending remains roughly balanced over the long run. One way of making such a commitment is assigning an independent central bank the responsibility of maintaining price stability.

In the United States, the Fed steers long-run inflation via monetary policy. While macroeconomists and monetary policymakers recognize that there are many factors that can influence the level of prices over the short and long haul, they largely agree that monetary policy has the ability to influence long-run inflation independent of other factors in the economy.

But according to the theory proposed by Leeper and Cochrane, monetary policy can only steer inflation as long as fiscal policy keeps the ratio of current debt and expected future surpluses constant. In other words, as long as the debt is viewed as sustainable, the Fed can use

monetary policy to guide inflation toward its 2 percent target. But if fiscal policy spends beyond what markets view as sustainable in the long run, prices and interest rates may adjust in ways that the Fed cannot fully control.

By assigning the Fed independent responsibility for maintaining price stability through monetary policy, the government has in effect committed to conducting fiscal policy in a way that markets view as sustainable. This is similar to the commitment under the gold standard, where the government pledged to offset any increase in debt with an increase in gold reserves in the future. Neither commitment is fully binding, since governments can and have set aside both pledges.

It is also theoretically possible for fiscal policy to set both spending and inflation targets. A relatively new school of thought known as Modern Monetary Theory (MMT) has argued that U.S. government borrowing shouldn’t be constrained by self-imposed debt limits or future revenue. Rather, the primary consideration should be whether or not that spending will be inflationary, which MMT says has nothing to do with the government’s budget.

“The government could always issue more debt,” says L. Randall Wray of the Levy Economics Institute of Bard College, one of the chief proponents of MMT.

In order to finance spending, MMT holds that the government could simply issue more short-term debt or have the central bank create new reserves. If there are not enough resources for the projects the government is trying to undertake, Wray says such spending will produce inflation. The government would then have to decide whether to accept higher inflation, cut back on spending, or attempt to constrain inflation in other ways. These could include wage and price controls or tax hikes to reduce private consumption of resources, says Wray. But he and other advocates of MMT are optimistic such steps wouldn’t be necessary.

“I can understand the fear that if politicians knew that the federal government does not face an external financial constraint, then they would try to spend too much,” says Wray. “But I don’t think there is any evidence for that.”

But critics argue that removing restrictions on fiscal policy, such as borrowing limits or an independent central bank, has historically led to an inflationary increase in spending in other countries — sometimes spectacularly so.

Cautionary Tales

In a recent working paper, Sebastian Edwards of the University of California, Los Angeles argued that fiscal expansions similar to what MMT calls for have already been tried in various Latin American countries, such as Chile, Peru, Argentina, and Venezuela. In each case, Edwards says that the government increased spending on new social programs by issuing more debt and through easy money policies implemented by the central bank.

“It resulted in huge, awful crises,” says Edwards. He found that the experiments generally started off successfully, but eventually bottlenecks began to appear,

leading to inflation. Once inflation pressures emerged, they proved difficult to stop.

“When inflation takes over, people ditch the domestic money. They don’t want to hold it,” says Edwards. “Domestic money becomes a hot potato, and people use foreign exchange, IOUs, or something else as money.”

A native of Chile, Edwards experienced this firsthand. Following an expansion of public sector spending in the early 1970s, Chile’s annual inflation rate grew to more than 500 percent in 1973. By comparison, annual inflation in the United States during the Great Inflation peaked at just shy of 15 percent in 1980 and still generated substantial economic disruption.

Edwards notes that, like advocates of MMT, policymakers in Chile and other Latin American countries voiced opposition to excess inflation prior to embarking on fiscal expansion. Once inflation pressures emerged, they implemented wage and price controls and raised taxes in attempts to contain rising prices, but those measures were unsuccessful. Once policymakers removed constraints on issuing debt and currency, it became difficult to maintain a stable value for money.

An oft-cited 1982 article by Nobel Prize-winning economist Thomas Sargent of New York University provides more examples. Sargent examined the inflation experiences of Hungary, Austria, Poland, and Germany after World War I. Each country confronted economic disruptions and significant debts in the aftermath of the war. Their governments responded by issuing new debt paid for by printing money. The resulting hyperinflations ended only after the governments implemented changes to balance their budgets and established independent central banks that were prohibited from monetizing future debt. Once those commitments were in place, Sargent found that inflation ended abruptly despite the fact that the money supply in each country continued to expand.

“It was not simply the increasing quantity of central bank notes that caused the hyperinflation,” Sargent wrote. “Rather, it was the growth of fiat currency which was unbacked, or backed only by government bills, which there never was a prospect to retire through taxation.”

Wray argues that the episodes in postwar Europe and in Latin America don’t apply to MMT’s prescriptions because the debts faced by those countries were not denominated in their own currencies. Germany’s debts in the Weimer Republic were tied to gold and Argentina’s debts were denominated in dollars, for example, imposing real constraints on their ability to repay that the United States doesn’t face.

Still, in the view of mainstream macroeconomists, such episodes suggest that when spending becomes disconnected from expectations about future revenues, inflation follows, regardless of the type of debt.

Spending More

To be sure, large fiscal expansions don’t need to result in inflation. Many economists have pointed to the case of Japan, which has a debt-to-GDP ratio surpassing 200 percent but has experienced very little inflation over the last two decades. But while Japan has engaged in substantial fiscal expansion designed to boost its economy, it has also increased its consumption tax at the same time. This signals that spending increases are backed (at least in part) by future revenue surpluses. Indeed, when asked if Japan’s policies served as an example of MMT’s prescriptions, Bank of Japan Governor Haruhiko Kuroda argued that they didn’t because the Japanese government “believes it’s important to restore fiscal health and make fiscal policy sustainable.”

There also may be times when generating inflation by committing to being “fiscally irresponsible” can be useful. In a paper with Margaret Jacobson of Indiana University and Bruce Preston of the University of Melbourne, Leeper examined President Franklin Roosevelt’s response to the Great Depression. Starting in 1933, Roosevelt took the United States off the gold standard and ran “emergency” government deficits that he pledged not to repay until after the economy had recovered. This “unbacked” fiscal expansion boosted economic activity and inflation at a time when the United States was experiencing deflation. But Leeper acknowledges that pulling off something similar today would be difficult.

“Roosevelt had to get fiscal expectations anchored in the right way,” he says. “During the Great Recession, Obama also enacted a fiscal stimulus, but within a week after the package passed, he was promising to raise surpluses and reduce the deficit. And that’s because the politics have changed.”

Even if modern-day policymakers succeeded in changing the public’s expectations about fiscal policy, those expectations may be difficult to change back if things don’t work out as planned. That may be why many governments have chosen to signal their intentions to balance budgets in the long run and charged independent central banks with keeping inflation steady.

“What the episodes in Latin America showed is that it is very difficult to fine-tune or stop the inflation process,” says Edwards. “Now, that isn’t a universal law like gravity, but the evidence tells us that we should be careful.” **EF**

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The Making of Star Economists

BY TIM SABLİK

Every January, hundreds of newly minted economics Ph.D.s travel to the annual Allied Social Sciences Association (ASSA) meeting to engage in a whirlwind of interviews and presentations. (See “Scrambling for Economists: The Ph.D. Job Search,” *Econ Focus*, Fourth Quarter 2015.) Only a handful of these job-seekers land jobs at the most prestigious research institutions. In a recent article in the journal *Economic Inquiry*, titled “Young ‘Stars’ in Economics: What They Do and Where They Go,” Kevin Bryan of the University of Toronto investigated which new economists rise to the top of the entry-level job market. In other words, what makes a young economist a star?

Bryan defined stars as those job candidates who attract a high level of attention from academic employers. After the ASSA meeting, academic departments seeking to hire economists invite their top picks to present a seminar on their research and meet with their potential colleagues — an occasion known as a “flyout.” Bryan classified the candidates who get a certain number of flyouts, weighted by the prestige of the institution extending the invitation, as stars. Using this criterion, he examined data on flyouts for young economists between 2013 and 2018. Of the more than a thousand economics Ph.D.s awarded each year during that period, Bryan identified 226 stars.

One potential problem with using academic flyouts as a metric for star power is that it may overlook promising young economists who forgo academic work and instead go straight into the private sector. Reserve Banks, companies, and other nonacademic employers also conduct interviews at the ASSA meeting and post jobs alongside academic employers. As a result, many candidates apply for both academic and private sector jobs at the same time. Thus, Bryan argues that even star economists who choose the private sector are still likely to apply to and attract attention from top academic employers.

As it turns out, entry-level stars overwhelmingly choose employment in academia. Bryan found that nearly half of the stars took a job at one of the top 15 economics departments in the United States as ranked by the 2018 *U.S. News & World Report*. Another 21 percent took a job at a top 10 U.S. business school. All told, 86 percent of the stars in Bryan’s sample took a job in American academia. In contrast, only one candidate out of the entire 226 took a temporary position in the private sector, and that individual later returned to academia.

Other studies suggest that new economics Ph.D.s as a whole are more likely than stars to take a private sector job, and the embrace of economists by the private sector seems to be increasing. (See “The Technologist

in the Machine,” *Econ Focus*, Third Quarter 2015.) In a 2014 article in the *Journal of Economic Education*, Wendy Stock of Montana State University and John Siegfried of Vanderbilt University found that the share of new economists who accepted jobs in the private sector was higher in 2011 than in 1997 and the share employed in academia was lower. Bryan’s research suggests that top economics talent does not seem to be following the same trend.

Just as many new stars end up working in top economics departments, they also tend to come from top departments. Nearly half of the stars in Bryan’s sample earned their Ph.D.s at one of five American universities — the Massachusetts Institute of Technology, Harvard University, Princeton University, Yale University, or Stanford University. Including another six top schools increases the share of stars to nearly 85 percent. Nearly all stars also have an undergraduate degree in economics or some technical field such as math, statistics, or engineering.

One trait that might seem predictive of star power, publishing papers while in school, does not seem strongly correlated with higher job prospects. Bryan found that about half of the stars in the sample did not publish a paper while in school. For those who did publish, their papers tended to be theoretical rather than empirical.

Bryan’s study also suggests that the gender imbalance present in economics generally is even more pronounced at the top. He found that stars are overwhelmingly male: In 2018, less than 17 percent of stars were women. This is even lower than the roughly 30 percent of women who pursue econ Ph.D.s each year on average. These low numbers have sparked a debate in the profession about potential barriers for female economists. (See “Where Are the Women?” *Econ Focus*, Second Quarter 2013.)

The fact that many of the stars who go to work in top departments graduated from top departments could raise concerns about academic “inbreeding.” Bryan examined this and found that very few stars in his sample take a job at the same institution where they earned their Ph.D.s — only around 2 percent. But he cited other studies that note that a higher share of faculty at top economics departments come from top departments than in other fields such as math or literature.

Addressing these concerns, Bryan noted that “to whatever extent social closure or other forms of irrational path dependence restrict the entry and diffusion of potentially important new researchers, we ought to be especially concerned about the process by which the next generation of gatekeepers is chosen.” **EF**

Central Banks and Climate Risks

Some researchers look at climate change and see economic uncertainty. Central banks are beginning to take notice

By Molly Harnish

Temperatures are rising. The National Academy of Sciences estimates that global average surface temperatures have risen by 0.8 degrees Celsius (1.4 degrees Fahrenheit) since 1900. According to data from the National Oceanic and Atmospheric Administration (NOAA), the National Air and Space Administration (NASA), and the climate research center Berkeley Earth, global surface temperatures in the past 40 years have consistently surpassed the 1951-1980 average. (See chart.)

This is not the first time global temperatures have risen. Long-run global temperatures have fluctuated historically, from the high temperatures of the Medieval Climate Anomaly (950-1250 A.D.) to the low ones that characterized the Little Ice Age (1450-1850 A.D.). In addition,

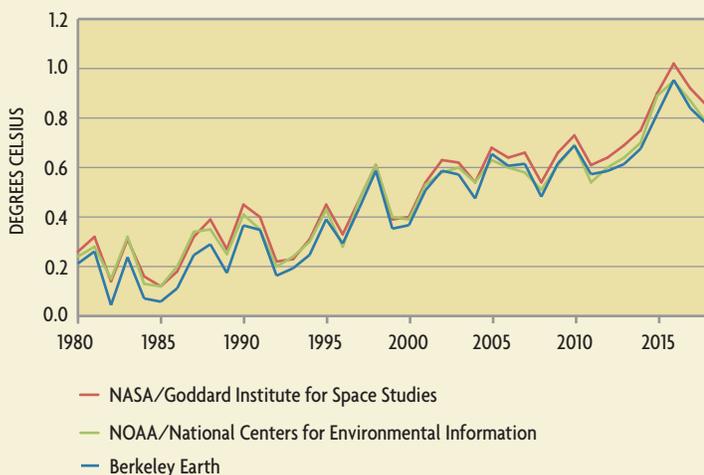
the pace of warming slowed significantly from 1998 to 2012, which climate scientists at NOAA hypothesize was a result of natural climate fluctuations allowing the deep oceans to absorb more excess heat. Yet since 2012, the pace of temperature increases has picked up again, with 2016 holding the title of the warmest year on record.

While some dispute the claim that humans are responsible for the higher temperatures, a recent study found that upward of 90 percent of published climate scientists attribute most of the recent warming to human activities. These activities include burning fossil fuels, which emit greenhouse gases (GHGs). According to the Environmental Protection Agency, global atmospheric concentrations of GHGs such as carbon dioxide, methane, fluorinated gases, and nitrous oxide have increased over the last few centuries. Climate scientists hypothesize that these gases contribute to higher temperatures by absorbing heat, preventing it from escaping Earth's atmosphere. The Intergovernmental Panel on Climate Change estimates that human-caused global warming is increasing by 0.2 degrees Celsius per decade and warns that consequences of continued warming include more frequent and intense precipitation in some regions and more frequent and intense droughts in others, as well as hotter extreme temperatures and rising sea levels.

These changes have led policymakers and economists to examine what climate change may mean for communities, governments, and the economy. More than 3,000 economists recently signed a statement in support of a carbon tax (see sidebar), and a leading finance journal hosted two conferences in 2017 and 2018 to promote research on the financial risks related to climate change. And as the discussion surrounding climate change heats up, central banks around the world are attempting to understand and prepare for its potential risks.

Global Temperatures Are Rising

Estimates of global surface temperature relative to 1951-1980 average



NOTE: Chart shows estimated temperature anomalies relative to base period. An increase of 1 degree Celsius is equivalent to an increase of 1.8 degrees Fahrenheit.

SOURCES: NASA/GISS, NOAA/NCEI, and Berkeley Earth

Challenges to Economic Growth

In a recent article, Riccardo Colacito of the University of North Carolina, Bridget Hoffmann of the Inter-American Development Bank, and Toan Phan of the Richmond Fed found that rising temperatures are associated with reduced economic growth. They analyzed temperature and output growth by season and industry, finding that for every 1 degree Fahrenheit increase in the average summer temperature, the annual growth rate of state-level output decreases by 0.15 to 0.25 percentage points on average. When combined with future temperature projections, their findings indicated that U.S. economic growth could decrease by as much as one-third over the next hundred years if this association continues.

Rising temperatures could influence growth through several different mechanisms. In their article, Colacito, Hoffmann, and Phan pointed to reductions in the growth rate of labor productivity as one such mechanism, citing previous research as well as their own data. Phan suggests that changes in labor productivity alone can't explain their findings, however.

“One potential mechanism could be hotter summer temperatures coming along with more intense disasters like heat waves or wildfires,” Phan says. “The effects of disasters can be twofold. If disasters damage physical capital or crops or property, that’s one immediate channel. Another channel is through making people more attentive to future risk, which is reflected in asset prices.”

He points to a working paper by Piet M. A. Eichholtz of Maastricht University, Eva Steiner of Cornell University, and Erkan Yönder of Concordia University. These authors examined commercial real estate prices after Hurricane Sandy, which hit New York City in 2012, and found that the prices of properties exposed to flood risk appreciated more slowly after Sandy than they did in regions unaffected by flood risk. Remarkably, this trend held not only in New York, but also in Boston, which experienced no physical damage from Sandy. The authors argued that this effect can be explained by a persistent increase after Sandy in the salience of flood risk to investors in coastal areas of Boston.

Taxing Away the Problem

In January 2019, more than 40 economists, including 27 Nobel laureates and four former Federal Reserve chairs, signed the Economists’ Statement on Carbon Dividends. The statement calls for a tax on carbon dioxide emissions to combat what it describes as the “serious problem” of global climate change. This tax would increase annually and replace “cumbersome regulations,” and its revenues would be redistributed to U.S. citizens. More than 3,500 economists have signed the statement since its publication.

The economic logic behind a carbon tax is simple. A majority of published climate scientists believe that human activities, namely emissions of carbon dioxide and other greenhouse gases (GHGs), are primarily responsible for recent global warming. But this cost to society as a whole is not factored into the private cost of GHG emissions, making those emissions an externality.

Almost 100 years ago, the economist Arthur Pigou argued that taxing an externality at the amount equivalent to its marginal social cost would “internalize the externality” by equating marginal social and private costs. By Pigouvian logic, taxing emissions of CO₂ and other GHGs would ensure that the price of those emissions reflected their social cost. In theory, this tax would also encourage firms to transition from carbon-intensive to carbon-neutral technologies and energy sources. And it wouldn’t just tax carbon dioxide emissions: Other GHGs, such as nitrous oxide and methane, are also included under the umbrella of a “carbon tax.”

But the question of how to move from theory to practice is far from settled. The first area of disagreement is the dollar value of the externality, known as the

social cost of carbon (SCC). That amount depends on the discount rate: the interest rate used to determine the present value of future benefits. A higher discount rate indicates a lower value placed on future benefits and a lower SCC. Choosing this rate is difficult, especially since it requires answering the ethical question of how much the present generation’s welfare is worth relative to that of future generations.

Some economists also argue that a national carbon tax alone will not be enough. Joseph Stiglitz, 2001 Nobel laureate, wrote in a 2019 National Bureau of Economic Research working paper that because the market is imperfect, optimal climate policy will include other interventions in addition to a carbon tax, such as regulations and differential pricing. William Nordhaus argued in his Nobel Prize lecture last year that because climate change is a global externality, any policy designed to remedy climate change requires international cooperation. Without it, each nation has little incentive to tax CO₂ emissions, because other nations will enjoy most of the benefit while the emission-taxing nation bears all of the cost.

As of 2018, despite these differences over optimal policy, 45 national governments have carbon tax initiatives. In the United States, however, the adoption of carbon taxes has made little headway. Washington state attempted to implement one in 2016, but voters rejected it, in part because environmental groups opposed the bill’s proposal to redistribute the revenue to businesses and consumers. Instead, they wanted to use the revenue to support green infrastructure projects and help low-income communities.

— MOLLY HARNISH



Some economists contend that climate change imposes physical and transition risks on the financial system, threatening its stability.

In addition to their aggregate findings, Colacito, Hoffmann, and Phan analyzed the influence of rising temperatures on output growth at the industry level. They found that higher summer temperatures negatively affected most industries, even those where most work takes place indoors. The most negatively affected sector was, as it happens, the so-called FIRE sector: finance, insurance, and real estate. For central banks, especially those specifically tasked with maintaining financial stability, this result is especially relevant. But how exactly could climate change affect the financial system?

Is Financial Stability at Risk?

Some economists contend that climate change imposes physical and transition risks on the financial system, threatening its stability. In a January 2018 working paper, Sandra Batten, senior economist at the Bank of England, wrote that physical risks arise from a combination of adverse climate-related events and systemic vulnerabilities. These risks, she argued, include both demand- and supply-side shocks to the financial system. For example, on the demand side, rising sea levels might decrease demand for coastal homes, while on the supply side, changes in precipitation patterns could affect crop yields. Climate change may also shift investment patterns by diverting resources to adaptation investments instead of the productive investments that would have been made otherwise.

Extreme weather events, such as droughts, wildfires, and hurricanes, are often named as key sources of physical risk. A recent article in the *Journal of Financial Stability* by Jeroen Klomp of Wageningen University & Research in the Netherlands supports such a connection. In an analysis of data on commercial banks from over 160 countries, Klomp found that natural disasters are associated with a higher likelihood of bank default, although not of system-wide crisis. The extent of climate change's influence on natural disasters, the study of which is known as event attribution, is an active area of research. A 2016 report by the National Academies of Sciences, Engineering, and Medicine indicates that scientists are most certain when attributing extreme heat and cold, drought, and precipitation to climate change, since these can be directly traced back to temperature changes. Scientists are less confident, however, about the extent of climate change's impact on extratropical cyclones, wildfires, and severe convective storms.

In a recent publication, Glenn Rudebusch, senior policy advisor and executive vice president at the San

Francisco Fed, included extreme weather events as one source of future climate-related economic transformation. Rudebusch wrote that an increase in the frequency and severity of extreme weather events, as well as higher temperatures and other consequences of climate change, could adversely affect the economy and financial system by reducing business profitability and asset values, disrupting operations, damaging infrastructure, and weakening labor productivity.

“I think of climate change as a problem multiplier, even where it's not the sole cause. For example, we've always had hurricanes, but a changing climate is going to exacerbate them — and the same is true for economic insecurity and inequality,” Rudebusch says.

Along with physical risks, some economists also note the transition risks from a shift toward low-carbon energy sources. In a 2016 report for the German Federal Ministry of Finance, Martin Stadelmann of the South Pole Group, a Swiss consulting firm in the area of climate finance, and Viola Lutz, now at Institutional Shareholder Services, wrote that transition risks present a much greater threat to financial stability than physical risks. Batten wrote that, were emissions-reduction policies to be implemented, short-term output would likely fall as carbon-intensive firms adjust. In fact, some estimates of global losses from transition risks are as high as \$20 trillion. And transition risks could also affect monetary policy. In a 2018 speech, Benoît Cœuré, a member of the Executive Board of the European Central Bank (ECB), indicated that a transition to low-carbon policies would affect relative energy prices. He said that this, in turn, could shift inflation expectations, which are directly relevant to monetary policy.

George Economides and Anastasios Xepapadeas of the Athens University of Economics and Business modeled the impacts of climate change on monetary policy in a 2018 working paper. They found that climate change presents shocks to total factor productivity, a measure of how efficiently an economy uses its labor and capital inputs. This means that in the presence of climate change, economic fluctuations tend to be both longer and more frequent than in its absence. But a decrease in output resulting from these shocks also decreases demand for fossil fuels, which boosts productivity by slowing the pace of temperature increases. Finally, they found that while a carbon tax curbs short-run output, it increases long-run output. Their findings indicate both physical and transition risks from climate change and policy.

What We Don't Know Could Hurt Us

Another key feature of climate change is uncertainty about its extent and its economic effects. One area of uncertainty is the extent of temperature increases and the probability of catastrophe. Martin Weitzman, an economist at Harvard University who passed away in August, researched “fat tail” probability distribution functions, in which catastrophic climate change — and thus, catastrophic economic

damage — is more likely than is typically assumed in climate models. In a 2011 article, Weitzman argued that, because of the lack of substantive historical data on past catastrophes, it is possible that extreme events are more likely than most models assume. He concluded that cost-benefit analyses of climate change should incorporate this structural uncertainty.

“A fat-tailed model increases tail risk generally. There’s more weight in the tails relative to what’s expected,” Weitzman told *Econ Focus*. “The huge problem is that nobody knows the probability or consequences.”

Uncertainty also affects models of climate change’s economic impact. Economists commonly use integrated assessment models (IAMs), which feature both climate science and economic modules, to analyze this issue. The climate science modules project future GHG emissions and resulting global temperatures, while the economic modules estimate the economic consequences of unmitigated climate change and the costs and benefits of emissions-reduction policies. In a 2013 article, Robert Pindyck, a professor at the Massachusetts Institute of Technology, identified significant flaws in these models. First, because they are calibrated only to small temperature increases, they are not informative about the economic effects of a climate catastrophe such as an extreme rise in temperature. Second, they rely on arbitrary constructions of the damage function, an element of the model that estimates economic losses from climate change. Because of these flaws, Pindyck argued, “IAMs are of little or no value for evaluating alternative climate change policies.” In a later op-ed, he noted that his critique is an argument not against taking action but for improving the models in order to better guide that action and imposing a carbon

tax as a form of insurance in the meantime.

Yet another source of uncertainty is how well societies will adapt to climate change, which could offset some of its downside risks. Stadelmann and Lutz suggested that while large storms could raise insurance premiums, the insurance sector’s ability to gradually adjust those premiums could allow it to adapt fairly well to climate change in the short to medium term. This could change in the long term, though, especially if temperatures increase by more than 2 to 3 degrees Celsius. In that case, Stadelmann and Lutz wrote, there is too much uncertainty to reject the possibility of more severe systemic effects. In her paper, Batten gave several examples of adaptation efforts, including investing in physical capital to accommodate new temperature and weather patterns and innovating GHG-removal technology. Adaptation might also entail planting more heat-resistant crops, updating infrastructure in order to better withstand floods, or enacting transition policies such as a carbon tax.

Still, some researchers and officials argue that uncertainty alone does not remove the need for action. “If anything, standard economic theory points us to the fact that when uncertainty rises, we insure against the worst-case scenario,” Phan says.

Central Banks’ Response

In 2015, Mark Carney, governor of the Bank of England, deemed climate change “the tragedy of the horizon.” He warned that “once climate change becomes a defining issue for financial stability, it may already be too late.” Four years later, central banks are beginning to incorporate climate-related risks into their economic forecasts. Some are even taking policy steps to mitigate those risks. (See table.)

Central Banks Are Preparing for Climate Change

Selected responses of central banks to potential climate-related risks

Bank	Actions
Bank of England	Plans to perform stress tests for resilience to climate change’s physical and transition risks by 2021, expects regulated insurers and banks to have plans for managing climate-related financial risks, and established the U.K. Climate Financial Risk Forum, which includes private- and public-sector partners
Banque de France	Published its own climate-related risk exposure and evaluates the financial sector’s exposure to climate-related risks with the help of the French Prudential Supervision and Resolution Authority
People’s Bank of China	Issued the first guidelines for green finance (defined as the use of financial services that support environmental improvement and climate change abatement efforts), created the Green Finance Study Group at the 2016 G-20 summit, and established five “pilot zones” throughout China for green finance initiatives
Banco de Mexico	Analyzing measures to better diagnose and communicate the risks posed by environmental factors, including climate change, to the financial system
Deutsche Bundesbank	Assesses the financial system’s ability to respond to physical and transition risks of climate change
Monetary Authority of Singapore	Incorporates climate-related risks into stress tests and encourages implementation of the recommendations of the Financial Stability Board’s Task Force on Climate-related Financial Disclosures (TCFD)
De Nederlandsche Bank	Has asked insurers and banks to evaluate climate-related risks in their risk assessments

NOTE: Includes all central banks that were founding members of the Network of Central Banks and Supervisors for Greening the Financial System

In December 2017, a group of central banks and other institutions founded the Network of Central Banks and Supervisors for Greening the Financial System (NGFS). Today, the organization has 42 members, including the European Central Bank and the People’s Bank of China, and eight observers, including the World Bank. Since its founding, the NGFS has focused on defining and sharing best practices for climate-related risk management and green finance. In April 2019, it issued its first comprehensive report, which contained six recommendations for central banks. Those recommendations included accounting for climate-related risks in financial supervision, considering sustainability in portfolio management, disclosing climate-related risks, and sharing data and knowledge.

Central banks and central bank officials have also expressed concern about climate change’s potential effect on the financial system. In a 2019 speech, Sabine Mauderer, member of the Executive Board of the Deutsche Bundesbank, called addressing climate change “a key factor for economic and financial systems.” The Bank of Canada listed climate change as an economic

vulnerability in its 2019 Financial System Review, citing physical damages and the costs of transitioning to a low-carbon economy. Speaking at the Official Monetary & Financial Institutions Forum in 2019, Sarah Breeden of the Bank of England called for immediate action on climate change given its broad and foreseeable risks. And while Coeuré of the ECB noted in his 2018 speech that “views and opinions certainly differ here,” he argued that “the ECB, acting within its mandate, can — and should — actively support the transition to a low-carbon economy.”

In some cases, these concerns have translated into policy. One example is the purchase of green bonds — debt securities issued to finance environmentally friendly investments. The first green bond was issued by the European Investment Bank in 2007. Over the past few years, the market has grown rapidly, counting some central banks among its investors. As of 2018, the Eurosystem — which includes the ECB and the central banks of member states — holds about a quarter of eligible public-sector green bonds and almost a fifth of eligible corporate green bonds.

Other steps have focused on disclosing and mitigating risk. The Task Force on Climate-related Financial

From the Director of Research

Changes to the Earth’s climate matter to monetary policymakers.

First, appropriate monetary policy depends fairly directly on the growth potential of the economy. A faster-growing economy means a higher average level for the appropriate central bank interest rate, and vice versa. Any force that changes this potential, as climate change certainly could, therefore matters for our approach to policy.

Second, changes in risks to the financial system matter to taxpayers who ultimately insure depositors and who occasionally, during crises, have bailed out creditors more generally. As a primary regulator of banks and other financial institutions, it is critical for the Fed to understand all the risks, including climate-related ones, that these entities face.

Notice that for a central bank, climate change can be viewed as simply one force among many that changes the growth potential of the economy and the risks to it. But unique or not, its implications need to be understood.

The Fed’s role also has significance for how it should think about climate change. The political system, not the Fed, selects fiscal and regulatory policies (apart from some specific areas of financial regulation that Congress has delegated to us). These policies as a whole, implicitly and explicitly, balance the well-being of different groups in our society: Think, in particular, about policies that affect the rich and poor differently, or people who are currently old versus those currently

young or yet to be born. Thus, the Fed’s role is to take those verdicts of the political process and do the best it can to pursue its dual mandate to deliver price stability and maximum employment.

There is, however, an exception where it may be appropriate for the Fed to do more. This is the extent to which we think climate change leaves *all* of us — young, old, rich, poor — worse off. In this instance, and perhaps only in this instance, we would be on firm ground in suggesting changes. One example is that by raising the risk to coastal cities, of which there are many in the Fifth Federal Reserve District, unabated climate change exposes us to losing significant economic and cultural “capital” that cities appear to deliver through the geographic concentration of talent and companies. Additionally, so long as public programs like flood insurance are not priced to reflect climate risks, building patterns will place all taxpayers at risk. Understanding and publicizing such distortions is valuable. Indeed, the nonpartisan nature of our institution places it well to look impartially at thorny issues with potentially significant economic implications.

There is much to be learned about the effects of climate change and how individuals and institutions should respond to it. I hope you’ll find the accompanying article helpful as you think about these issues.

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

Disclosures (TCFD), which was formed in 2015, develops standards for climate-related risk disclosures for financial companies. Central banks including the Bank of England and the Monetary Authority of Singapore have indicated their support of TCFD standards. In addition, the Bank of England indicated in its July 2019 Financial Stability Report and Record that it planned to perform stress tests focused on climate-related physical and transition risks.

These procedures are not standard practice, however. In a 2019 survey of central banks conducted by the news source Central Banking and the European asset management company Amundi, 32 of the 34 responding institutions indicated that they don't include climate-related risks in their stress tests, and 29 said they do not ask banks to disclose their exposure to those risks. Moreover, only six respondents, of which more than half were from industrial countries, viewed climate change as a major risk to financial stability. Only three central banks, all from industrial countries, indicated that they were actively responding to climate change, although 21 indicated that they were monitoring it as a concern.

Climate Change and the Fed

The extent of a central bank's response to climate change depends partly on its mandate. "Some mandates consider macroeconomic stability, and others are more focused on price stability or low inflation," Rudebusch says. "And there's additional disparity in whether and how a central bank's mandate addresses financial stability."

For its part, the Fed's dual mandate of ensuring maximum employment and price stability is silent on climate change, although the Fed does play a supervisory role in the financial system. Perhaps as a result, the Fed's response to climate change has been narrower in scope than that of its peers. It is not a member of the NGFS, nor does it purchase green bonds. (Apart from those

issued or guaranteed by a federal agency, the extent to which the Fed is legally authorized to purchase green bonds is unclear.) In January 2019, Sen. Brian Schatz of Hawaii wrote a letter to Fed Chair Jerome Powell asking how the Fed planned to address climate-related risks. Powell responded that while directly addressing climate change is outside of the Fed's authority, its role does include preparing for and responding to financial risks from extreme weather events.

Aside from its mandate, a number of other factors could deter the Fed from acting. One could be a desire to preserve its monetary policy independence. Actions taken by the Fed in response to concerns about climate change, if perceived by Congress as too much or too little, could be regarded by Fed leaders as weakening political support for the Fed's traditional independence in the making of monetary policy. Moreover, climate change, like many issues, may be viewed as a matter for fiscal policy — the province of the political branches — rather than monetary policy.

Another factor could be that climate change and monetary policy have historically had different time horizons: Monetary policy is concerned with near- and medium-term trends, while some climate-related risks are decades out and others' timelines are completely uncertain. However, some economists argue that climate change, like demographics, is a long-term economic trend that should be taken into account during deliberations over monetary policy, even if that policy doesn't aim to mitigate climate-related risk.

"There have been some big trends in the macroeconomy in the past few decades. Some of them include rising inequality, slowing productivity growth, and increasing industry concentration. And one very important trend is the changing distribution of weather events," Phan says. "This is a very important driving, underlying factor of the macroeconomy, so of course I think the profession will have to pay attention." **EF**

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WORKERS' SHRINKING SHARE OF THE PIE

Economists have advanced a wide variety of explanations for why workers' share of overall income has been going down

By John Mullin

By most measures, workers' share of U.S. national income has declined substantially in recent years. This development marks a departure from the post-World War II pattern. During 1947-1999, the Bureau of Labor Statistics (BLS) headline number for labor's share ranged between a low of 61 percent and a high of 66 percent. (See sidebar.) During the past decade, in contrast, it averaged only 57 percent.

The relative constancy of labor's share had achieved widespread acceptance as an economic regularity. But the significance of this regularity had been regarded with skepticism by some prominent economists. As early as 1939, John Maynard Keynes referred to it as "a bit of a miracle." Indeed, the economy-wide constancy of labor's share has masked a fair amount of variation across industries at given points in time and across time in various industries. And there was never a satisfactory theoretical explanation as to why these disparate industry trends should have evened themselves out at an economy-wide level.

Nevertheless, labor's share did remain relatively constant for much of the postwar period, and so its recent decline in the United States has been notable, as has been the nearly simultaneous decline of labor's share in most non-U.S. developed markets. And while there have been criticisms of the BLS headline numbers, other measures of labor's share have shown similar declines in recent years.

One thing is certain: By definition, the decline in labor's share means there has been a decline in wages relative to productivity. Wages — inclusive of benefits — grew in tandem with labor's net productivity in the corporate sector during the 1990s, but they have lagged productivity growth since then. (See chart.) Economists have proposed many explanations for this development, including changes in automation, globalization, firms'

increased power in product markets, and workers' weakened bargaining power in labor markets.

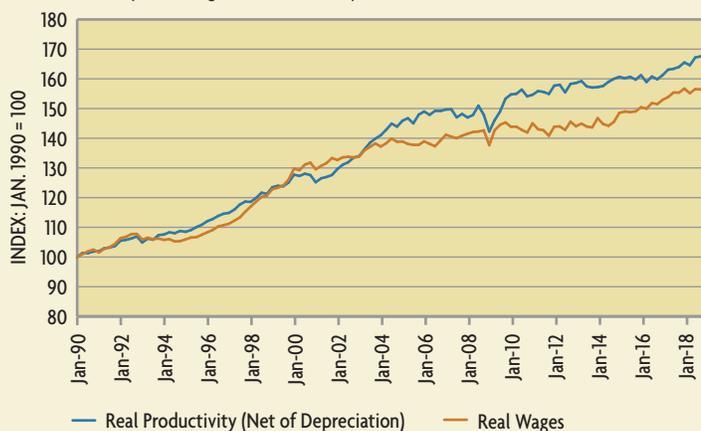
Automation

Advances in automation have shaken up many industries in recent years, including manufacturing, shipping, and mining. A recent newsworthy example has been the introduction of "iron roughnecks" into the oil patch. These machines automate the coupling work that is done at oil and gas drilling sites, and they reduce the number of workers needed on a drilling crew by as much as 40 percent. With this type of automation, it is fairly easy to identify the jobs that are lost directly, but it is much more difficult to map out the indirect effects that ripple throughout the economy.

A substantial body of economic research, starting with that of the late William Baumol of New York University, has been devoted to understanding the economy-wide adjustment process by which labor is reallocated from technologically advanced industries to lagging ones. The literature has identified several

Productivity Has Been Rising Faster than Wages

Real Productivity and Wages in the U.S. Corporate Sector



NOTE: Real productivity and wage data are both deflated by the implicit price deflator for the nonfinancial corporate sector. Wages include supplementary benefits.

SOURCE: Bureau of Labor Statistics via Federal Reserve Economic Data (FRED)

channels through which the direct employment losses caused by automation are offset by employment gains elsewhere. Automation in the steel industry, for example, tends to lower the price of steel. This tends to increase the quantity of steel demanded as well as the demand for inputs in the steel production process. In addition, decreased steel prices lower the costs of steel-using firms and ultimately increase the quantities demanded for their products. The cumulative impact of these input-output connections is to lower economy-wide costs and boost real income and aggregate demand. In theory, therefore, the displaced labor can be largely reabsorbed.

David Autor of MIT and Anna Salomons of Utrecht University explored these adjustment channels and input-output connections in a 2018 article in *Brookings Papers on Economic Activity*. Their analysis found good news and bad news for labor. The good news was that the jobs

displaced by automation were indeed largely reabsorbed by other industries. The bad news was that automation caused a decline in labor's share of aggregate income, because the reduction of labor's share within the firms that had automated was not fully offset elsewhere. But Autor and Salomons raised a caveat: Although their evidence supported a broad connection between automation and the decline of labor's share since the 1980s, their analysis could not account for what they called the "acceleration in the labor share decline observed during the 2000s."

Indeed, the timing issue is difficult. Labor productivity growth — arguably a reasonable proxy for the pace of automation — has not been particularly rapid in recent years. In the nonfarm business sector, labor productivity has grown at an average annual rate of 1.9 percent since 2000, only marginally higher than the 1.8 percent annual growth experienced during 1980-1999 and substantially lower than the

Three Measures of Labor's Share

Much effort has been spent trying to ascertain whether the recent decline of labor's share of national income has been something of an artifact of accounting issues. The BLS headline figure for labor's share is based on the U.S. non-farm business sector, which excludes the household, farming, and government sectors. (See chart.)

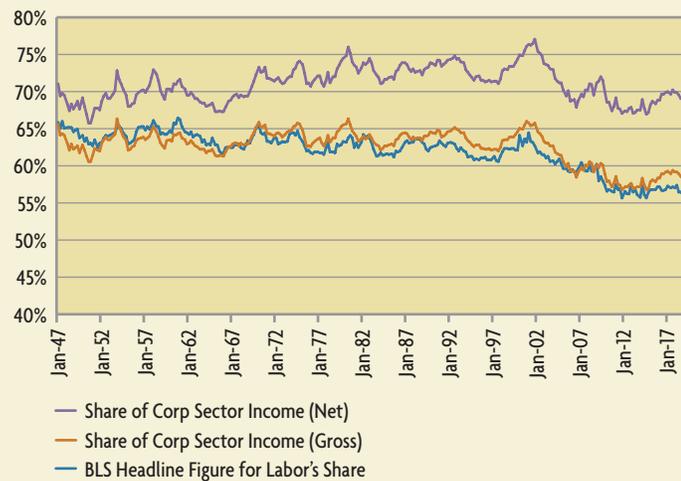
One objection to this measure has been its treatment of proprietors' income. A typical proprietor is a business owner who puts in working hours but has also invested money in the business. Consequently, proprietors' income is best thought of as a combination of employment compensation and return on investment. There are several methods of dividing proprietors' income into these two components, but none of them have a particular claim on accuracy, including the method the BLS uses to construct its headline number for labor's share.

The problem with proprietors' income can be dealt with by focusing instead on the BLS number for labor's share of corporate sector gross income, which excludes proprietorships. This number correlates highly with the headline number. But economists have also criticized the appropriateness of this statistic because it is calculated gross of depreciation and thus arguably overstates earnings. After all, depreciation is a real cost of doing business.

The problem with depreciation can be handled by focusing on the BLS number for labor's share of net corporate sector income. This figure is, of course, higher than labor's share of gross income because the numerator (labor compensation) is the same and the denominator (net corporate sector income) is smaller. What stands out is that labor's net share actually

Labor's Share Has Declined in Recent Years

Three Measures of Labor's Share of Income



NOTE: Corporate sector data exclude the financial sector. BLS "headline" data are the share of nonfarm business sector income.

SOURCE: Bureau of Labor Statistics via Federal Reserve Economic Data (FRED)

trended upward, at least modestly, during 1947-2000. The growing discrepancy between the net and gross numbers during this period reflected an upwardly trending rate of depreciation, which economists have generally attributed to the growing importance of IT investments with relatively short lives.

All three measures of labor's share have declined substantially over the past 20 years, which suggests that the change has not been a result of measurement issues tied to proprietors' income or depreciation. While there have been other critiques of BLS labor-share calculations, a consensus among economists has emerged that the decline in labor's share is a real thing, not just a statistical artifact.

— JOHN MULLIN

earlier post-World War II experience. Disruptive transformations took place in many U.S. industries throughout the postwar period. For example, the process of containerization profoundly transformed the U.S. shipping and transport industry. In the 1950s, ports on the West Coast employed as many as 100,000 longshoremen. By the end of the century, however, that number had declined to roughly 10,000, despite much greater cargo volumes than before. Yet labor's share of U.S. national income remained relatively steady during that era. This raises the question: What is so different about the current wave of automation?

Globalization

It is hardly a new idea that globalization can depress wages. The idea is embedded in some long-standing theories of international trade. Neoclassical trade theory predicts that the emergence of trade between countries will tend to equalize the relative rewards to capital and labor among countries. The theory says that, for a relatively rich country like the United States, the opening of trade with relatively poor, labor-abundant countries will tend to reduce wages. Unskilled U.S. workers are likely to take the biggest hits due to the abundant supplies of unskilled labor in relatively poor countries.

Globalization has also made it easier for companies to substitute away from domestic workers through foreign direct investment or outsourcing. These alternatives tend to increase the elasticity of demand for labor because they allow companies to respond to increased domestic wages by shifting productive tasks to foreign subsidiaries or suppliers. This can effectively cap wages.

Twenty years ago, the majority of economists tended to downplay the impact of international trade on U.S. wages. This view was based in large part on the relatively small size of U.S. trade with low-income countries (trade with other high-income countries was not considered as relevant because those countries have relative factor supplies similar to those of the United States). But China's emergence as a major manufacturing exporter has prompted a reassessment.

Economists have more recently found ample evidence that globalization has depressed wages — particularly for lower-skilled workers. Avraham Ebenstein of Hebrew University of Jerusalem, Ann Harrison of the University of Pennsylvania, and Margaret McMillan of Tufts University, for example, found evidence that globalized competition has reallocated workers away from high-paying manufacturing jobs and into lower-paying jobs in other industries.

This finding was supported by research of Autor, David Dorn of the University of Zurich, and Gordon Hanson of the University of California at San Diego, who focused on local U.S. labor markets heavily exposed to foreign competition. They found that employment had declined in these localities and that wages had remained persistently depressed. Moreover, lower-wage employees were the

hardest hit, suffering larger proportionate declines in income than their higher-wage counterparts. Further support was provided by Bart Hobijn of Arizona State University, Michael Elsby of the University of Edinburgh, and Ayşegül Şahin, now at the University of Texas at Austin, who found evidence that labor share declines during 1987-2011 were more substantial in those industries that had experienced larger increases in exposure to import competition.

Product Market Power

Economists have increasingly examined the hypothesis that the decline in labor's share has been driven by an increase in firms' pricing power. This work looks past the neoclassical paradigm, in which the rewards to capital and labor are set equal to marginal products, and analyzes firms' power to set prices above marginal cost and thereby achieve abnormal profits. (See "Are Markets Becoming Less Competitive?" Federal Reserve Bank of Richmond *Economic Brief*, June 2019.)

Autor, Dorn, Lawrence Katz of Harvard University, and Christina Patterson and John Van Reenen of MIT presented a theory of pricing power that combines technology and globalization in their widely cited National Bureau of Economic Research (NBER) working paper, "The Fall of the Labor Share and the Rise of Superstar Firms." Their account differs markedly from neoclassical models that are based on the behavior of a "representative" or average firm. (For more on how neoclassical models have been used to look at the decline of labor's share, see web-exclusive sidebar, "Too Much Capital, or Too Little?")

"If the story was mostly about capital accumulation due to cheap equipment prices, you would expect it to be happening at most firms," says Autor. "But it's not the case that the median firm has a falling labor share. It's that a lot of economic activity has been reallocated toward firms that are already more capital intensive and have lower labor shares."

According to this view, economies of scale have increasingly favored firms that are able to leverage small competitive advantages — a phenomenon dubbed "winner take most." This trend can be seen across most sectors of the economy, but one of the most obvious examples is retail, where mom-and-pop stores have given way to retail giants such as Walmart and Target. These "superstar" firms have been able to gain an edge through information technology, efficient global supply chains, and the market power that comes from bulk purchasing. They are highly profitable, and their labor shares are among the lowest in the retail sector. And their shares of industry sales have been growing.

The researchers found a great deal of empirical support for the theory. Industries have tended to become more concentrated in a small handful of firms; labor's share has tended to decline most in the most concentrated industries; and industry labor-share declines have been driven primarily by the relative growth of firms with low labor shares.

Labor's Declining Bargaining Power

Labor markets, too, do not always behave according to neoclassical theory, where wages are set equal to marginal products in perfectly competitive markets. On the contrary, a great deal of evidence has shown that firms can and do set wages below competitive levels. This type of labor market power can arise in concentrated labor markets, where competition among employers for workers is relatively weak and firms face inelastic labor supplies. Numerous studies have reported empirical evidence that higher labor market concentration is associated with lower wages. For example, a recent working paper by Keven Rinz of the U.S. Census Bureau found support for the linkage based on data from the Internal Revenue Service and the Census Bureau's Longitudinal Business Database.

There is also considerable anecdotal evidence that concentration facilitates collusion — which sometimes occurs in the form of wage fixing and anti-poaching agreements. For example, in a series of prominent cases, the Department of Justice targeted technology firms that had conspired to restrict labor market competition for software engineers and designers. By May 2014, Justice had reached settlements against a large number of major tech players, including Adobe, Apple, Google, Intel, Intuit, and Pixar. (See “No Poaching,” *Econ Focus*, First Quarter 2019.)

But firms are often able to exercise considerable market power even in markets that do not appear, at first glance, to be highly concentrated. This market power is enhanced by frictions that limit wage competition, including search costs, geographical segmentation, and job-specific human capital. According to a 2016 Council of Economic Advisers report, “30 million American workers are currently covered by non-compete agreements, and... these agreements are often imposed broadly on low-income workers or others with no access to trade secrets.” These agreements appear to have no other purpose, the report argued, than to “impede worker mobility and limit wage competition.”

But the key question for the decline of labor's share is not whether employers exercise market power; rather, the question is: Has there been a change in the trend? By most accounts, labor market concentration has not trended upward over the past two decades. Rinz, for example, showed that although labor market concentration has increased at the national level since 1990, it has actually declined modestly at the local level (which is presumably the relevant level of analysis for labor markets).

But at least some compelling evidence suggests that employers have increasingly exercised market power, despite the lack of a trend in labor market concentration. In a 2018 NBER working paper, Orley Ashenfelter and the late Alan Krueger of Princeton University studied the “role of covenants in franchise contracts that restrict the recruitment and hiring of employees from other units within the same franchise chain.” They found that the share of franchisors with these types of “non-poaching” covenants — which limit competition and impede labor mobility — increased from 35.6 percent in 1996 to 53.3 percent in 2016.

Trends in technology and globalization may have weakened labor's bargaining power by increasing the threat of replacement through automation and outsourcing. In a neoclassical world of perfectly competitive markets, these trends may have diminished labor's share on their own, but the insecurity that they have created may well have increased employer negotiating leverage and thereby amplified the decline. This explanation is made more plausible given the weakened influence of labor unions, which historically have provided a countervailing force against employers' labor market power. The overall U.S. unionization rate declined from 20 percent in the early 1980s to 10.5 percent in 2018 (although the bulk of that decline had already occurred by the turn of the century).

Conclusion

So what explains the recent decline in labor's share? Unfortunately, it is difficult to untangle the separate roles of automation, globalization, and changes in market power. Automation has likely played a role, but its independent impact is hard to gauge, due to the difficulty in differentiating the recent wave of automation from previous episodes in which labor's share of national income held steady. Globalization appears to have been a strong contributor — a claim that is buttressed by the near simultaneity of the rise in U.S. trade with China and the decline of labor's share. A variety of evidence also points to firms' increased pricing power in product markets and workers' weakened bargaining power in labor markets. In product markets, information technology and globalization appear to have increased the pricing power and profitability of certain dominant firms. And in labor markets, the insecurity engendered by automation and globalization may have helped to weaken workers' bargaining power. In short, from the perspective of workers, multiple forces have come together to narrow their slice of an expanding economy. EF

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Emmanuel Farhi

A young Emmanuel Farhi knew that his father, who passed away when Emmanuel was 10 years old, was an economist. But the boy never fully knew during his father's lifetime just what an economist was.

Three decades later, Farhi is one of the pre-eminent macroeconomists of his generation in both the United States and his native France. It was a roundabout journey: At age 16, he won first prize in the French national physics competition. Two years afterward, on the threshold of entering university, he attained the highest score in the nation on the entry exam for France's elite engineering school, the *École Polytechnique*. But he turned it down for another coveted institution, the *École Normale Supérieure* in Paris, often called ENS. (Today, ENS is also the alma mater of numerous other notable French economists, including the University of California, Berkeley's Emmanuel Saez, MIT's Esther Duflo, Farhi's Harvard colleague and frequent co-author Xavier Gabaix, and Thomas Piketty, author of the 2014 bestseller *Capital in the Twenty-First Century*.)

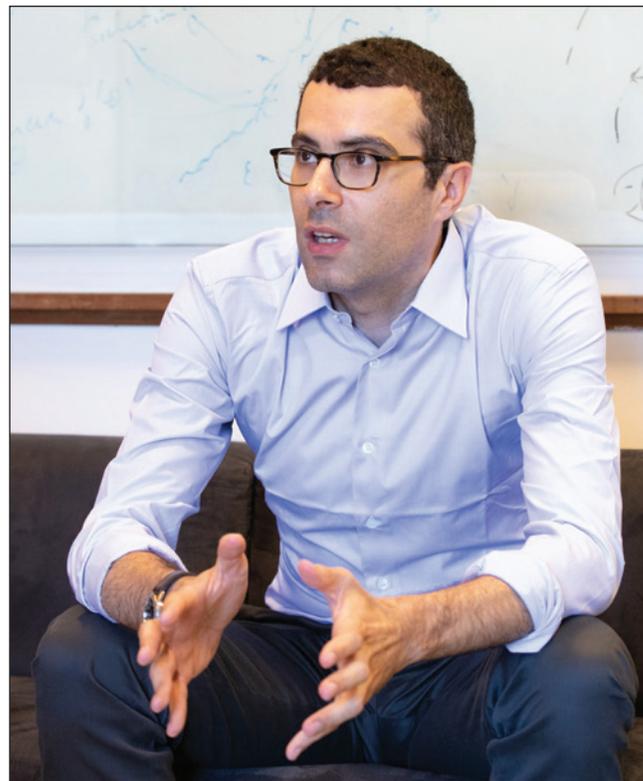
At ENS, he planned at first to be a mathematician, but became drawn to economics instead. In his spare time, he read MIT professor Paul Samuelson's classic economics text.

"I think what drew me in particular was the ability to model economic phenomena," he says. "And I thought that was a powerful way of deeply understanding these forces and how they were shaping the world."

At the urging of his mentor at ENS, an economist named Daniel Cohen, Farhi (pronounced "far-hee") continued his studies as a doctoral student at MIT. After receiving his Ph.D., he joined the faculty of Harvard in 2006 and received tenure four years later.

Here, he talks with *Econ Focus* about, among other topics, the rising demand for safe assets, the future role of the dollar in a multipolar world, and how economists have misunderstood productivity trends.

David A. Price interviewed Farhi in his office at Harvard in August 2019.



EF: You've done research in a variety of areas, but a major part of your work has centered on the international monetary system. What led you to those issues and what do you find particularly interesting about them?

Farhi: There is very little academic work on the topic today. There is a general notion that the concept is a bit amorphous. Many economists also seem to believe that these questions are not so important any more — maybe it mattered back when we had the gold standard and things like that, but these are remnants of the past and we've graduated from them.

I think it's a big mistake. The international monetary system played a major role in history and it remains important today. Just think about the role of the gold exchange standard in propagating the Great Depression. Think about the end of Bretton Woods, the advent of flexible exchange rates, the liberalization of capital accounts, the explosion of capital flows. There are a lot of very pressing policy questions that pertain to the international monetary system and its workings nowadays.

These questions really haven't been resolved. They are coming back to bite policymakers and policymakers are searching for answers. How should we conduct monetary policy in an interconnected world economy? Should we seek to generalize inflation targeting or should we somehow manage exchange rates? How should we regulate

international capital flows? Is there a role for capital controls? How should we regulate the international financial cycle? How should we integrate macroprudential policy and monetary policy into the international macroeconomic policy framework?

These are very pressing questions that are begging for answers. Practice is ahead of theory there. You go to central bank conferences in the developed world or in the emerging world and you see central bankers grappling with these issues, trying to innovate, trying to come up with new solutions. They are really thinking ahead of theoretical practice. So I think we in academia have a big role to play there and there is not enough work on these issues. That's why I find them interesting and important to work on.

EF: When you say “generalize inflation targeting,” what do you mean by that?

Farhi: If you look at developed economies, most of them conduct monetary policy by implementing some version of inflation targeting. The idea is that the first and foremost responsibility of the central bank is to deliver stable prices or a stable inflation rate with some consideration for the overall level of economic activity.

But if you look at the way monetary policy is practiced in many less developed countries, what you see is that they're not straight inflation targeters. In particular, a lot of them seem to be managing the level and volatility of their exchange rates. So you really have a variety of coexisting regimes ranging from strict inflation targeting, to managed floats, to strict currency pegs, to dollarized economies.

One question is whether these countries are gradually going to graduate to inflation targeting. Maybe that's the most advanced form of monetary policymaking, or maybe not. That's a question. There is a reason why they are doing things in that way. Are we going to move more in the direction of inflation targeting as the world develops or will we see some other kind of system emerge?

EF: You said earlier this year that the dollar is going to face competition for status as the world's reserve currency — that is, the world monetary system will no longer be dollar-centric. Why do you think so?

Farhi: If you look at the world today, it's very much still dollar-centric even though, formally, in the organization of the international monetary system, there is a priori no special role for the dollar. So it's a de facto dollar-centric world, not a de jure dollar-centric world.

This dominance manifests itself in several aspects. The U.S. is really sort of the world banker. As such, it enjoys

It's hard to imagine right now a run on the dollar because there is nowhere else to go. There's no good substitute. But as substitutes start emerging, there will be a place to go if you start doubting the financial or fiscal solidity of the U.S. And I think that could create a lot of instability.

an exorbitant privilege and it also bears exorbitant duties. Directly or indirectly, it's the pre-eminent supplier of safe and liquid assets to the rest of the world. It's the issuer of the dominant currency of trade invoicing. And it's also the strongest force in global monetary policy as well as the main lender of last resort.

If you think about it, these attributes reinforce each other. The dollar's dominance in trade invoicing makes it more attractive to borrow in dollars, which in turn makes it more desirable to price in dollars. And the U.S. role as a lender of last resort makes it safer to borrow in dollars. That, in turn, increases the responsibility of the U.S. in times of crisis. All these factors consolidate the special position of the U.S.

But I don't think that it's a very sustainable situation. More and more, this hegemonic or central position is becoming too much for the U.S. to bear.

The global safe asset shortage is a manifestation of this limitation. In my view, there's a growing and seemingly insatiable global demand for safe assets. And there is a limited ability to supply them. In fact, the U.S. is the main supplier of safe assets to the rest of the world. As the size of the U.S. economy keeps shrinking as a share of the world economy, so does its ability to keep up with the growing global demand for safe assets. The result is a growing global safe asset shortage. It is responsible for the very low levels of interest rates that we see throughout the globe. And it is a structural destabilizing force for the world economy.

It creates macroeconomic instability by pushing the world economy toward the zero lower bound. For example, if we were to experience a recession in the U.S., it's pretty clear that we would hit the zero lower bound. Monetary policy would then have a limited ability to deal with the recession. It also creates financial instability. The fact that interest rates are so low means that it's very cheap to borrow. It encourages leverage and reach for yield.

In my view, the global safe asset shortage echoes the dollar shortage of the late 1960s and early 1970s. At that time, the U.S. was the pre-eminent supplier of reserve assets. The global demand for reserve assets was growing because the rest of the world was growing. And that created a tension, which was diagnosed by Robert Triffin in the early '60s: Either the U.S. would not satisfy this growing global demand for reserve assets, and this lack of liquidity would create global recessionary forces, or the U.S. would accommodate this growing global demand for reserve assets, but then it would have to stretch its capacity and expose itself to the possibility of a confidence crisis and of a run on the dollar. In fact, that is precisely what happened. Eventually, exactly like Triffin had predicted, there was a run on the dollar. It brought down the Bretton Woods system: The dollar was floated and that was the

end of the dollar exchange standard.

Today, there is a new Triffin dilemma: Either the U.S. does not accommodate the growing global demand for safe assets, and this worsens the global safe asset shortage and its destabilizing consequences, or the U.S. accommodates the growing global demand for safe assets, but then it has to stretch itself fiscally and financially and thereby expose itself to the possibility of a confidence crisis.

More generally, the relative importance of the U.S. is going to keep shrinking. Other global powers are going to assert themselves. There is going to be rebalancing. It's happening today in foreign affairs and it's a safe bet that it's also going to happen in economic and financial affairs. Basically, I think that the role of the hegemon is becoming too heavy for the U.S. to bear. And it's only a matter of time before powers like China and the eurozone start challenging the global status of the dollar as the world's pre-eminent reserve and invoicing currency.

It hasn't happened yet. But you have to take the long view here and think about the next decades, not the next five years. I think that it will happen. These countries need to develop the ambition, the institutions, and the reputation necessary to play a global monetary role. It takes time.

EF: When did the shortage of safe assets emerge? And what do economists mean when they talk about safe assets in this context?

Farhi: A safe asset is a good store of value. It's an asset that's going to maintain its value in bad times and one you can liquidate without incurring too much cost.

The price of safe assets is inversely related to their yield. The yield of safe assets is the safe interest rate. And the unmistakable sign of the growing global demand for safe assets and of the safe asset shortage is that safe interest rates have been declining. It's not a recent phenomenon; it's a worldwide, long-term trend that started in the mid-1980s.

Now those rates are at historically low levels. There are a lot of conjectures as to exactly what is behind this long-run decline. One thing that I think is important

Emmanuel Farhi

► Current Position

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► Education

Ph.D. (2006), Massachusetts Institute of Technology; MSc. (2001), École Normale Supérieure

► Selected Publications

"Optimal Taxation with Behavioral Agents," *American Economic Review*, forthcoming (with Xavier Gabaix); "Productivity and Misallocation in General Equilibrium," *Quarterly Journal of Economics*, forthcoming (with David Baqaee); "The Macroeconomic Impact of Microeconomic Shocks: Beyond Hulten's Theorem," *Econometrica*, 2019 (with David Baqaee); "The Safety Trap," *Review of Economic Studies*, 2018 (with Ricardo Caballero); "A Model of the International Monetary System," *Quarterly Journal of Economics*, 2018 (with Matteo Maggiori); "A Theory of Macroprudential Policies in the Presence of Nominal Rigidities," *Econometrica*, 2016 (with Ivan Werning); "Fiscal Devaluations," *Review of Economic Studies*, 2014 (with Gita Gopinath and Oleg Itskhoki); "Fiscal Unions," *American Economic Review*, 2017 (with Ivan Werning); "Collective Moral Hazard, Maturity Mismatch, and Systemic Bailouts," *American Economic Review*, 2012 (with Jean Tirole); "An Equilibrium Model of Global Imbalances and Low Interest Rates," *American Economic Review*, 2008 (with Ricardo Caballero and Pierre-Olivier Gourinchas); *Reforming the International Monetary System*, Centre for Economic Policy Research, 2011 (with Pierre-Olivier Gourinchas and Hélène Rey)

and is sometimes ignored in these discussions is the fact that all rates of returns have not been declining in parallel. For example, there is evidence that the expected rates of return on riskier assets like equities have not been declining as much as safe interest rates since the turn of the century. There is something special going on with safe assets.

EF: If the dollar were to lose its special status as the reserve currency, what would we see happen?

Farhi: I think you have to distinguish the transition and the eventual new situation. This transition could be very turbulent and take a long time. In the very long run, when the transition is over, it's entirely possible that we will have a stable multipolar equilibrium with several global currencies. For example, it could be the dollar, the euro, and the renminbi. Perhaps there will be other players also, like digital currencies.

One historical precedent is the coexistence of dollar and sterling during the interwar years. It's not a particular happy precedent; it was a period of monetary instability. You saw frequent rebalancing of international portfolios into one reserve currency and out of another, which created a lot of volatility.

That should serve as a warning for us that the transition to a truly multipolar currency world is probably not going to be smooth. You can think about it in the following terms. Right now, the U.S. is completely dominant.

So it's hard to imagine right now a run on the dollar because there is nowhere else to go. There's no good substitute. But as substitutes start emerging, there will be a place to go if you start doubting the financial or fiscal solidity of the U.S. And I think that could create a lot of instability.

EF: Would China need to increase its supply of safe assets before its currency could become the reserve currency? And if so, how might it do that?

Farhi: There are different attributes of a global currency. One is to be a reserve currency. As I mentioned before, that means you need to have a very liquid market for safe instruments denominated in the currency and that requires

volume. So, for the renminbi to become a reserve currency, China would have to develop large, deep, and integrated markets for safe instruments denominated in renminbi. And that's not there for now. But as China keeps asserting itself, it's entirely possible it's going to become a reality.

The second attribute of a global currency is to be a currency of trade invoicing. You want economic and financial contracts to be denominated in your currency. And China is very aggressive there in trying to push different kinds of economic agents to denominate their economic and financial contracts in renminbi.

And third, the government issuing the currency needs to be evolved to act as lender of last resort on a massive scale. There again, China is extremely aggressive right now in developing an international network of central bank swap lines. So I think it's a matter of time.

In the long run, the more multipolar system that I think will occur could provide a solution to the global safe asset shortage. You're going to have more suppliers of safe assets. That's the good part. I think the tricky period is the transition.

EF: In work with Ricardo Caballero of MIT, you've said that the rise in the demand for safe assets before the financial crisis helped to drive the creation of complex mortgage-backed securities. What was the connection between the two?

Farhi: The connection, I think, is the prices of safe assets. If you have a growing global demand for safe assets, the price of safe assets is going to go up. The interest rate on safe assets is going to go down. So it's going to be attractive to create these safe assets. It's also going to be attractive to create assets that maybe you can portray as being safe but that are not completely safe. And you saw a lot of that.

The demand for safe assets increased the incentive for leverage and it also increased the incentives for shenanigans and complacency. The financial system started manufacturing large quantities of assets that were not completely safe but were complex enough that people could persuade themselves they were safe. Obviously, they weren't safe.

EF: Where do the supply of and demand for safe assets seem to be heading?

Farhi: I don't have a crystal ball. But what you do see is that the rising demand is not a recent phenomenon. It's been with us for almost 30 years now and it's been intensifying. The underlying reasons are probably multiple but all of them are structural, not cyclical. There is no particular reason why we should expect it to go away soon.

In the long run, there are solutions on both the demand side and the supply side. As I described earlier, I think if we transition to a more multipolar system, that could provide a more ample supply of safe assets

for the world economy. I think it is also important to strengthen the global financial safety net by institutionalizing the network of central bank swap lines, supporting reserve-sharing arrangements, and boosting the role and financial resources of the international institution at the center of the system, the IMF.

But realistically, the global safe asset shortage is going to be with us for a while.

EF: In recent research with your Harvard colleague Xavier Gabaix, you found that if individuals and firms are somewhat inattentive to changes in tax rules, several of the longtime tenets of economics in the area of taxation have to be reconsidered. Please explain this and why is it important?

Farhi: Public finance is a beautiful set of theories. But it also relies heavily on the assumption of rationality on the part of firms and households, including that they are highly informed with respect to these taxes and that they understand the environment quite well. Public finance delivers sophisticated insights into the way we should design taxes to take into account all sorts of spillovers and behavioral responses by individuals but always based on the presumption that these responses are rational. And there is accumulating evidence that it's not the case. It's important to confront that to come up with more sensible taxation recommendations.

There's something else that comes with recognizing that agents are behavioral, which is that they don't necessarily act in their own interest. One question, which is delicate, is whether you could try to alleviate these problems through the tax system or not. It also leads you to consider completely unconventional instruments that are used in policy but have no space in traditional public finance theory.

For example, nudges. A nudge is attractive from a policy perspective because it's a way of influencing behavior in a way that we think is helpful for individuals while preserving their freedom of choice. If they want to do something else, they can, at no cost. If you think agents are completely rational, nudges should have no effect whatsoever — yet people do implement nudges that seem to be effective. What we did in our work is to allow one, for example, to think about nudges and to think about how to design these nudges and integrate them into the public finance framework.

EF: If you're in public finance and you change your model to allow for taxpayers to be more human, less rational, what are some implications of that?

Farhi: I'll give you an example. There is a basic tenet of public taxation called the dollar-for-dollar principle of Pigouvian taxation. It says that if the consumption of a particular good generates a dollar of negative externality,

you should impose a dollar of tax to correct for this externality. For example, if consuming one ton of carbon generates a certain number of dollars of externalities, you should tax it by that many dollars.

But that relies on the assumption that firms and households correctly perceive this tax. If they don't — maybe they aren't paying attention — then you have to relax this principle. For example, if I pay 50 percent attention to the tax, the tax needs to be twice as big. That's a basic tenet of public finance that is modified when you take into account that agents are not rational.

In public finance, there is also a traditional presumption that well-calibrated Pigouvian taxes are better than direct quantity restriction or regulations because they allow people to express the intensity of their preferences. Recognizing that agents are behavioral can lead you to overturn this prescription. It makes it hard to calibrate Pigouvian taxes, and it also makes them less efficient. Cruder and simpler remedies, such as regulations on gas mileage, are more robust and become more attractive.

Yet another example, still related to Pigouvian taxation, is called the targeting principle. It says that if there's an externality somewhere, you should tax that externality directly. You shouldn't try to tax complements or subsidize substitutes but instead target the externality. For example, if you believe that there is a problem with fossil fuels, you should tax fossil fuels; you shouldn't subsidize solar panels. But if people don't really understand this tax on fossil fuels — and in particular, if some people are paying attention and some people are not paying attention — it becomes a very imperfect instrument. That makes room for auxiliary instruments like subsidies on solar panels and things like that.

EF: There is evidence that average markups of firms have been increasing over the past two decades. You've argued that this trend has led to inflated measurements of productivity growth. Can you explain?

Farhi: The purest measure that we have of productivity growth is aggregate TFP growth.

TFP is total factor productivity. How is this measure constructed? It's very mysterious. It's meant to measure how productive the economy is in using its factors of production — capital and labor — to produce output. To arrive at measures of this, economists look at how much output is growing and then they estimate how much of this growth in output is explained just by growth in inputs. It could be that all of the growth in output is coming from the fact that there is more capital and more labor. In that case, productivity didn't change. Or it could be that output grew because productivity grew while capital and labor didn't change. Or both could be happening at once.

David Baqaee of UCLA and I have embarked on a research agenda on aggregation from the micro level to the macro level. One of the things that we have done is to come

up with better measures of productivity when you don't have perfect competition — when you have markups over and above competitive rates of return. And in particular, we have come up with a new definition that accurately measures aggregate TFP growth when you have markups.

According to our findings, there has been more aggregate TFP growth than what people normally measure. But there is something else, which we think is also very interesting.

Aggregate TFP growth reflects two different mechanisms. The first is that it reflects the different productivity shocks that are affecting all the different producers in the economy, holding the allocation of resources constant. We call that the pure technology effect. But in an economy that's not efficient — for example, when you have markups — you're also going to have changes in how efficiently resources are allocated in the economy. And what we find is that if you look at the past 20 years, for example, about 50 percent of aggregate TFP growth is due to improvements in allocative efficiency, not to pure technology effects.

So aggregate TFP growth, if you measure it correctly, hasn't been so slow. It's been higher than we imagined, but a lot of it is driven by improvements in allocative efficiency. And you can trace these improvements in allocative efficiency back to something that's happening in the microeconomic data.

If you look at the reason markups are increasing, you realize that it's not so much because individual firms are increasing their markups, but instead because high-markup firms are becoming bigger. In other words, the increase in markups is predominantly driven by a composition effect between firms, not within.

You have what other people have called superstar firms that are very profitable and are charging high markups and that are overtaking the economy. They are growing larger and larger at the expense of less profitable firms with lower markups. Mechanically, because these high-markup firms are becoming bigger, you see the average markup going up. The reason that improves allocative efficiency is that firms that charge high markups are too small from a social perspective compared to firms that charge low markups.

What you want to improve allocative efficiency is to transfer resources from low-markup firms to high-markup firms. And that's precisely what this superstar phenomenon is doing. It's reallocating resources from firms that were too big to begin with to firms that were too small to begin with from a social perspective.

EF: In the sense that the high-markup firms are more efficient?

Farhi: It's not that they are more productive. A lot of people go to this intuition that you mentioned. Productivity improves if I reallocate resources from less productive firms to more productive firms, but that's not what's going on here.

Reallocating resources toward a particular firm improves allocative efficiency if, compared to the social optimum, this firm was too small to begin with. That has nothing to do with how productive it is. If it's very productive, it has a low price and it's big. What makes it *too* large or *too* small is its markup. A firm that has a high markup is behaving too much like a monopolist compared to a firm that has a low markup. Allocative efficiency improves when you reallocate resources from the latter to the former.

The superstar phenomenon that's behind the rise in markups is driven by a reallocation from low-markup firms to high-markup firms, which improves allocative efficiency. And we show that that has been important to the growth of TFP over the past 20 years.

EF: Who have been your most important influences, and do you see yourself working in a particular tradition?

Farhi: I don't really see myself working in any particular tradition. I try to draw inspirations from many different sources and many different traditions, actually. For example, lately in this work with David that we've done on aggregation, we've been reading the work of post-Keynesians, which are typically neglected in the academic mainstream.

There's an interesting episode in the history of economic thought. It's called the Cambridge-Cambridge controversy. It pitted Cambridge, Massachusetts — Solow, Samuelson, people like that — against Cambridge, U.K. — Robinson, Sraffa, Pasinetti. The big debate was the use of an aggregate production function.

Bob Solow had just written his important article on the Solow growth model. That's the basic paradigm in economic growth. To represent the possibility frontiers of an economy, he used an aggregate production function. What the Cambridge, U.K., side attacked about this was the idea of one capital stock, one number. They argued that capital was very heterogeneous. You have buildings, you have machines. You're aggregating them up with prices into one capital stock. That's dodgy.

It degenerated into a highly theoretical debate about whether or not it's legitimate to use an aggregate production function and to use the notion of an aggregate capital stock. And the Cambridge, U.K., side won. They showed that it was very problematic to use aggregate production functions. Samuelson conceded that in a beautiful paper constructing a disaggregated model that you could not represent with an aggregate production function and one capital stock.

But it was too exotic and too complicated. It went nowhere. The profession moved on. Today, aggregate production functions are pervasive. They are used everywhere and without much questioning. One of the things David and I are trying to do is to pick up where the Cambridge-Cambridge controversy left. You really need

to start with a completely disaggregated economy and aggregate it up.

EF: Disaggregated into firms and whatnot?

Farhi: Firms, products, agents. No aggregate production function, no representative agent.

And I think what I described about markups is a good illustration. If you try to model the macroeconomy directly by modeling aggregate relationships — productivity, investment, and aggregate markup — you're going to miss the picture. It's really important to understand what's going on at the micro level and how these patterns at the micro level are aggregating up to macro phenomena.

For example, when we see average markups going up, it's not obvious what implication it has for productivity. If you don't see that it's happening through this composition effect, whereby high-markup firms are becoming bigger at the expense of low-markup firms, you completely miss it.

EF: What are you working on now?

Farhi: I'm really fascinated by this work that I'm doing with David. We have a name for our vision. We call it "macro as explicitly aggregated micro."

The idea is you need to start from the very heterogeneous microeconomic environment to do justice to the heterogeneity that you see in the world and aggregate it up to understand macroeconomic phenomena. You can't start from macroeconomic aggregates. You really want to understand the behavior of economic aggregates from the ground up.

What many people used to do to tackle these issues is some kind of statistical aggregation. What you need to do is what you could call economic aggregation. You need to have a general equilibrium model with heterogeneity and aggregate this microeconomic heterogeneity into macroeconomic aggregates the way a national accountant would in the data. You need to do the same thing in the model and then understand the behavior of these aggregates in that way. You need to flesh out going from the micro to the macro in economic terms.

For example, you can't just come up with your measure of aggregate TFP and study that. You need to derive it from first principles. You need to understand exactly what aggregate TFP is.

I talked about aggregate TFP and markups, but the agenda is much broader than that. It bears on the elasticity of substitution between factors: between capital and labor, or between skilled labor, unskilled labor, and capital. It bears on the macroeconomic bias of increasing automation. It bears on the degree of macroeconomic returns to scale underlying endogenous growth. It bears on the gains from trade and the impact of tariffs. In short, it is relevant to the most fundamental concepts in macroeconomics. EF

The House Is in the Mail

“Kit homes” from Sears and others were an affordable housing option

BY JESSIE ROMERO

During the first half of the 20th century, tens of thousands of Americans bought homes through mail-order catalogs. Prospective homeowners picked out a design, and the manufacturer shipped them everything they needed to build it, along with detailed blueprints. (Sears, Roebuck and Company, the best-known kit home purveyor, sent the blueprints in a leather book embossed with the buyer’s name.) Many homeowners built the homes themselves; Sears estimated that a “man of average abilities” could complete one of their houses in 90 days.

“Imagine getting a letter that says, ‘Your house will be on the train three days from now. Go down to the depot and unload your box car,’” says architectural historian Rebecca Hunter, who has written several books about kit homes. “It’s so weird and wonderful.”

On the designated day, the new homeowners would arrive at the train station and begin unloading the materials they would use to build their new home. Over the next several days, they would transport (in an automobile, if they were lucky) lumber, nails, shingles, windows, doors, pipes, and even doorknobs to their home site. The materials for Sears Modern Home #111, a two-story foursquare home called the “Chelsea,” included 25 doors, 28 windows, 750 pounds of nails, 325 feet of crown molding, and six dozen coat hooks.

Sears and other companies marketed their homes to buyers of “modest means”; advertisements emphasized the low cost and described the homes as “practical” and “for everybody.” In an era where single-family housing was still relatively rare, mail-order homes were a way for middle-class families to attain a previously unaffordable goal of homeownership. In addition, Sears and some other manufacturers offered financing for the kits, and the applications didn’t ask about race, gender, or ethnicity. This may have made it easier for immigrants, minorities, and single women to purchase homes, since they faced discrimination from other mortgage lenders of the time (although they might still have been restricted, formally or informally, from purchasing lots in many places). Existing records don’t enable historians to determine the composition of kit-home buyers, but anecdotal evidence suggests that some people who couldn’t obtain financing from traditional sources were able to obtain it from Sears.

A modern-day analog to kit homes is manufactured housing. These homes are assembled in a factory and then shipped to the site and tend to cost significantly less than traditional site-built homes. With housing affordability

an increasing challenge for even middle-class families, observers ranging from industry trade groups to affordable housing advocates are looking to manufactured housing as a potential solution.

Building a Market

In the late 1880s, former railroad station agent Richard Sears started selling watches through the mail with Alvah Roebuck, a watchmaker and repairman. They incorporated as Sears, Roebuck and Company in 1893, and by the following year, their catalog was 322 pages long and sold everything from syringes to refrigerators. By 1908, when Sears started its Modern Homes program, more than one-fifth of Americans subscribed to a catalog that at its peak advertised 100,000 items on 1,400 pages.

Sears started selling construction materials in 1895, but the division languished unprofitably until Frank Kushel, previously the head of the company’s china department, took over in 1906. He realized Sears was losing money by paying to store the materials before they were shipped to buyers and proposed something new: shipping the goods directly from the factories to the customers.

The first *Book of Modern Homes and Building Plans* was published in 1908 with 22 different homes. At first, Sears sold only bulk materials and the blueprints, but in 1915 the company started offering complete kits that included pre-cut lumber numbered to match the plans; windows, doors, and flooring; and even the exact number of nails needed. (Plumbing fixtures, for homes that included an indoor bathroom, were available for an extra charge.) Eventually, Sears offered 447 different plans in three product lines, ranging from the most expensive “Honor Bilt” homes, some of which had two stories, to “Simplex Sectional” garages and farm buildings. For little or no additional charge, Sears’ architects would modify the plans upon request — reversing a floor plan, for example, or adding extra dormers.

Kit homes were made possible by a variety of new construction techniques. In the late 1800s, many residential roofs were made of large sheets of felt covered with pine tar and asphalt. But in 1903, roofing contractor Henry Reynolds started cutting these rolls into individual shingles, which were much easier to ship and install. Also in the 1800s, the timbers in a home’s frame were connected using mortise-and-tenon joints, which required advanced carpentry skills. But by the end of the century, “balloon” framing was in widespread use. With this technique, a house could be framed with pre-cut two-by-fours and two-by-sixes that ran straight from the floor to the roof and

could be nailed together. The invention of drywall in 1916 also dramatically simplified home construction. Before drywall, wood walls were covered with layers of plaster, a skill- and time-intensive process. But sheets of drywall could be manufactured and shipped in large quantities and installed by someone with “average abilities.”

Sears didn’t keep its sales records, so no one knows exactly how many Sears homes were built. By most estimates, the company sold between 70,000 and 75,000 homes from 1908 to 1940, when the Modern Homes division closed its doors, although some estimates are higher. Overall, Hunter estimates that the kit homes sold by Sears and other manufacturers accounted for between 2 percent and 5 percent of housing starts in the 1920s.

Sears’ homes sales reached \$12.5 million in 1929 — but nearly half of that value was in financing, which the company had started offering in 1911. (The typical Sears loan required a 25 percent down payment, with a five-year repayment period at 6 percent interest. Sometimes Sears would extend the period to as long as 15 years.) During the Great Depression, Sears had to foreclose on many of its customers; it liquidated \$11 million in loans in 1934. Although Sears continued to sell homes for the remainder of the decade, it no longer offered financing and sales steadily declined. The final Sears house catalog was issued in 1940.

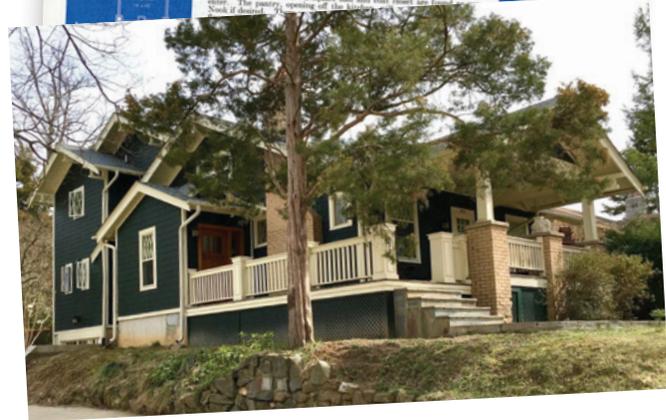
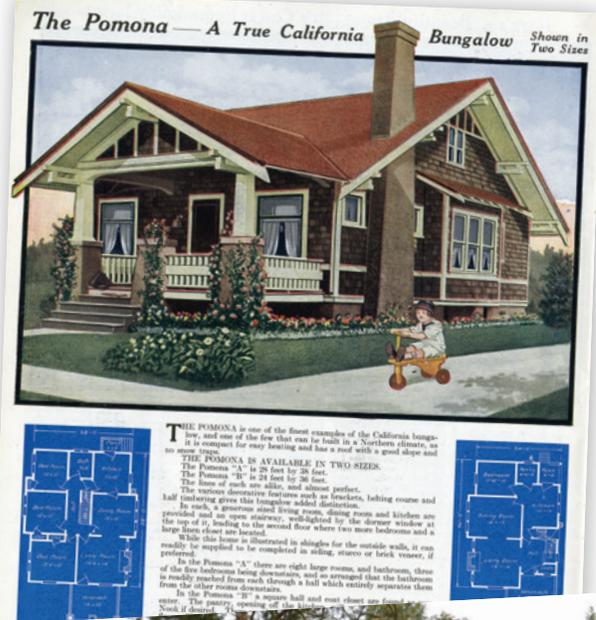
Catalog Competitors

“Sears home” has largely become synonymous with “kit home.” But that’s deceiving. “Sears wasn’t the first to start selling kit houses, they weren’t the last company out of the market, and they didn’t sell the most homes,” says Hunter. As early as 1866, the Lyman Bridges Company of Chicago sold prefabricated “sectionalized” homes to settlers in the West. And Sears’ Frank Kushel actually got the idea for selling kits from brothers William and Otto Sovereign, who founded the North American Construction Company in Bay City, Mich., in 1906.

The Sovereign brothers, who later renamed their company Aladdin, started out making kits for boat houses, garages, and summer cottages. Aladdin would become Sears’ largest competitor; between 1913 and 1927, they sold around 2,000 homes per year, peaking at 3,650 in 1926.

Aladdin didn’t just sell individual homes — it also sold entire communities. More than 300 corporations built company towns with homes purchased in bulk from Aladdin’s *Low Cost Homes Designed Especially for Industrial Purposes* catalog. One such corporation was DuPont, which in 1914 signed a contract with France to produce 8 million pounds of guncotton, a smokeless propellant that replaced gunpowder during World War I. More Allied orders followed, and DuPont quickly built three new factories near its small dynamite factory in Hopewell, Va. To help house its workers, DuPont ordered hundreds of Aladdin homes, dozens of which are still standing.

DuPont also built Aladdin kit homes for World War I-era munitions workers in Sandston, Va., outside



At top, the “Pomona” in Aladdin’s 1920 catalog. At bottom, a Pomona that sold for nearly \$1.4 million in Washington, D.C., in 2017.

Richmond, and in Penniman, Va., on the York River near Williamsburg. Penniman was largely abandoned after World War I, but some of its Aladdin homes were shipped to Norfolk via barge, where they remain today.

In 1925, Aladdin purchased a parcel of land south of Miami, Fla., and started building “Aladdin City,” which was designed to house 10,000 residents. But Florida was at the peak of a real estate boom, and that same year, overwhelmed by delivering building materials, the railroads refused to transport anything besides food and other essentials. Development across the state slowed, prices started to decline, and the boom went all the way bust after a major hurricane in 1926. Aladdin’s development went dormant, and the venture was officially dissolved in 1936. It continued to sell a few hundred kit homes per year through the 1970s but never fully recovered. It went out of business in the 1980s, having sold around 100,000 homes in the United States, Canada, the United Kingdom, and Africa.

Other major manufacturers of kit homes included Lewis-Liberty Homes and Sterling Homes, both based in Aladdin’s home town of Bay City, Mich.; Gordon Van-Tine of Davenport, Iowa; Chicago’s Harris Brothers; California-based Pacific Homes; and Sears catalog

competitor Montgomery Ward, which also offered mortgage financing and, like Sears, saw the Great Depression put an end to its housing division.

Searching for Sears

Although kit homes were a relatively small share of the housing market, there is a modern-day network of enthusiasts, including Hunter, who travel the country to identify those that are still standing. So far, Hunter and other aficionados have documented about 11,500 Sears homes in 44 states, Washington, D.C., and Alberta and Ontario, Canada. The most Sears homes — 2,500 — have been found in Ohio, followed by Illinois with 2,200.

Sometimes it's possible to identify a kit home by comparing it to a picture in a catalog, but Sears modified some designs and many homes have been renovated over the years. And sight alone is not enough, as Sears intentionally mimicked popular home designs of the era. To authenticate a Sears home, enthusiasts look for mortgage records or for numbers stamped on the plumbing or lumber. In some instances, homeowners have found the original leather book of blueprints in the attic. No one knows how many homes are still out there, but Andrew Mutch, who with his wife, Wendy, maintains what collectors consider the definitive list of authenticated kit homes, estimates that about 70 percent of the homes Sears shipped out still exist today.

How do kit-house hunters know where to look? “Any town that had major middle-class growth in that era is going to have kit homes,” says Hunter. Many kit homes also are located in neighborhoods known as “streetcar suburbs,” which developed as electric streetcars enabled people to move farther away from the city center. (The first electric streetcar went into service in Richmond, Va., in 1888.) Kit homes also tend to be located within a mile or two of a railroad station, since the homeowners had to transport everything from the train cars themselves.

Washington, D.C., is a case in point. Between 1914 and 1919, the city's population grew from around 350,000 to more than 520,000, as World War I drew soldiers, civilian volunteers, lobbyists, and new federal workers to the city. The city was served by several railroads, and multiple streetcar lines had spurred the development of suburbs such as Mount Pleasant, Anacostia, and Chevy Chase. More than 300 Sears homes have been identified in Washington, D.C., and Washington real estate agents Catarina Banner and Marcie Sandalow estimate that there are hundreds more by other manufacturers throughout the city. They have authenticated about 100 kit homes in the Chevy Chase neighborhood alone. In 2017, a “Pomona” model by Aladdin in Northwest Washington sold for nearly \$1.4 million.

Aladdin's 1915 catalog advertised the Pomona for \$1,365; a second floor was available for an additional \$138.

Manufactured Affordability

Plenty of pricey homes have been sold in Washington, D.C., recently. In June 2019, median home prices reached \$620,000, a new record for that month. A similar story is occurring across the country: Nationwide, housing prices are 15 percent above the 2006 peak, pushed up by a lack of supply and rising costs for labor and materials. (See “The Missing Boomerang Buyers,” *Econ Focus*, First Quarter 2017.) This is especially true for the lower end of the market; since 2014, prices have increased faster for the bottom fifth of homes than for homes overall.

The dearth of low- and mid-priced homes is driving renewed interest in factory-built housing, which is typically much less expensive than traditionally built homes. Not including land, the average new manufactured home costs \$55 per square foot as of 2018. The average new site-built home costs \$114 per square foot. Despite the low cost, manufactured homes account for only about 10 percent of housing starts, due in part to perceptions about quality, zoning restrictions, and traditional mortgage lenders' reluctance to offer financing.

Since the late 1970s, however, the Department of Housing and Urban Development (HUD) has implemented a number of construction standards to improve the durability, safety, and energy efficiency of manufactured homes. And the Manufactured Housing Institute, a trade group, notes that technological advances have made it possible to produce a wide range of architectural styles and exterior finishes. In June 2019, a bipartisan group of senators introduced legislation that would allow state and local governments to include manufactured housing in their plans when they apply for HUD funding. The previous summer, Fannie Mae announced a new program to purchase loans for manufactured homes that met certain criteria, with the goal of making more financing available. Freddie Mac has launched a similar program as part of its “Duty to Serve” initiative, which focuses on affordable housing and underserved markets. But to be eligible for either program, homes must have features including permanent foundations, pitched roofs, and architectural details such as porches or dormers. Such homes typically cost between \$150,000 and \$250,000 and thus still may be out of reach for many households.

A million-dollar modernized Sears home is almost certainly out of reach for most households. But it's still possible for some people to live in Sears housing — after a fashion. Although the retailer filed for bankruptcy in 2018, its former catalog printing plant, in Chicago's Homan Square, has been redeveloped into 181 affordable apartment units. **EF**

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Transportation and Commuting Patterns: A View from the Fifth District

BY SANTIAGO PINTO

The transportation system is a key component of the economic performance of regions. An important role of the urban transportation system is to facilitate commuting between homes and jobs. At the national level, in 2017 commutes represented on average about a quarter of all annual vehicle trips per household. (The shares of trips that were shopping trips, recreational and social trips, and other trips for personal and family reasons were all about the same.) Economists have more data on commuters and their commutes than is commonly realized — and it’s relevant to many economic questions.

National Commuting Data

The commuting and workplace data of the American Community Survey (ACS) and the Longitudinal Employer-Household Dynamics Origin-Destination Employment Statistics (LODES) are the main two sources usually considered to examine home-to-work flows. These databases, both produced by the Census Bureau, offer different but complementary information. The ACS commuting database contains information on individuals’ residence and work locations, the mode of transportation, the duration of the trip, the time of the day commuters leave home for work, and the number of car, truck, or van riders. It also conveys this information according to different demographic characteristics. The LODES database describes jobs by workplace and residence location, in addition to job, employer, and worker characteristics; these include industry type, firm size, firm age, average monthly earnings, sex, race, ethnicity, and educational attainment, among others.

Analysis of data from the ACS reveals a few interesting facts about commuting in the United States. (See table.) Commuters using public transportation tend to be younger than those who rely on cars, trucks, or vans and drive alone. Roughly equal proportions of female and male commuters use public transportation; however, since 47 percent of all commuters are female, this implies that female workers tend to use public transportation more than male workers. Blacks or African Americans tend to rely more on public transportation than other groups. Public transportation tends to be used more by median-income workers; on average, car, truck, or van drivers who drive alone have higher incomes and those who carpool have lower incomes.

On average, Americans’ travel time to work is approximately 26 minutes. It varies across modes of transportation, with public transit the slowest (almost 50-minute long commutes). The national averages, however, hide large regional variations. Locations face different

geographic challenges and rely on different transport technologies associated with different travel speeds and capacity. Mean commuting times vary as a result, from 17 minutes in South and North Dakota to 33 minutes in New York. (The difference between the highest and lowest times amounts to 128 hours per year for a typical full-time worker, or 16 workdays.) In the Fifth District, mean commuting times are about 32 minutes in Maryland, 30 minutes in D.C., 28 in Virginia, almost 26 in West Virginia, and 24 in North and South Carolina.

One reason transportation systems are a complex issue is that some commuters travel outside their location of residence. This behavior introduces several challenges regarding the organization, design, and financing of the transportation system. On average, in the United States, almost 28 percent of workers commute to a different county. Workers who commute outside their county of residence rely more on public transportation than those who work in the county of residence.

Selected Characteristics of Commuters

Subject	United States			
	Total	Car/truck/van drove alone	Car/truck/van carpooled	Public transp.
SEX				
Male	53.0%	52.9%	53.5%	50.1%
Female	47.0%	47.1%	46.5%	49.9%
RACE				
White	75.0%	77.3%	68.5%	50.1%
Black, African American	11.4%	10.8%	11.7%	23.8%
American Indian, Alaska Native	0.7%	0.6%	0.9%	0.6%
Asian	5.7%	4.9%	7.9%	12.1%
Other or mixed	7.3%	6.4%	11.0%	13.4%
MEDIAN EARNINGS (past 12 months)	\$35,855	\$37,213	\$27,789	\$35,065
MEAN TRAVEL TIME TO WORK (minutes)	26.4	25.1	28.0	49.7

NOTE: Workers age 16+

SOURCE: Census Bureau (American Community Survey, 2013-2017)

Commuting Distances by City

Miles	How far are city residents commuting?			How far are workers commuting to the city?		
	Baltimore, MD	Charlotte, NC	Richmond, VA	Baltimore, MD	Charlotte, NC	Richmond, VA
Less than 10	67.6%	55.1%	65.9%	57.7%	37.9%	51.8%
10 to 24	19.6%	27.3%	16.8%	25.1%	35.4%	24.9%
25 to 50	9.2%	3.5%	1.7%	11.7%	8.3%	4.8%
More than 50	3.5%	14.1%	15.5%	5.5%	18.4%	18.5%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

SOURCE: Census Bureau (LODES 2017)

Commuting in Fifth District Cities

How are the commuting patterns observed in the Fifth District different from the national averages? Focusing on three of the District's largest cities — Richmond, Va., Baltimore, Md., and Charlotte, N.C. — the commuting behavior observed in these cities differs from the national data in several ways. First, the proportion of commuters who rely on public transportation is remarkably high in Baltimore (18 percent) compared to the national average (5.1 percent) and to the other two cities (5.2 percent in Richmond and 3.5 percent in Charlotte). Second, in all three cities, public transportation is used mostly by lower-income workers, in contrast with the national pattern in which it is used more commonly by median-income workers. Third, the percentage of workers walking to work in Baltimore and Richmond is higher than the national average (about 6 percent of workers choose this alternative in the two cities, while the national average is 2.7) and lower in Charlotte (2 percent). Fourth, average commuting time is markedly higher than the national average in Baltimore (30 minutes vs. 26 minutes) and markedly lower in Richmond (22 minutes). It's about the same as the national average in Charlotte (25 minutes).

The LODES data allow us to obtain information on distance traveled by commuters for these cities. The data indicate that most Baltimore residents and most workers commuting to Baltimore travel fewer miles than the same groups of commuters in the other two cities. Commuters to and from Charlotte travel the longest distances. (See table above.) This pattern suggests that the variability of commuting times across the three cities is not driven simply by miles traveled. While commuters travel shorter distances and experience longer commuting times in Baltimore, the opposite is observed in Charlotte. Other factors, such as geographic constraints, reliance on public transportation, available transportation infrastructure, and traffic definitely play an important role in explaining such differences.

Commuting times may not depend only on decisions made by local transportation planners since commuting flows, as shown earlier at the national level, take place across local jurisdictions. Where to work and where to reside are of course mutually dependent decisions that depend not only on individuals' preferences, but also on the availability of jobs

and transportation costs. Uncovering the extent to which mobility extends beyond local political borders is crucial, therefore, to coordinate transportation planning and investment efforts.

The LODES data, which contain detailed information

on inflows and outflows of workers by city, allow us to quantify this phenomenon for the three cities under consideration. (See table on adjacent page.) The data reveal an interesting observation. The three cities clearly constitute large employment centers. In fact, the number of jobs in those cities largely exceed the number of local residents (the ratio of city residents to jobs is 72.6 in Baltimore, 64.2 in Charlotte, and 62.9 in Richmond). However, local jobs are not entirely filled by local residents (the percentage of local jobs filled by city residents is 33.3 in Baltimore, 41.8 in Charlotte, and 23.2 in Richmond). In fact, a large share of residents commute outside of the city (about 63 percent of the residents in Richmond commute outside of the city, 55 percent in Baltimore, and 35 percent in Charlotte).

The table also shows earnings obtained by city residents in jobs in and outside of the city and earnings obtained by workers commuting into the city. In all three cities, outside workers tend to work in higher-paying jobs than city residents (the percentage of workers receiving \$3,333 per month or more in jobs available in the city is higher for outside workers than for city residents). Also, in all three cities, the proportion of city residents who work outside of the city in lower-income jobs (earning less than \$1,250) is higher than the proportion of city residents who work in low-income jobs within the city.

Where do residents of the cities commute to work? LODES data show some interesting distinctive behavior across cities. (See table on page 30.) First, commuting flows in and out of the three cities are very dispersed. In other words, there are several origin and destination locations, each one explaining only a minor part of the overall commuting flows in and out of the three cities. Second, the data also reveal some amount of cross-commuting among certain locations. In the case of Richmond, large commuting flows take place both to and from Mechanicsville and Tuckahoe. A similar pattern is observed in Baltimore (commuting flows from and to Towson and Columbia) and in Charlotte (commuting flows from and to Concord, Raleigh, and Huntersville).

How Urban Economists Think About Transportation

Location decisions by firms and individuals, and as a result, the use of land, involve the consideration of several

factors. Accessibility, determined by the transportation system in place, is one of them. But accessibility depends, at the same time, on where firms and individuals locate. In other words, transportation and land use interact and influence one another: Changes in transportation investment affect local accessibility levels; the latter affects location choices by firms and residents, which eventually affect accessibility, and so on. As a result, when economists think about transportation, they do not consider it in isolation but as one of the components of a more general and interrelated system that includes cities and regions.

Two basic principles characterize the role of transportation in the context of cities. First, one of the main reasons for the existence of cities is that there are special advantages, usually referred to as “economies of agglomeration,” to carrying out economic activities in close proximity. In other words, costs are lower when certain types of activities locate close to each other. Transportation is therefore critical: Anything that reduces transportation costs would allow a higher concentration of production, resulting in larger benefits from agglomeration.

Second, local wages and housing prices adjust at every location so that households and firms do not have an incentive to move; that is, wages and land prices should adjust until households and firms are indifferent between locations. When choosing where to live, individuals consider several factors, such as job opportunities, housing options, social networks, and commuting costs. Some people might choose to live far away from jobs, possibly accepting a costlier commute, because they would be compensated, in effect, by other factors such as lower housing costs.

A very specific trade-off between commuting costs and land prices emerges as a result: At locations near employment centers, commuting costs are low and land prices are high; at more distant locations, commuting costs are higher and land prices are lower. The different levels of accessibility are explained, in part, by the quality of the local transportation system.

Economic Importance of Transportation

Research in urban transportation has mainly focused on the effects of transportation on job accessibility and local economic conditions. Estimating those effects is challenging, however, precisely because of the interdependence between transportation and land use explained earlier.

Commuting Flows and Earnings by City

	Baltimore, MD	Charlotte, NC	Richmond, VA
Living in the City	72.6%	64.2%	62.9%
Living and Employed in the City	45.5%	65.1%	36.9%
Employed and Living in the City	33.0%	41.8%	23.2%
External Jobs Filled by Residents			
\$1,250 per month or less	20.7%	21.9%	21.9%
\$1,251 to \$3,333 per month	37.5%	34.5%	37.4%
More than \$3,333 per month	41.9%	43.6%	40.7%
Internal Jobs Filled by Outside Workers			
\$1,250 per month or less	11.0%	14.8%	14.2%
\$1,251 to \$3,333 per month	24.6%	28.5%	28.2%
More than \$3,333 per month	64.4%	56.8%	57.6%
Internal Jobs Filled by Residents			
\$1,250 per month or less	15.3%	16.5%	20.3%
\$1,251 to \$3,333 per month	37.2%	31.6%	37.8%
More than \$3,333 per month	47.5%	51.9%	42.0%

NOTE: “Living in the City” is the number of residents in the city divided by the number of people employed in the city. “Living and Employed in the City” is the number of people who both live in and work in the city divided by the number of residents in the city. “Employed and Living in the City” is the number of people who both live in and work in the city divided by the number of people working in the city.

SOURCE: Census Bureau (LODES 2017)

In a 2011 *American Economic Review* article, Gilles Duranton of the University of Pennsylvania and Matthew Turner of Brown University explore the relationship between transportation infrastructure and traffic congestion. Specifically, they estimate the effect of increasing highway capacity on congestion. Their main finding is that people actually drive more when the stock of roads in their city increases. In fact, they find a one-for-one relationship between the two. It follows, then, that an increase in the provision of highways would not alleviate congestion. Their explanation of this outcome is that cities with better roads attract more people. The use of the roads would therefore increase until traffic congestion reaches its pre-existing levels. In a different article, published in 2012 in the *Review of Economic Studies*, the same authors examine the effect of increasing highway miles on employment growth in American cities; they find that a 10 percent increase in a city’s initial stock of highways caused about a 1.5 percent increase in its employment over a 20-year period.

Between 1950 and 1990, the aggregate population of central cities in the United States declined by 17 percent, despite the fact that population increased by 72 percent in metropolitan statistical areas (MSAs). This process is generally known as suburbanization. Work by Nathaniel Baum-Snow of the University of Toronto, published in the *Quarterly Journal of Economics* in 2007, investigates the extent to which this phenomenon is attributable to the construction of highways, which tend to lower commuting

Commuting Destinations by City

Share of workers who reside in ...					
Baltimore, MD		Charlotte, NC		Richmond, VA	
And work in ...	Share	And work in ...	Share	And work in ...	Share
Baltimore city, MD	45.5%	Charlotte city, NC	65.1%	Richmond city, VA	36.9%
Towson CDP, MD	4.6%	Concord city, NC	2.1%	Innsbrook CDP, VA	3.7%
Columbia CDP, MD	2.6%	Raleigh city, NC	1.9%	Manchester CDP, VA	1.8%
Cockeysville CDP, MD	2.4%	Matthews town, NC	1.5%	Tuckahoe CDP, VA	1.7%
Catonsville CDP, MD	1.6%	Huntersville town, NC	1.4%	Mechanicsville CDP, VA	1.7%
Owings Mills CDP, MD	1.4%	Pineville town, NC	1.4%	Short Pump CDP, VA	1.6%
All Other Locations	42.1%	All Other Locations	26.6%	All Other Locations	52.6%
Share of workers who work in ...					
Baltimore, MD		Charlotte, NC		Richmond, VA	
And reside in ...	Share	And reside in ...	Share	And reside in ...	Share
Baltimore city, MD	33.0%	Charlotte city, NC	41.8%	Richmond city, VA	23.2%
Dundalk CDP, MD	2.8%	Concord city, NC	2.6%	Tuckahoe CDP, VA	3.2%
Towson CDP, MD	2.4%	Huntersville town, NC	2.1%	Mechanicsville CDP, VA	2.3%
Columbia CDP, MD	1.7%	Gastonia city, NC	1.7%	Short Pump CDP, VA	1.6%
Essex CDP, MD	1.6%	Raleigh city, NC	1.4%	Bon Air CDP, VA	1.4%
Ellicott City CDP, MD	1.6%	Indian Trail town, NC	1.3%	Meadowbrook CDP, VA	1.3%
All Other Locations	57.0%	All Other Locations	49.1%	All Other Locations	67.0%

SOURCE: Census Bureau (LODES 2017)

costs. The paper finds a positive relationship between roads and suburbanization. The results indicate that one additional “ray,” or segment, of interstate highway originating from the city center leads to about a 9 percent decline in the central city population. It should be noted, however, that other factors occurring at that time were inducing residents to move out of downtown areas: increases in income, a flight from blight due to crime, the degradation of housing stock, and changes in the school system.

U.S. cities show differing patterns of residential sorting by income. In most U.S. MSAs, the suburbs are of higher income status and the central cities are relatively poor. There are important exceptions, such as Chicago, Philadelphia, and others. The literature suggests different mechanisms that could explain this kind of spatial sorting of households. One such explanation focuses on transportation mode choices. In a 2008 article published in the *Journal of Urban Economics*, Edward Glaeser of Harvard University, Matthew Kahn of Johns Hopkins University, and Jordan Rappaport of the Kansas City Fed state that transport modes are key for explaining the central location of the poor. The reasons are twofold: First, the larger financial costs associated with owning a car may cause lower-income families to rely on other modes of transportation, such as public transit; and second, public transit

is more accessible in central cities than in suburbs.

A different line of research that also focuses on job accessibility is related to the spatial mismatch hypothesis. The spatial mismatch hypothesis pioneered in 1968 by John Kain, then an economist at Harvard University, attempted to explain an apparent spatial disconnection between jobs and workers’ locations. The shift of jobs predominantly toward the suburbs observed during the 1960s and 1970s hurt the labor market prospects of minorities. For different reasons, African-American populations, largely concentrated in central urban areas, were unable to relocate closer to the jobs. They experienced, as a result, either excessive commuting costs or higher and persistent unemployment levels. In Kain’s view, the inability of minorities to move and follow the jobs to the suburbs was mainly due to racial discrimination in the suburban housing market.

The spatial mismatch hypothesis motivated a large body of research on job accessibility and transportation. This literature has mainly focused on determining how the lack of connection to job opportunities affects an individual’s prospects in the labor market, especially low-skilled workers and minorities.

Research generally confirms the hypothesis. The main findings can be summarized as follows. First, the effect of spatial mismatch is stronger in large central urban areas, where low-skilled minorities tend to live. Jobs are generally located far away from central areas, and minorities face geographical barriers that prevent them from finding and keeping jobs. Second, the research indicates that better job accessibility significantly decreases the duration of joblessness among lower-paid displaced workers, the result being strongest for non-Hispanic, African-Americans, females, and older workers.

A corollary of these findings is that improving spatial access to jobs would lead to better labor market outcomes. Investing in transportation infrastructure and improving transportation services (increasing frequency, capacity, and so on) would increase connectivity between high-unemployment neighborhoods and locations with an abundance of jobs and help alleviate the negative consequences of the spatial mismatch.

Transportation Policies: Challenges and Opportunities

Given the durability of the transportation infrastructure, policies aimed at shaping the performance of the transportation system will have long-term implications.

Consider the process of suburbanization observed during the 1950s through the 1970s. This process is usually attributed to the interaction of three forces: a growing population, rising incomes, and falling commuting costs. The interaction of these forces would naturally lead to urban growth. But specialists such as Jan Brueckner of the University of California, Irvine believe that the failure to correct for the existence of different market imperfections may have also contributed to an excessive urban expansion, commonly referred to as urban sprawl. Distortions may arise, for instance, because commuters do not internalize the social costs of congestion when they drive on freeways or because developers, under traditional financing mechanisms, do not bear the burden of the increased infrastructure costs associated with new developments. Brueckner suggests that development taxes, congestion tolls levied on commuters, and other policies aimed at increasing urban densification may partially address some of these issues.

In fact, most economists tend to agree that the best way to reduce congestion is through congestion tolls. Yet only a few cities in the world (such as Stockholm, London, and Singapore) have implemented this policy. In general, this policy lacks political support, and other alternatives, such as taxes on gasoline, are more frequently used instead. The problem with gasoline taxes is that even though they do increase the cost of using the road, they do not necessarily alleviate congestion since drivers pay the same amount at congested and uncongested hours.

Other price-based mechanisms aimed at reducing traffic congestion involve changing the customary agreements between employers and employees. One example is the reimbursement of parking charges. Typically, workers pay for parking fees and employers would raise their wages accordingly. Under the revised approach, however, workers would be allowed to pocket the money from higher wages and take public transit to work rather than pay for parking fees.

Political reasons may also explain the implementation of less desirable and sometimes unproductive transportation policies. Some of these practices include the failure to adopt congestion pricing, a disproportionate emphasis on new road construction rather than maintaining existing infrastructure, the provision of free parking in congested cities, an overinvestment in lower-density infrastructure and underinvestment in higher-density infrastructure, the insufficient reliance on user fees, and

the excessive reliance on funding from the national level, even for highly local projects.

Innovations

A number of innovations have been taking place recently in the transportation sector, and these changes are reshaping the way residents and workers interact in the job market. Examples include the growing role of ride-sourcing private transport services, such as Uber and Lyft, and the possibility to telecommute.

On-demand transport services allow a more efficient use of the existing stock of vehicles. By combining information technology with a potential large supply of vehicles and a flexible pricing mechanism, ride-sourcing services allow more efficient matching between passengers and drivers, resulting in higher levels of mobility and accessibility. Some empirical research indicates that on-demand services can improve the productivity of vehicles by about 30 to 50 percent relative to traditional taxi services. These could eventually improve congestion in high-density areas if fewer vehicles are required to satisfy similar mobility needs. Moreover, as more individuals rely on this system, fewer parking spaces would be required in central urban areas, reducing traffic caused by cars looking for vacant parking spots and allowing the allocation of this space for more productive alternatives. There is some evidence, however, that ride-sourcing services could generate more congestion in some cities. The reason is that not only have ride-sourcing services drawn commuters off trains and buses, they have also contributed to the increase in the number of waiting drivers with empty seats.

According to the American Time Use Survey, the share of workers doing some or all of their work at home was approximately 24 percent in 2018, growing from 19 percent in 2003. Workers in managerial and professional occupations were more likely than workers in other occupations to do some or all of their work at home. The basic theoretical framework used by urban economists to study location decisions by workers and firms would suggest that the rise in telecommuting should cause cities to spread out and become less dense in the center. The impact of telecommuting on the economy could, as a result, be ambiguous: While telecommuting reduces traffic congestion (and traffic pollution), it also reduces the beneficial impact of agglomeration economies on workers' productivity.

Other innovations, such as driverless cars, will likely also affect the way people commute. Their impact on the transportation system and commuting behavior is, however, unclear. The main challenge faced by policymakers is that due to the nature and underlying characteristics of the transportation system, investment and policy decisions in this area will have long-lasting effects on everyone's lives. EF

Composing the Fed's Balance Sheet

BY JOHN WEINBERG

During the Great Recession, the Fed engaged in a number of extraordinary policy steps, including reducing its short-term interest rate target to near zero and significantly expanding the size of its balance sheet by purchasing long-term Treasuries and other securities. Over the last few years, the Federal Open Market Committee (FOMC) has embarked on a process of monetary policy “normalization,” which includes raising interest rates above zero and reducing the size of the Fed’s balance sheet. Both of these tasks have now largely been completed.

After steadily raising its interest rate target throughout 2017 and 2018, the FOMC paused and then cut rates at its July and September 2019 meetings. This could be interpreted as signaling to the public that interest rates have reached a “normal” level, in the sense that the FOMC could now adjust rates up or down or hold them steady depending on economic conditions. Still, some might argue that the level of short-term interest rates remains lower than “normal,” at least by historical standards.

In its normalization principles, the FOMC said that it planned to reduce the size of the Fed’s balance sheet until it holds “no more securities than necessary to implement monetary policy.” In 2017, the Fed began unwinding its security holdings by a monthly amount that started small and gradually increased. At its July 2019 meeting, the FOMC announced that this unwinding would come to an end in August, suggesting that the size of the balance sheet has reached what might be considered its new normal for the time being. That said, the Fed will continue to exchange its holdings of mortgage-backed securities for Treasury securities. This raises one last question related to policy normalization: What mix of Treasury securities should the Fed hold? The minutes of the FOMC’s meeting at the end of April 2019 reported on a preliminary discussion of this topic, although no decision has been announced by the Committee. (I should be clear that, as in all of my columns, I’m speaking only for myself here and not for the Federal Reserve System.)

The Treasury issues securities with maturities ranging from one month to 30 years. The Fed has historically held a mix of Treasuries, but its holdings were weighted more toward shorter-term maturities compared with all Treasuries outstanding. During the Great Recession, the Fed purchased longer-term Treasuries and sold virtually all of its T-bills (the shortest maturity Treasury securities) in an effort to bring down long-term interest rates and provide additional monetary policy accommodation. The idea behind such balance sheet moves is that purchasing long-term securities bids up their price, which reduces the yield or interest rate. As a result of these operations, the Fed’s

balance sheet is weighted more toward long-term Treasury securities than usual.

This distribution creates a potential risk to the Fed’s net interest income. The Fed earns interest on its portfolio of securities, which it uses to pay operating expenses. Any remaining income is returned to the Treasury. When short-term interest rates rise, as they have until recently, the yield on outstanding long-term securities in the Fed’s portfolio doesn’t change. That means that while the interest the Fed pays out on reserves increases, the interest income it earns on its long-term securities stays roughly the same, reducing the Fed’s overall net income. From an operational and economic standpoint, this isn’t a big problem. The Fed’s unique ability to issue currency and bank reserves is not affected by its net income or net worth, so it can continue to conduct monetary policy. But this volatility in the Fed’s payments to the Treasury could draw additional scrutiny from government officials and prompt intervention into the Fed’s operations, which could threaten monetary policy independence.

Leaving the composition of the Fed’s balance sheet as it is could also limit the Fed’s ability to engage in maturity extension operations during a future crisis. There are varying estimates of the impact of the Fed’s balance sheet operations during the Great Recession, but being able to ease long-term rates by selling short-term and buying long-term securities arguably provided the Fed with an additional tool when short-term rates reached their effective lower bound. Recalibrating the balance sheet now in good economic times would ensure that this tool is available again in future crises. Even if the impact of this tool may not be large, there could be some value in saving as much room for balance sheet operations as possible for when they are needed most.

That said, there may be some costs to shortening the maturity of the Fed’s balance sheet. Selling long-term securities could have the effect of raising long-term interest rates, which in turn would make it necessary for the Fed to keep short-term rates lower for longer. Given that short-term rates are already low and have recently fallen, shortening the maturity of the balance sheet now could contribute to the Fed once again hitting the effective lower bound.

But such broader financial market effects could be less likely now than in the wake of the financial crisis, when financial markets were more fragile. Undertaking this transformation in a gradual and transparent way, as the Fed has sought to do with all of its policy normalization operations, is likely to avoid serious market disruptions. **EF**

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NEXT ISSUE

Talking Ourselves into a Recession

How consumers and businesses feel about the future affects their economic activity today. Pessimism can lead to cutbacks in consumer spending and business investments. Can these effects be enough to push us into a recession even without a major negative shock to the economy?

Tourism in the Fifth District

The Fifth Federal Reserve District is home to a wealth of tourist attractions, from beaches in the Carolinas to historical destinations like Colonial Williamsburg and Harpers Ferry to urban centers like Baltimore and Washington, D.C. Leisure and hospitality is the district's fifth largest industry by payroll employment — and trends that are underway now are shaping the industry's future.

Interview

Janice Eberly of Northwestern University on intangible investments, household spending decisions, and the value of college.

Federal Reserve

The United States is home to an alphabet soup of financial regulators — in addition to the Fed, there's the FDIC, the OCC, the CFPB, the SEC, the CFTC, and more — and that's just at the national level. How did this intricate system evolve? What are its pluses and minuses compared to the more consolidated approaches of some other countries?

Community Colleges

More than 600,000 residents in the Fifth Federal Reserve District are enrolled at a community college. Who are they? What goals are they trying to achieve? What challenges do community colleges face, and how do they differ in states across the District? And how do these institutions work with industry to improve employment outcomes?

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Technology Diffusion and Productivity Workshop

Leading macroeconomics researchers shared their findings on the diffusion of knowledge and technology and its impact on various sectors and economic growth.

<https://tinyurl.com/diffusion2019>

Technology Diffusion: Evidence and Theory, Nancy Stokey, University of Chicago

Idea Flows and Economic Growth, Paco Buera, Washington University in St. Louis, and Robert Lucas, University of Chicago

Declining Search Frictions, Unemployment and Growth, Guido Menzio, New York University

Assessing the Gains from E-Commerce, Pete Klenow, Stanford University

Two-sided Market, R&D and Payments System Evolution, Zhu Wang, Federal Reserve Bank of Richmond

Innovation, Knowledge Diffusion, and Selection, Danial Lashkari, Boston College

Market Structure and the Macroeconomy Workshop

Researchers presented their findings on market power and concentration and their economic implications.

<https://tinyurl.com/structure2019>

Quantifying Market Power, Jan Eeckhout, UPF Barcelona

Indivisibilities in Distribution, Thomas Holmes, University of Minnesota

Diverging Trends in National and Local Concentration, Esteban Rossi-Hansberg, Princeton University

Kaldor and Piketty's Facts: The Rise of Monopoly Power in the United States, Gauti Eggertsson, Brown University

The Rise of Niche Consumption, Joseph Vavra, University of Chicago

Labor Market Concentration, Earnings Inequality, and Earnings Mobility, Kevin Rinz, U.S. Census Bureau

From Population Growth to Firm Demographics: Implications for Concentration, Entrepreneurship and the Labor Share, Hugo Hopenhayn, University of California, Los Angeles

Labor Market Power, Simon Mongrey, University of Chicago

Using Empirical Marginal Cost to Measure Market Power in the U.S. Economy, Robert Hall, Stanford University

Concentration in U.S. Local Labor Markets: Evidence from Vacancy and Employment Data, Claudia Macaluso, University of Illinois at Urbana-Champaign

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