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Lessons for Economists from the Pandemic

Cecilia Elena Rouse

It is an honor to be here today; I owe my love of economics to the Bureau as well as my many friends and colleagues. Marty Feldstein was one of the people who made it such a special place. I enjoyed seeing him around the Bureau, learning public finance from him, and briefly serving as his research assistant. I'd sit in his office, in awe of his incredible intellect and economic insights, and be completely distracted by the hilarious cartoons he had framed in his office. My favorite was the one in which Marty is depicted rowing in the wrong direction in a skiff while President Reagan yells "Feldstein!" They all reflected his steadfast willingness to speak his mind, to "speak truth to power," even to the president of the United States.

While I would never presume to compare to Marty as chair of the Council of Economic Advisers (CEA), I did share his view of the role of the CEA in an administration. As my staff knows all too well, I said (perhaps more often than we'd like to admit) that I did not believe anyone should say something that would require them to "give back their PhD." Our integrity matters, and I believe that any decision-maker — the president of the United States included — benefits from hearing what his or her staff actually thinks.

Marty took over as chair of the CEA as the economy was recovering from a period of high inflation and a subsequent recession. I was appointed during a different crisis. To truly understand the nature of the challenges we faced, it is useful to think back to where we were in 2021. First, we were still in the midst of a pandemic: thousands of Americans were dying each week. The first death was recorded in the US at the end of February of 2020, and by the time President Biden took office in January 2021 that number had reached 460,000. By then, the first of the vaccines were available, but we did not know how effective they would be at containing the spread, how long immunity would last, or how quickly they could be distributed and administered. While there was hope, the end of the pandemic was not yet clearly in sight.

Given that we did not understand the nature of the virus (Do we or don't we need to wear masks? Do we need to wash our groceries?), that we had no natural immunity, and that we had no medical response, we were asked to limit contact with other people and stay home if possible. In March and April of 2020, the number of Americans living under stay-at-home orders reached more than 300 million.

Despite the shutdowns, stock markets quickly recovered. And given that the pandemic restrictions were basically about face-to-face interactions, people swapped their services consumption for durables. A switch of this magnitude from services to goods had never happened before over such a short period of time. And because those "things" had to be produced and shipped, we ended up with massive supply chain disruptions. The New York Fed's Global Supply Chain Pressure Index, which attempts to measure the presence of supply constraints in the economy, spiked, reaching its highest value on record in December 2021. Shortages of microchips and semiconductors due to COVID restrictions, the total shutdown of many supply chains cutting through China, and disruptions in international shipping all played a

Cecilia Elena Rouse

Cecilia Elena Rouse is the president of the Brookings Institution and former Chair of the Council of Economic Advisers (2021–23). She is also a professor at Princeton University specializing in labor economics and education.

key role. The cost of shipping a container from China to the West Coast of the United States increased from about $1,300 per container in February of 2020 to about $20,000 in September of 2021.[1]

Supply chains are just one example; other novel issues that emerged ranged from childcare and school closures to declining commercial real estate values in cities (particularly offices), many of which continue to have repercussions in our society today. The key point is that this crisis had a distinct cause and consequences, and we can learn something new from it.

Which leads to the heart of my talk: What lessons can we learn from the pandemic and our responses to it? We will be learning from this crisis and evaluating the response for years to come; for now, I will focus specifically on three lessons I learned during my tenure at the CEA. And I will discuss them with a focus on three areas: fiscal responses, unemployment insurance (UI), and labor markets.

The first lesson: In a crisis, policymakers can't let the perfect be the enemy of the good.

First, I want to take us back to 2021 so that we can remember the potential crisis we were facing. Weekly initial UI claims tell the story well. As shown in Figure 1, at the beginning of March 2020, weekly claims were about 207,000; just two weeks later, they were ten times that, and at the beginning of April, claims reached a high of 6,137,000. This was nearly ten times the peak of weekly claims during the 2008 financial crisis.

In response, in 2020, Congress passed and then-President Trump signed two bills: the Families First Coronavirus Response Act on March 18, 2020 (providing $192 billion for COVID research, enhanced UI, and health funding), and the Coronavirus Aid, Relief, and Economic Security Act (the CARES Act) less than 10 days later (providing more than $2.2 trillion in economic stimulus). CARES alone was the largest stimulus package in American history. These were followed by the Coronavirus Response and Relief Supplemental Appropriations Act of

Unemployment Claims, 2007–2023

Weekly total, seasonally adjusted

In April 2020, claims reached a high of 6,137,000.

Shading denotes NBER-dated recessions

Source: US Department of Labor.

Employment-to-Population Ratio

Indexed to prior business cycle peak for last four recessions

— Jul 1990–Mar 1991
— Mar 2001–Nov 2001
— Dec 2007–Jun 2009
— Feb 2020–Apr 2020

Months since business cycle peak

Source: Author's replication of calculations by the Center for American Progress.

cession levels. And the effects of the recession in 2008 on the labor market were even longer lasting: it took 77 months, or more than six years, for employment to fully recover. A slow recovery can have lasting repercussions: an extensive literature shows the lasting effects of recessions on labor markets, ranging from the cost of entering a poor labor market for young people (who face lower wages and lower employment rates that persist for years after recovery) to scarring for prime-age and older workers (some of whom exit entirely, leading to lasting declines in employment and growth).[2]

Further, there was concern that the response in 2008 had not been large enough. To be clear, in 2008, the federal government spent a historic sum at the time, more than $2 trillion in 2022 dollars. But in retrospect, many economists agree that it did not go far enough, leaving us with a large and lasting demand shortfall that extended the recession and contributed to the slow labor market recovery. These concerns were at the top of policymakers' minds in 2020 and early 2021 — they did not want a repeat of the slow 2008 recovery, and this was a new and scary pandemic of unknown duration. Moreover, in early 2021, there were political economy concerns — many were not confident Congress would pass another stimulus bill should it be necessary. As a result, the federal government went big. The total spending on the pandemic crisis was more than double that of the financial crisis in real terms, not including the support the Fed provided to financial markets to keep credit flowing.

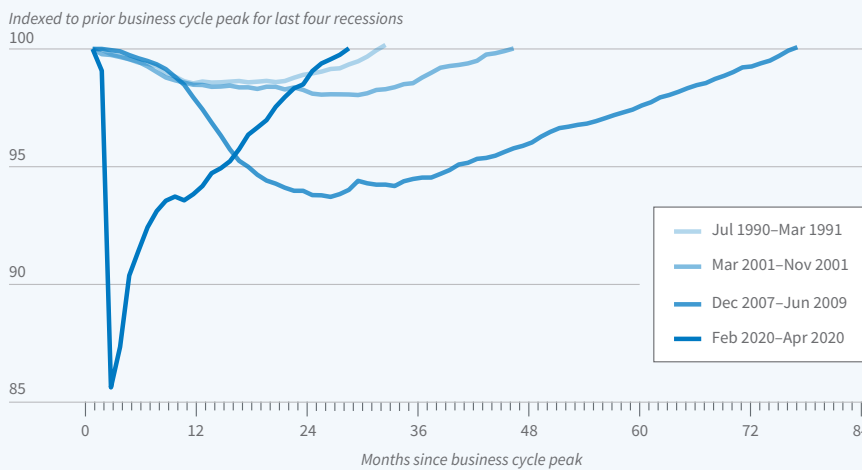Was it worth it? In the affirmative, the labor market recovery from the COVID pandemic was faster than after any other major recession since World War II (see Figure 2). Further, the US recovery in terms of GDP was much faster than that of virtually every other major economy. Figure 3, an extension of a report by my colleague Gian Maria Milesi-Ferretti, shows that by the fourth quarter of 2021, US GDP was above its pre-pandemic trend by more than half a percentage point, compared to declines of more than 2 percent in the UK, Germany, and Canada.[3]

2021, which was signed in December 2020, providing $900 billion in additional funding and stimulus. And then, in 2021, Congress passed and President Biden signed the American Rescue Plan, which added yet another $1.9 trillion in stimulus and recovery funding. In total, this was more than $4.5 trillion in stimulus, compared to just over $2 trillion throughout the 2008 global financial crisis (both in 2022 dollars).

So why did we go so big? A concern of policymakers and economists at the time was that extended job loss is associated with long-term costs for individuals and the economy. Many were focused on data such as those in Figure 2, which show the employment-to-population ratio (indexed to 100 at the peak of the business cycle) for the last four recessions. The time it takes for employment to return to its previous peak approximates the length of the labor market recovery from the recession.

Even the relatively mild recessions in 1990 and 2001 had long-lasting effects on employment — it took 30 months and 46 months, respectively, for employment to return to its pre-re-
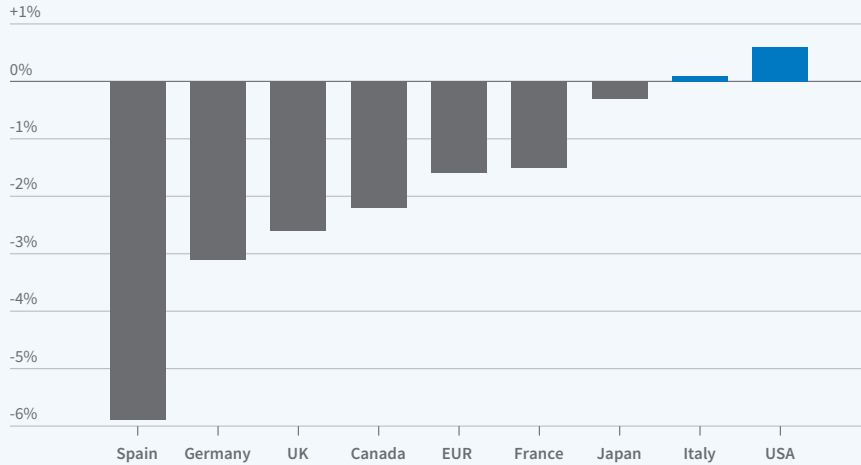
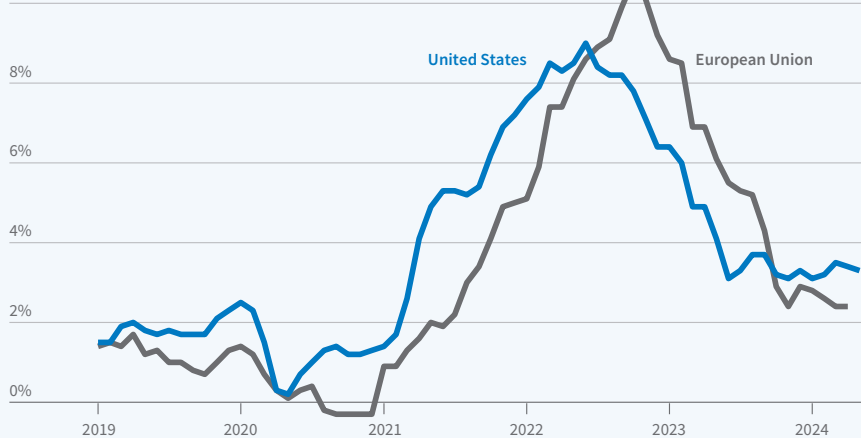**Real GDP Relative to Pre-Crisis Trend, Q4 2021**

Source: "A Most Unusual Recovery: How the US Rebound from COVID Differs from Rest of G7," Milesi-Ferretti GM. Brookings Institution, December 8, 2021. Reproduced with permission from the author.

Annual Inflation Rate

Index of Consumer Prices (EU) and Consumer Price Index (US)

Source: Researchers' calculations using data from the Bureau of Labor Statistics and Eurostat.

That said, the recovery was not without its costs. As shown in Figure 4, inflation spiked, and economists are still trying to understand the reasons for its rise. Broadly, the two major explanations are that it was due to the massive federal support of the economy and the supply constraints discussed earlier. Of course, these are not mutually exclusive. My read of the literature to date is that both likely contributed. It is too early to assess whether the pandemic response was "irresponsible" or "misguided": we will need a few more years to fully assess the costs and benefits of economic policymaking during the pandemic. But for now, the benefits appear to have outweighed the costs. To date, the worst fears have not come true, and inflation in the US has largely been in line with other developed countries that passed much smaller stimulus packages.

Was this perfect economic policymaking? Probably not, but for the moment, it looks as though it was "good." My second lesson highlights why aiming for the perfect would very likely have been the enemy of the good in this case.

The second lesson: Better calibrated economic policymaking will require much deeper investment in data and infrastructure.

This lesson is based on the fact that federal data, computer, and human resource infrastructures were — and still are — not up to the task of delivering surgical and speedy support for the economy. Components of the CARES Act highlight this reality well. For example, the Paycheck Protection Program (PPP) provided uncollateralized and forgivable loans to small businesses (generally, those with fewer than 500 employees). These loans could officially be used only to retain workers (with several safe harbor provisions), meet payroll and health insurance costs, or make mortgage, lease, and utility payments. If these conditions were met and firms met their employment targets, the loans would be entirely forgiven after the pandemic. The Economic Injury Disaster Loan (EIDL) program provided low-interest-rate loans of up to $2 million, payable over up to 30 years. Loans also included the option to defer all payments during the first two years while businesses and nonprofits got back on their feet after the pandemic. And finally, the coverage and generosity of UI were expanded dramatically. Benefits were increased by $600 per week, and those not typically covered, such as gig workers and contractors, were made temporarily eligible.

While it may have been "good enough," it was sloppy. On the one hand, nearly 1 million firms received PPP loans (worth $150,000 to $10 million), and 3.9 million received EIDL loans. On the other hand, this assistance was rather inefficiently delivered. Waste and poor targeting were a problem. David Autor and his coauthors estimate that PPP loans cost between $169,000 and $258,000 per job-year saved, which is more than twice the average salary of these workers. They also estimate that more than two-thirds of the total outlays on the program accrued to business owners and shareholders rather than employees.[4]

Outright fraud was also a major issue. The Government Accountability Office (GAO) estimates that PPP fraud totaled about $64 billion out of a total

of nearly $800 billion in loans— that is, about 8 percent of all PPP loans may have been fraudulent. Under EIDL, some borrowers claimed loans using falsified names or business details and often simply ran off with the cash. In the end, the GAO and the Small Business Administration estimate that EIDL fraud was even more pervasive than PPP fraud, in dollar terms — more than $136 billion. UI fraud also skyrocketed during the pandemic; the GAO estimates that fraud may have cost anywhere from $55 to $135 billion.[5]

Why did the federal government fail to verify the identities and creditworthiness of borrowers? Part of the answer is speed: it wanted to get money out to small businesses as quickly as possible to ensure they wouldn't fold during the crisis. The usual procedures for background checks and verifying application details were shortened or removed altogether.

But another more structural issue was state capacity. Along with old technology, underfunding was another issue agencies faced, which led to a shortage of skilled employees who could administer and detect fraud in the programs. These issues were compounded by the US's focus on privacy protections, which has created regulations that have the side effect of limiting our capacity to implement programs.

It is worth acknowledging that fraud and misallocation were not unique to the US. There were also headline cases of fraud in other developed countries, especially regarding the allocation of European Union (EU) pandemic funding. But, according to the European Public Prosecutor's Office, the entire EU area (with a larger population than the US and a similar GDP) likely experienced COVID-related fraud on the order of, at most, tens of billions of dollars, an order of magnitude smaller than the hundreds of billions of dollars of fraud in the US.[6] We were first in class.

In short, it didn't have to be this bad: The speed of program implementation was inevitably going to lead to some fraud, but not necessarily as much as we had in the US. To develop this point, I'd like to focus on our UI system.

What challenges did UI face leading into the pandemic First, funding: The federal unemployment tax, intended to fund UI, is applied to annual wages below a federally determined cap. Back in 1937, the full earnings of about 97 percent of covered workers were subject to the tax. But the nominal wage cap has not been adjusted to keep pace with inflation — it is currently just $7,000. As a result, just over 25 percent of wages are now subject to the tax. This has had the downstream effect of gradually restricting real funding to state unemployment agencies, especially for states that don't impose their own higher tax on employers.[7]

As of 2020, less than half of the states had modernized their UI systems. Some state systems still run on COBOL; it is almost impossible to submit an application on a mobile device in most states, and workers in some states must still be physically mailed a password to log in to their UI account.[8] In part because of these challenges, by the end of May 2020, only about 57 percent of unemployment claims had been paid nationwide.[9] This created a double crisis, where overworked employees didn't have the resources they needed to rigorously verify claims, leading to more fraud, while genuinely eligible workers had to wait weeks or months to get their benefits.

But outdated tech and low funding weren't the only issues. Other challenges have to do with modernizing the UI system to meet the needs of the modern labor market. Beyond the many state-level differences in minimum levels of earnings and time worked required for eligibility, there are entire groups of workers who are totally ineligible under current law, including workers who quit or were fired for cause; students who work in addition to getting their education; and self-employed workers, gig workers, and contract workers.

Figure 5 shows the unemployment recipiency rate over time, effectively the percentage of total unemployed workers receiving UI. Recipiency rates have fallen dramatically since the 1950s, with a particularly large drop in the late 1970s and early 1980s as states tightened their requirements in response to the fiscal challenges created by a falling real cap on the federal unemployment tax. The decline after the 2008 financial crisis is less well-understood but may reflect a combination of further tightening of state-level unemployment programs, workers remaining unemployed for longer than the legal limit to continue receiving UI benefits, and one other detail — the rise of "alternative work arrangements" that are not covered by our current UI system.
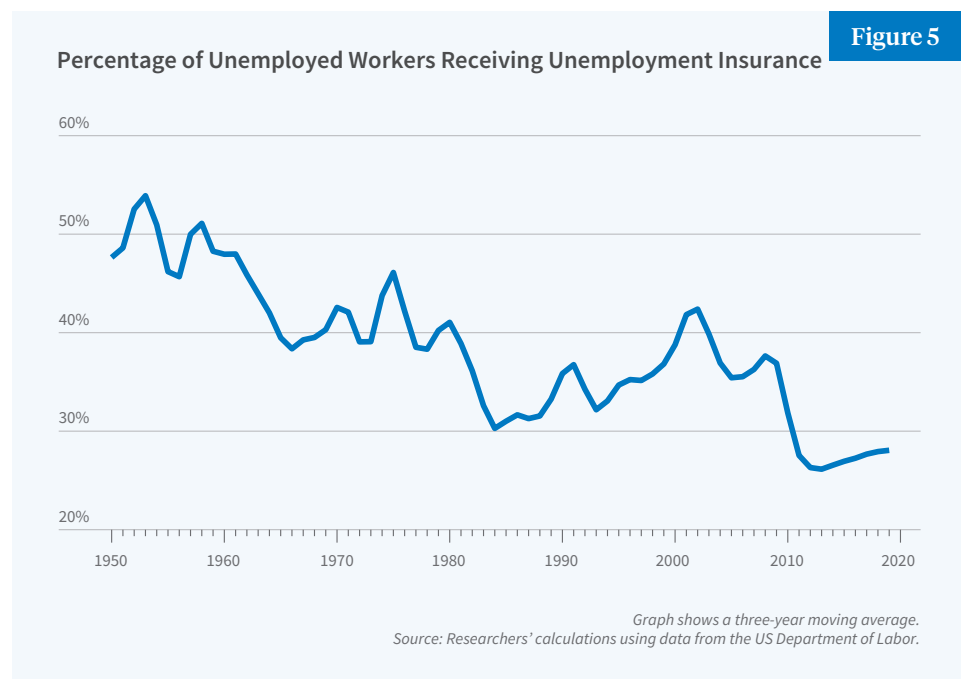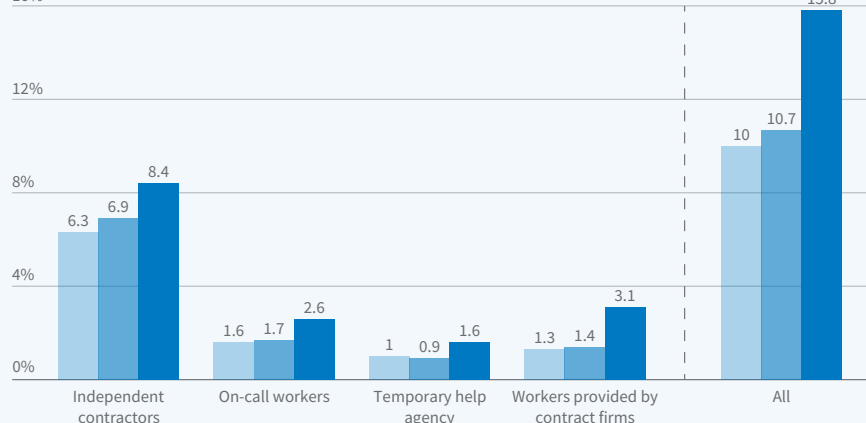

Figure 5

Percentage of Unemployed Workers Receiving Unemployment Insurance

Graph shows a three-year moving average.
Source: Researchers' calculations using data from the US Department of Labor.

Rise of Alternative Work Arrangements

■ 1995 ■ 2005 ■ 2015

Percentage of employed workers

	Independent contractors	On-call workers	Temporary help agency	Workers provided by contract firms	All
1995	6.3	1.6	1	1.3	10
2005	6.9	1.7	0.9	1.4	10.7
2015	8.4	2.6	1.6	3.1	15.8

Source: "The Rise and Nature of Alternative Work Arrangements in the United States, 1995-2015," Katz LF, Krueger AB. NBER Working Paper 22667, September 2016, and ILR Review *72(2), 2019, pp. 382–416.*

Figure 6, based on data from a 2019 paper by Lawrence Katz and Alan Krueger,[10] shows the rise of alternative work arrangements (AWAs) over two decades. From 1995 to 2005, all forms of AWAs rose only slightly, ticking up from 10 to 10.7 percent of the employed workforce. But between 2005 and 2015, the percentage rose dramatically to more than 15 percent of all workers in America. Some categories saw an even faster rise — for instance, the percentage of workers provided by contract firms more than doubled. More recent survey evidence suggests the percentage of workers in AWAs may be even higher.[11]

This is particularly important since most workers in an AWA are ineligible for UI. Independent contractors and other "1099 employees" cannot receive UI in any state; most of the workers described here are also ineligible under most states' rules concerning time worked, minimum earnings, and other qualifications.

And since 2015, a new sort of AWA has come to the fore: the gig economy. Andrew Garin, Emilie Jackson, Dmitri Koustas, and Alicia Miller estimate that in 2012, the number of Americans with any payments for platform work listed on their tax return was essentially zero. By 2016, it had already risen to 2 million. Even after the reporting threshold was increased in 2017, the amount of gig work reported on tax returns continued to increase, and the number of gig workers rose to almost 5 million by 2021 — about 3 percent of the workforce.[12] Because of the rising minimum earnings level for reporting gig work on tax forms, the true proportion of workers who participate in the gig economy is likely higher. Data from the Pew Research Center American Trends Panel suggest that the actual share of Americans who currently rely or recently relied on gig work as an important source of income is about 5 percent. Moreover, of Americans who engaged in gig work in 2021, 31 percent considered it their main job, while 58 percent of them considered it essential or important for meeting their basic needs.[13]

Putting it together, challenges with our UI response were not only due to a lack of administrative capacity but also to the expansion of the UI pandemic program to these non-traditionally covered workers. Even in states with well-funded and up-to-date UI systems, the sudden expansion of the program to gig workers and the self-employed made it challenging to ensure that only people who really qualified were getting benefits. And more generally, our UI system is falling behind in providing the kind of consumption-smoothing support it was designed to provide during job transitions because eligibility has not kept up with our evolving economy.

The third lesson: Crises such as that spurred by the pandemic can help us better understand our economy.

The final lesson stems from the fact that the economy has performed in unexpected ways since the start of the pandemic, puzzling many economists (including myself). By attempting to solve puzzles created by crises, we can better understand how our economy works. One example is the evolution of the wage structure over the past few years.

Figure 7 shows the change in average real wages, indexed to one in January 2020, for workers split into three occupational wage terciles (low, medium, and high-wage occupations).[14] The three occupational groups tracked each other relatively closely from 2015 to 2020; low-wage workers caught up slightly, with wage gains of about a percentage point more than medium- and high-wage occupations over that time, but there were no major distributional changes. But in late 2020 through 2023, as the initial composition effects from pandemic unemployment began to recede, the pattern changed dramatically: Low-wage occupations experienced meaningful real wage gains while wage growth for medium-wage occupations was essentially flat relative to 2020 and high-wage occupations experienced real wage *declines*. Similar patterns emerge when splitting workers based on wages or education. Why might this have occurred?

Let's first consider unlikely explanations. It is unlikely to have occurred due to improved human capital, education, or skills given that postsecondary enrollment fell sharply between 2019 and 2020 and has not yet recovered. Similarly, minimum wage increases likely do not explain these patterns: Minimum wages have either decreased in real terms or simply been indexed to inflation in most states. In addition, while new union elections have increased over the past couple of years, the union membership rate has continued its gradual decline since the early 1980s. That said, union threat effects — in which firms elect to increase wages and benefits out of fear that workers would otherwise unionize — may have contributed.[15]

Figure 7

Real Hourly Wages by Tercile

Difference in real hourly wage from January 2020
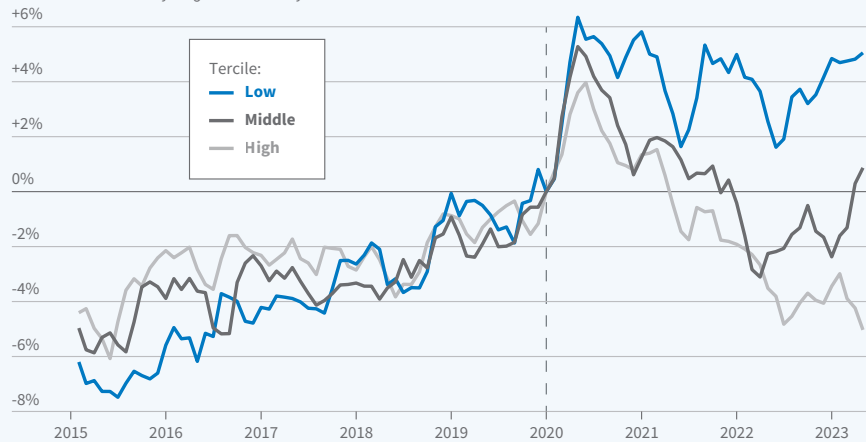
Source: "The Unexpected Compression: Competition at Work in the Low Wage Labor Market,"
Autor D, Dube A, McGrew A. NBER Working Paper 31010, May 2024.

If it wasn't human capital, minimum wages, or unions, what happened? A few stylized facts may point us towards an answer, although, of course, more causal research will be needed to make a more conclusive determination. First, the pandemic recession was much shorter than most of us expected, lasting only two months. Moreover, as highlighted earlier, the labor market recovery was exceptionally fast — unemployment was below 5 percent by September 2021. Second, pandemic support for households was quite generous, especially as a share of pre-pandemic wages for low-income households. This influx of income led to higher savings, especially since many were stuck at home and couldn't spend it. Further, enhanced UI payments were well above a 100 percent replacement rate for more than 70 percent of workers.[16] This increase in resources may have sharply increased reservation wages at the bottom of the income distribution.

These facts alone might have affected the wage distribution, but their impact was magnified by a few other trends and policy decisions. As already discussed, the US approach to unemployment during the crisis was essentially to expand and bolster our existing UI system. States issued almost $800 billion in unemployment benefits, including additional federal funding, between March 2020 and July 2021 — more than three times as much money as they issued in 2009, even after adjusting for inflation. But there were no requirements that workers return to their previous jobs after the pandemic ended. In contrast, most other developed countries relied on "job retention schemes" which essentially paid employers to keep their employees on the payroll for the duration of the crisis. Countries like New Zealand, France, and Great Britain each kept more than a third of their entire workforce on the payroll through these schemes, and almost every country used them for at least a subset of their workforce.[17] But in the US, despite federal funding and backing, an equivalent policy known as short-time compensation never caught on. Instead, in the US, workers were separated from their jobs, got expanded unemployment coverage, and then were required to search for a new job once the pandemic had receded.

In part for this reason, vacancy and quit rates skyrocketed after the pandemic began to recede. For several months in a row between 2021 and 2023, the number of unemployed Americans per job opening was at or below 0.6 — that is, there were nearly two job openings for every person looking for work. And at the same time, workers already in their jobs were leaving in search of better options — the quit rate reached 3 percent for the first time ever in the Job Openings and Labor Turnover Survey data.[18] Workers typically quit when they believe they will be able to secure a better job — about two-thirds of total quits in the Current Population Survey (CPS), on average, are direct employer-to-employer transitions. Moreover, CPS data analyzed by Ryan Michaels at the Philadelphia Fed suggest that younger, nonwhite, and non-college-educated workers experienced a sharper increase in quits between 2020 and 2022, which could help explain part of why those workers gained the most from the "Great Resignation."[19]

How would these trends explain wage patterns since the pandemic? The simplest explanation is a model of labor market tightness akin to the one proposed by Arthur Okun.[20] The Okun hypothesis suggests that when markets approach full employment, workers throughout the income distribution are able to move into higher-quality jobs and the lowest-paid workers benefit the most from this process since they move from marginal employment to more steady and productive jobs. During the pandemic, these factors almost certainly played a part in the wage compression, particularly given that labor demand returned relatively quickly and workers, especially low-income workers, who were separated from their jobs could quickly find new ones at a higher wage.

But we also know more about labor markets today than we did when Okun made his contributions. The last two decades of research have revealed the profound importance of labor market imperfections for understanding wage patterns across the economy; two areas I want to highlight are the role of search frictions and market power.

Frictions are a more established area of research, but one with implications for wage patterns that I don't think have been fully explored. Okun's model of labor markets included frictional unemployment, but the Diamond-Mortensen-Pissarides model showed us that frictions matter not just for creating unemployment but also for wages themselves, introducing a possible range of indeterminacy in equilib-

rium wages and perhaps even throwing the entire concept of an equilibrium wage into question.[21] And the work of Alan Manning and others on dynamic, or "modern" monopsony — the market power created for employers through search frictions and imperfect matches — also highlights some of the direct consequences of frictions for our labor markets.[22] This new generation of research, some of which was highlighted in David Card's 2022 address to the American Economic Association,[23] has helped establish the importance of employer and worker power for wage determination.

What, exactly, is the source of this power is an active matter of debate. One hypothesis is that monopsony power, where employers are able to decrease worker wages because of a combination of static concentration and dynamic frictions, is the most important channel. Another interpretation highlighted by Krueger and Larry Summers decades ago,[24] and more recently by Summers and Anna Stansbury,[25] suggests it is imperfect product markets, rents, and worker bargaining over a share of those rents that matters most. In practice, both models could yield labor market patterns like the ones in Figure 7 and demand much more research on their implications for the wider economy.

So, there you have it, three lessons: In a crisis, policymakers can't let the perfect be the enemy of the good. We need more data and public infrastructure if we want better economic policymaking. We can learn lots of things about our economy because of a crisis, and many important questions about the pandemic-induced crisis remain to be addressed. Which leads to a bonus lesson: Crises can always be counted upon to provide full employment for economists.

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Understanding Early Childhood Development and Its Importance

Orazio Attanasio

In the process of human development, what happens in the early years — including the first thousand days after conception — is of key importance for determining life-cycle outcomes. Early outcomes, however, are not fixed at birth or determined exclusively by genetics; they are influenced by a variety of factors, including parental behaviors, the environments children live in, and policy interventions. Furthermore, human development is a multidimensional process, with different skills leading to different adult outcomes by interacting in complex ways during the developmental process. Such multidimensionality is made salient by the important roles that different skills play in the production process.

These areas of general consensus are the result of years of contributions by a wide range of researchers to a large, growing, and diverse literature, which I cannot summarize satisfactorily here. I review selected papers from earlier work and my recent research to discuss where the literature stands, with an emphasis on what I think are open challenges and questions for future investigation.

Longitudinal Studies and Long-Run Evidence

Evidence on the importance of the early years and their malleability has been accumulating for decades from both developed and developing countries in a growing literature too large to cite here. In developed countries, several studies have shown the impact of various dimensions of early health status on adult outcomes, including in-womb experience, birth weight, and nutritional status in the early years. Similar evidence is available from developing countries. The widely used Consortium of Health-Orientated Research in Transitioning Societies (COHORTS) studies, for instance, were developed in Brazil, Guatemala, India, the Philippines, and South Africa, while the Young Lives project is still collecting information on two cohorts of children born in Ethiopia, India, Peru, and Vietnam as they age through their 20s. The Guatemalan COHORTS study, run by the Institute of Nutrition of Central America and Panama (INCAP), has been following children for about 50 years (and counting), finding that early-life nutritional status impacts multiple health, cognitive, and socioeconomic outcomes of adults decades later.

Much of the available evidence refers to the effects of children's *health and nutritional status* on adult outcomes. By contrast, evidence on the impacts of early cognitive or socioemotional skills on late childhood and adult development is much scarcer, partly because of the limited availability of longitudinal data, including limited early-year information on different dimensions of child development.

Some of my recent research seeks to help address these gaps. My recent paper with Darwin Cortes, Dario Maldonado, Paul Rodriguez-Lesmes, Natalie Charpak, Rejean Tessier, Juan G. Ruiz, Juan Gallego, Tiberio Hernandez, Felipe Uriza, and Andres Gallegos uses data from the 20-year follow-up evaluation of kangaroo mother care (KMC).[1] KMC is a relatively short intervention at the start of life — often defined as skin-to-skin contact between mother and newborn, frequent or exclusive breastfeeding, and early discharge from the hospital — often targeted to underweight and premature babies. Analyzing data from an experimental KMC intervention in Colombia that began in 1993–94, we find that certain skills measured at 12

Orazio Attanasio

Orazio Attanasio is the Cowles Professor of Economics at Yale University. Before coming to Yale, he was on the faculty at University College London (2001–22), Stanford University (1990–94), and the University of Bologna (1994–2001). He is also a research associate affiliated with the Economic Fluctuations and Growth and Development Economics programs at the National Bureau of Economic Research, a senior fellow at the Bureau for Research and Economic Analysis of Development, and a research fellow at the Centre for Economic Policy Research. He served as president of the Econometric Society in 2020 and the European Economic Association in 2014.

Dr. Attanasio received his PhD in economics from the London School of Economics and studied economic and statistical sciences as an undergraduate at the University of Bologna. He is a recipient of the Carlos Diaz-Alejandro Prize from LACEA (2016) and the Klaus J. Jacobs Research Prize from the Jacobs Foundation (2016). His research focuses on household economics, policy evaluation in developing countries, and early childhood interventions, with significant work evaluating educational and social programs in Mexico, Colombia, India, Ghana, and Chile.

months are predictive of outcomes 20 years later, including cognitive and socioemotional skills. Furthermore, KMC has an impact on adult socioemotional skills and involvement in violent episodes. Our findings suggest that these impacts are mediated by the greater attachment that parents exhibit during the first year of life.

Policy Interventions and Their Impacts

For some time, the prevalent view was that skills like intelligence were mostly inherited and determined at birth — a view that only began to be questioned in the 1930s, as described in the wonderful book by Marilyn Brookwood.[2] More recently, a wealth of rigorous evidence has shown that early development can indeed be affected by policy interventions.

Much of this literature comes from developed countries. Several prominent interventions, such as Michigan's Perry Preschool Project, North Carolina's Abecedarian, Tennessee's Nurse-Family Partnership, the Chicago Child-Parent Center Program, and the Irish Learning for Life program have been shown to have long-term impacts.[3] Some programs go beyond small randomized controlled trials (RCT) and have been rolled out (and to an extent evaluated) on a large scale in the US (i.e., Head Start) and the UK (i.e., Sure Start), with the available evidence suggesting that they have large benefits, particularly for the most disadvantaged children.

Some interesting evidence on the impact of early-years interventions also comes from developing countries. In Colombia, for instance, studies of early-year stimulation interventions showed sizeable impacts as early as the 1970s[4] and later.[5] The best-known evidence, however, is from what is now known as Reach Up and Learn (RULe), an early-years cognitive/socioemotional intervention in Jamaica[6] that has followed the original trial's subjects for decades, enabling researchers to study its remarkable long-run effects on various adult outcomes.[7] Partly because of its success, the RULe intervention has been replicated and adapted to multiple contexts and countries.[8]

Three of my recent papers have studied the effects of RULe replications. In Colombia, work with Sarah Cattan, Emla Fitzsimons, Costas Meghir, and Marta Rubio-Codina argued that the significant gains in cognitive and socioemotional skills observed in a RULe RCT targeted at disadvantaged children aged 12 to 24 months were mediated by increases in parental investments.[9] In China, work with Sean Sylvia, Nele Warrinnier, Renfu Luo, Ai Yue, Alexis Medina, and Scott Rozelle found that a home-based parenting program delivered by the Family Planning Commission significantly increased infant skill development after six months.[10] (An application by other researchers explicitly compares a similar program in China with the original Jamaican trial.[11]) And in rural India, my work with Meghir, Pamela Jervis, Monimalika Day, Prerna Makkar, Jere Behrman, Prachi Gupta, Rashim Pal, Angus Phimister, Nisha Vernekar, and Sally Grantham-McGregor found that an early-years stimulation intervention had positive impacts on both IQ and school readiness and that these effects were sustained after 15 months.[12] As with other adaptations of RULe, the India trial explored different modes of delivery — including home visits, as in the original Jamaican intervention, and group visits. They all had similar average impacts, likely through different mechanisms.

My research has also focused on the medium-run impacts of early cognitive/socioemotional interventions, though the findings have been more mixed. In the Colombian intervention mentioned above, for example, work with Alison Andrew, Fitzsimons, Grantham-McGregor, Meghir, and Rubio-Codina found that the initial impacts waned two years after it ended.[13]

In other contexts, however, the results are different. The aforementioned study from India, for example, found sizeable positive medium-run impacts for that RULe intervention.[14] Similarly, recent work with Jervis, Lina Cardona-Sosa, Michele Giannola, Grantham-McGregor, Meghir, Day, and Rubio-Codina looks at the medium-run effects of a RULe intervention in urban India and finds sizeable impacts on school readiness almost four years after the intervention's completion.[15] In Bangladesh, a recent paper finds positive impacts six years after the initial intervention, with larger impacts on children with anemia.[16] This mixed evidence indicates that many factors might be at play, ranging from the quality of the intervention — and its success in changing parental behaviors on a sustainable basis — to the interaction of the initial effects with different environments that children face. To explain these different impacts, it is key to understand the mechanisms behind them.

While this research emphasizes the large potential impacts of interventions in the early years of life, it is important to note that policies directed at older children and adolescents are also useful.

The Drivers of Child Development

My research and this very partial summary of the literature make clear that the early years and their malleability are critically important. However, there are still important gaps in our understanding of the child development process and its many dimensions that make the design of effective policies difficult. For example, we do not fully understand how the development process changes as children age, nor what factors could or should be targeted by interventions that, when implemented at scale, might have to rely on limited financial and human resources. As previous studies have stressed,[17] child development is a complex process, with different skills interacting contemporaneously and dynamically. The relative paucity of data, especially for the early years, has limited what we know: better and richer longitudinal data providing information on various aspects of development at different ages is needed. Such data, if linked to specific intervention evaluations, could enable precise impact estimates while also providing a better understanding of the mechanisms behind human development.

Figure 1

Distributions of Children's Development, by Age

Cognitive | Socioemotional | Health

Source: "Child Development in the Early Years: Parental Investment and the Changing Dynamics of Different Dimensions," Attanasio O, Bernal R, Giannola M, Nores M. NBER Working Paper 27812, September 2020.

The Complex Process of Child Development

Recent work with Raquel Bernal, Giannola, and Milagros Nores uses a dataset from Colombia that follows a sample of (relatively disadvantaged) children from ages 1 to 7, with yearly observations.[18] This relatively high frequency of data collection allows us to study the skill-formation process on a year-by-year basis and document how it changes over time. We consider three key dimensions (cognition, socioemotional skills, and health) and describe how their distribution evolves with age.

We have several findings. First, in some dimensions and for some ages, the dynamics of the process are complex, with multiple developmental lags being relevant. Second, to assess the productivity of parental investments, it is important to consider the fact that parental behavior is a choice. Third, child development processes — and the productivity of parental investments on the dimensions we consider — change considerably with age. Cognition, for instance, becomes progressively more persistent, particularly after age 4. The productivity of early-years parental investments is particularly high for cognition, while later parental investments are important for socioemotional skills. Figure 2 illustrates how the productivity of pa-

rental investments varies, both by age and by initial conditions.

Figure 3 illustrates how exogenous increases in parental investments at different ages affect cognitive development in various ways. This highlights that understanding the complex dynamics of child development is not only an academic exercise; grasping how different inputs and their effects change with age is crucial for designing and implementing effective, scalable policies.

Parental Behavior, Social Norms

Parents clearly play key roles in shaping the early years of development. But what drives parental behaviors? Simple models point to some of the key drivers, including parents' tastes, resources, and perceptions of the child development process. If parents do not spend much time stimulating their children, it may be because they underestimate the usefulness of such activities — an explanation that is consistent with the anthropological and sociological evidence.[19]

Flávio Cunha, Jervis, and I provide quantitative evidence on the role of parental beliefs using data from Colombia collected as part of the RULe evaluation mentioned earlier.[20] We elicit parental beliefs about the returns to parental investments in child development and compare those subjective beliefs to objective data. Parents in the sample systematically underestimate the productivity of parental investment. This is clearly visible when it is assumed the productivity of parental investment does not depend on the initial level of child development. If investment productivity changes with initial conditions, we again find that parents underestimate productivity, particularly at high levels of initial conditions. Similar research has been conducted using data from Guatema-

Figure 2a

Returns to Parental Investment in Children's Cognitive Skills
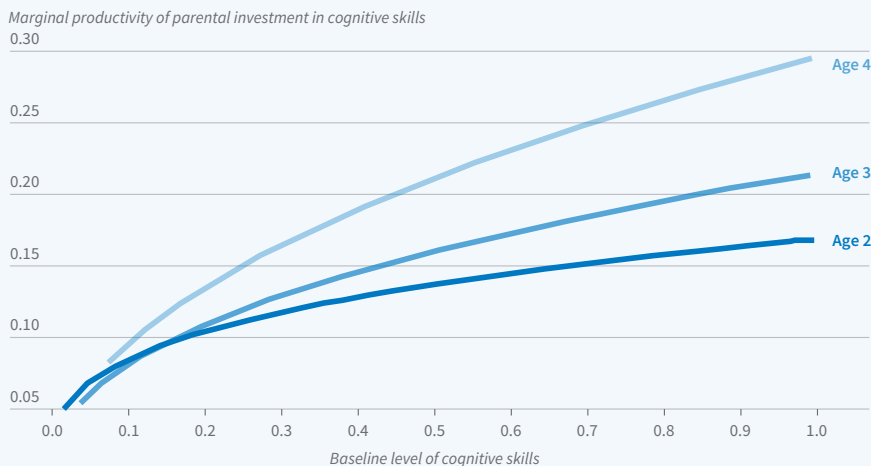
Marginal productivity of parental investment in cognitive skills

Source: "Child Development in the Early Years: Parental Investment and the Changing Dynamics of Different Dimensions," Attanasio O, Bernal R, Giannola M, Nores M. NBER Working Paper 27812, September 2020.

Returns to Parental Investment in Children's Health Figure 2b
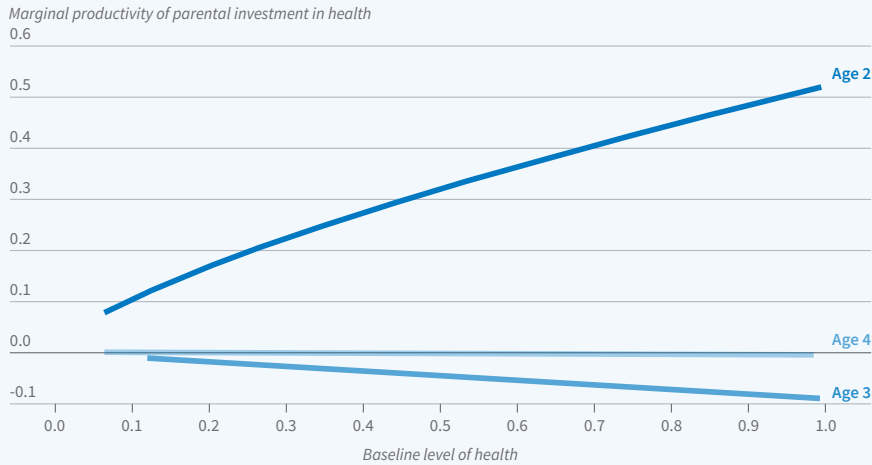
Marginal productivity of parental investment in health

Source: "Child Development in the Early Years: Parental Investment and the Changing Dynamics of Different Dimensions," Attanasio O, Bernal R, Giannola M, Nores M. NBER Working Paper 27812, September 2020.

Returns to Parental Investment in Children's Socioemotional Skills Figure 2c
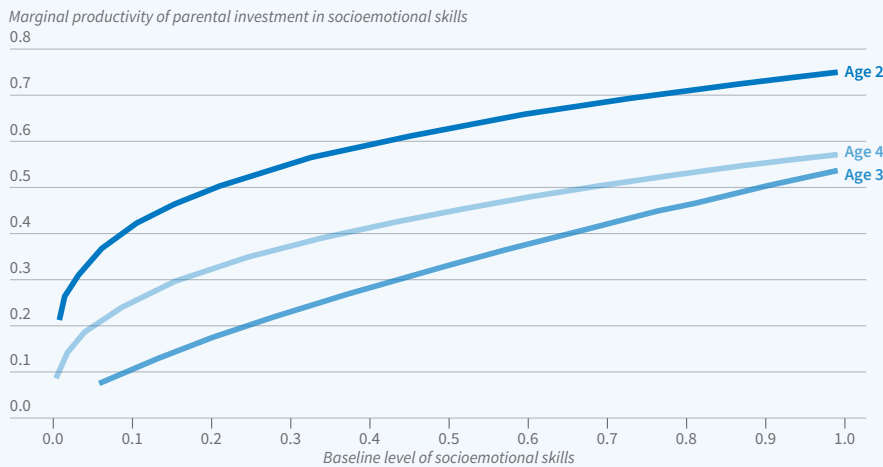
Marginal productivity of parental investment in socioemotional skills

Source: "Child Development in the Early Years: Parental Investment and the Changing Dynamics of Different Dimensions," Attanasio O, Bernal R, Giannola M, Nores M. NBER Working Paper 27812, September 2020.

la[21] and the US[22] while another recent paper[23] explores how residential sorting can result in *distorted* beliefs about child development.

In addition to subjective beliefs about child development, other factors are likely important for determining parental behavior and the inputs children receive. Ingvild Almås, Jervis, and I have analyzed the dynamics within families and found that the relative position of husbands and wives might be relevant for determining parenting choices.[24] Poor families might also have to allocate limited resources among several children.[25] Likewise, gender and other social norms absorbed during the early years might be key, as recently shown using the British 1958 birth cohort.[26]

Childcare, Preschool Centers, Primary Schools

Parental inputs in the first years of life are not the only factors affecting individual development. My research also looks at inputs children start receiving as they age, including from childcare centers, preschool teachers, and peers. In work with Ricardo Paes de Barros, Pedro Carneiro, David K. Evans, Lycia Lima, Pedro Olinto, and Norbert Schady, I look at the impact of Brazilian childcare centers on children aged 0 to 3 as well as on their parents or caregivers. With data from Rio de Janeiro following an opt-in lottery program, we show that the average time in daycare for the city's children increased by 34 percent during the first four years of life — giving parents and caregivers more time to work, resulting in higher incomes for beneficiary households.[27] Beneficiary children saw sustained gains in height-for-age and weight-for-age (likely due to the better nutritional intake in daycare) as well as shorter-term gains in cognitive development. We also find that childcare-center quality is likely to interact with the quality of early-years inputs that children receive at home: the cognitive benefits, for example, were primarily driven by short-term improvements in home resources and environments due to increased household incomes.

Recent research also suggests that the ways in which different interventions affect the quantity and quality of childcare centers and preschools can be extremely important. In work with Andrew, Bernal, Cardona-Sosa, Sonya Krutikova, and Rubio-Codina, I evaluate two strategies to improve the quality of public preschools in Colombia: providing extra funding, mainly earmarked for hiring teaching assistants, and offering low-cost training for existing teachers.[28] The first intervention had no effect on child development, largely because it reduced the time that existing teachers focused on teaching. The second intervention, however, improved children's cognitive development, especially for more disadvantaged children. Similar research on preschool quality has used data from Ghana[29] and Mexico[30] while other studies have focused on primary schools in a variety of countries. Later-childhood interventions are, of course, important too as highlighted in several contributions.

Figure 3

Increased Parental Investment and Children's Early Development

Change in cognitive skills in response to parental investment
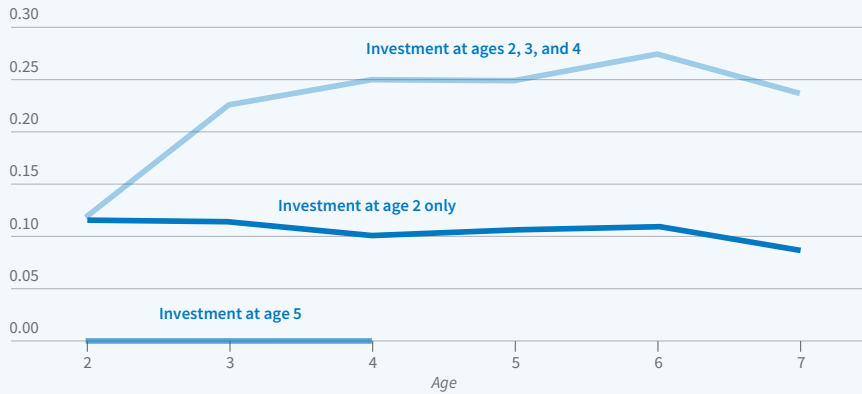
Investment at ages 2, 3, and 4

Investment at age 2 only

Investment at age 5

Age

Source: "Child Development in the Early Years: Parental Investment and the Changing Dynamics of Different Dimensions," Attanasio O, Bernal R, Giannola M, Nores M. NBER Working Paper 27812, September 2020.

Challenges

While this growing evidence reflects significant progress, the research on early childhood development and interventions to support it still faces several key challenges. First, we need a deeper understanding of child development over the early years. Second, as parents are so key in the early years, we need a better understanding of what drives parenting practices and choices about resources like childcare centers, preschools, and schools as well as subjective beliefs, the balance of power within households, and social norms. Third, we need to understand what determines teachers' behaviors, including their interactions with parents.

For this research to be influential, we also need to understand how to design interventions that are sustainable and effective at scale. As many of these policies aim to change individual behaviors of parents and possibly teachers, the design of the interventions is critical. It is important to convey the relevant messages in ways that can be understood and consistently acted upon. To address these challenges, it is necessary to develop richer and better measurement tools to allow better assessment of child development processes and their drivers.

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Influencing Retirement Savings Decisions with Automatic Enrollment and Related Tools

John Beshears, James Choi, David Laibson, and Brigitte C. Madrian

Historically, retirees in the US relied on the "three-legged stool" of Social Security, defined benefit (DB) pension plans, and personal savings to provide retirement income.[1] Beginning in the late 1970s, however, access to DB plans began to fall while access to defined contribution (DC) plans, which require individuals to make their own savings plan contributions and investment decisions during their working years, rose.[2] As of December 2023, retirement assets in DC plans — e.g., 401(k)s — and individual retirement accounts (IRAs) totaled $24.1 trillion, with 56 percent of those assets held in IRAs. Nearly two-thirds of IRAs contained funds rolled over from 401(k)s or other employer-sponsored retirement plans. By comparison, DB plans held $11.8 trillion.[3]

While households now have more power to decide how much to save and how to invest it, many save little during their working years. About one-quarter of Americans aged 65 or older receive 90 percent or more of their household income from Social Security.[4] We have spent the past 25 years investigating how plan design features influence individuals' savings behavior, which is all the more important as DC plans now serve as a critical savings vehicle for retirement preparation.

Here, we summarize this research stream in three sections. The first section describes our early research documenting that automatically enrolling individuals in their employer-sponsored DC plan has a powerful impact on their participation, contribution, and asset allocation outcomes. The second section discusses research on DC plan features other than automatic enrollment that also influence savings outcomes and that simultaneously illuminate mechanisms responsible for automatic enrollment's effects. The third section reports results from our recent work examining individual decisions that undermine the ultimate impact of automatic enrollment and auto-escalation on long-run wealth accumulation. Although not all of us coauthored every paper summarized, for economy of expression, we will describe them as papers "we" wrote.

John Beshears

John Beshears is the Albert J. Weatherhead, Jr. Professor of Business Administration in the Negotiation, Organizations & Markets Unit at Harvard Business School and a research associate at the National Bureau of Economic Research. Before joining HBS, he was an assistant professor of finance at the Stanford Graduate School of Business.

Professor Beshears's primary research area is behavioral economics, the field that combines insights from psychology and economics to understand individual decision-making and market outcomes. He collaborates with organizations to study how managers can change the design of decision-making environments — for example, by altering the way choices are presented or by adjusting the process that is used to select options from a menu — to influence the decisions of customers and employees. In his work, he has examined participation in retirement savings plans, household investment decisions, and healthcare choices.

James Choi

James Choi is a professor of finance at the Yale School of Management. He is a two-time recipient of the TIAA Paul A. Samuelson Award for outstanding scholarly writing on lifelong financial security, an associate editor at the *Journal of Finance*, a member of the American Finance Association Ethics Committee, and a TIAA Institute Fellow. Professor Choi is a research associate at the National Bureau of Economic Research (NBER) affiliated with the Economics of Aging program. He has previously served as codirector of the Retirement and Disability Research Center at the NBER and as a member of the FINRA Investor Issues Committee. He holds a PhD in economics and a bachelor's degree in applied mathematics from Harvard University.

Automatic Enrollment and 401(k) Participation, Contributions, and Asset Allocations

Most households believe that they need to save for retirement, but following through is challenging. A survey we ran in 2001 showed that among employees of a large US employer, 68 percent felt they were saving too little, 24 percent planned to start saving more in the near future, and only 3 percent actually followed through.[5] This inertia can lead to low savings if the status quo is not to save. Automatic enrollment turns this logic on its head by harnessing inertia to generate contributions to DC plans.

In a traditional opt-in DC plan, employees must proactively sign up to participate. In an automatic enrollment regime, employees are enrolled by default by their employer in the savings plan. They can always change their contribution rate or opt out entirely, but if they take no action, they will save the default percentage of gross pay from each paycheck — usually between 3 percent and 6 percent.[6] In 2001, we analyzed the rollout of automatic enrollment at a large US corporation and found that it increased the percentage of employees who were participating in the 401(k) plan in tenure months 3–15 from 37 percent to 86 percent.[7] We later corroborated these findings using data from other large employers and showed that automatic enrollment boosted 401(k) participation rates by 50 to 67 percentage points in tenure month 6, and by 31 to 34 percentage points in tenure month 36.[5] Furthermore, the effect of automatic enroll-

David Laibson

David Laibson is the Robert I. Goldman Professor of Economics and a Faculty Dean of Lowell House at Harvard University. Laibson's research focuses on behavioral economics with an emphasis on intertemporal choice, self-regulation, behavior change, household finance, consumption, and asset pricing. Laibson is a research associate at the National Bureau of Economic Research and is part of the Economics of Aging, Asset Pricing, and Economic Fluctuations and Growth Programs. He is a recipient of a Marshall Scholarship and a Fellow of the Econometric Society. He is an elected member of the American Academy of Arts and Sciences, the National Academy of Social Insurance, and the National Academy of Sciences. He is a two-time recipient of the TIAA Paul A. Samuelson Award for outstanding scholarly writing on lifelong financial security. Laibson serves on the Board of Trustees of the Russell Sage Foundation. Laibson holds degrees from Harvard University (AB in economics, summa cum laude), the London School of Economics (MSc in econometrics and mathematical economics), and the Massachusetts Institute of Technology (PhD in economics). He received his PhD in 1994 and has taught at Harvard since then. In recognition of his teaching, he has been awarded Harvard's Phi Beta Kappa Prize and a Harvard College Professorship.

Brigitte C. Madrian

Brigitte C. Madrian is the dean and Marriott Distinguished Professor at the Brigham Young University Marriott School of Business, where she has a joint appointment in the Department of Finance and the George W. Romney Institute of Public Service and Ethics. Before coming to BYU, she was on the faculty at the Harvard Kennedy School (2006–18), the University of Pennsylvania Wharton School (2003–06), the University of Chicago Graduate School of Business (1995–2003) and the Harvard University Economics Department (1993–95). She is also a research associate at the National Bureau of Economic Research, involved with the Public Economics, Economics of Health, Labor Studies, and Economics of Aging Programs. She also served as codirector of the NBER Household Finance Working Group from 2010 to 2018.

Dr. Madrian received her PhD in economics from the Massachusetts Institute of Technology and studied economics as an undergraduate at Brigham Young University. She is a recipient of the Skandia Research Award for outstanding research on "Long-Term Savings" with relevance for banking, insurance, and financial services (2019), the Retirement Income Industry Association Achievement in Applied Retirement Research Award (2015), and a three-time recipient of the TIAA Paul A. Samuelson Award for outstanding scholarly writing on lifelong financial security.

Figure 1

Automatic Savings Plan Enrollment and New Hire Participation

Share of workers that ever participated in plan

Legend:
— Hired under automatic 6% enrollment
— Hired under automatic 3% enrollment
— Hired before automatic 3% enrollment

X-axis: Tenure at company, months (0, 6, 12, 18, 24, 30, 36)
Y-axis: 0% to 100%
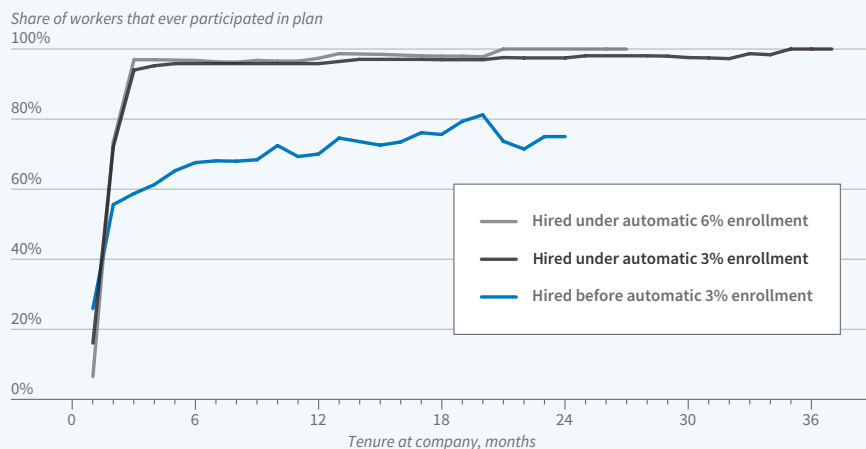
Source: "The Importance of Default Options for Retirement Savings Outcomes: Evidence from the United States," Beshears J, Choi JJ, Laibson D, Madrian BC. NBER Working Paper 12009, March 2007, and in Lessons from Pension Reform in the Americas, Kay SJ, Sinha T, editors. New York: Oxford University Press, 2007.

ment on the participation rate does not seem to depend on the exact default contribution rate — see Figure 1, which provides evidence from a company that instituted, at various points in time, an opt-in enrollment system, automatic enrollment at a 3 percent default contribution rate, and automatic enrollment at a 6 percent default contribution rate.[8]

The effect of automatic enrollment on participation is much larger than the effect of financial incentives in the form of employer contributions that match employee contributions to the 401(k). In a study of an employer that used automatic enrollment, we found that the plan participation rate dropped by 8 percentage points when the employer stopped offering a match.[9]

We have also documented the stickiness of default contribution rates and asset allocations in 401(k) plans. Our 2001 paper found that nearly two-thirds of automatically enrolled workers had not opted out, changed their contribution rate, or changed their asset allocation as of the time they were observed, some as early as after three months of tenure and others at 15 months of tenure.[7] Similar patterns are present in other settings. For example, at the employer mentioned above that changed from a 3 percent to a 6 percent automatic enrollment default contribution rate, at 15–24 months of ten-

ure the 3 percent default regime had 28 percent of employees at a 3 percent contribution rate and 24 percent of employees at a 6 percent rate (the lowest rate that earned the maximum employer matching contribution), whereas the 6 percent default regime had only 4 percent of employees at a 3 percent contribution rate and 49 percent of employees at a 6 percent rate.[8]

Automatic enrollment is a powerful device for shaping outcomes within a 401(k) plan, but it is important to note that the effect of automatic enrollment (relative to opt-in enrollment) on the mean employee contribution rate hinges on the magnitude of the default contribution rate. Automatic enrollment can increase the contribution rates of employees who otherwise would not have contributed at all or would have contributed at a rate lower than the default, but it can simultaneously decrease the contribution rates of employees who otherwise would have contributed more than the default. The net effect of automatic enrollment depends on the balance between these two forces.

Our early work on automatic enrollment helped to pave the way for legislative and regulatory changes. The Pension Protection Act of 2006 encourages employers to implement automatic enrollment in 401(k) plans as well as automatic escalation (a pro-

gram of automatic annual contribution rate increases proposed and studied by Thaler and Benartzi[10]), and to make contingent (matching) or noncontingent contributions to employee accounts.[11] In 2019, 40 percent of private sector workers participating in a 401(k) or similar plan were in a plan with an automatic enrollment feature.[12] At the end of 2023, 59 percent of DC plans administered by Vanguard were using automatic enrollment.[13] The SECURE 2.0 Act of 2022 requires most newly established 401(k) plans to implement automatic enrollment and default automatic escalation. Internationally, automatic enrollment has become a required feature of DC plans in Italy, Lithuania, New Zealand, Poland, Turkey, and the United Kingdom.

How Households Make Decisions: Procrastination and Complexity

A default specifies the outcome for employees who are passive. An alternative plan design, which we call active choice, does not allow employees to be passive: the employer requires each employee to actively indicate by a deadline the contribution rate they would like to implement.

We studied a large employer that changed its 401(k)-enrollment system from active choice to opt-in. Relative to opt-in, active choice resulted in a participation rate that was 28 percentage points higher in tenure month 3. Opt-in took two and a half years of tenure to attain the participation rate active choice achieved in three months.[14]

The fact that employees often choose to participate immediately when required to make an active choice but delay enrollment when allowed to be passive is consistent with the hypothesis that most employees believe they should save but procrastinate in enrolling in their 401(k). This mechanism also partially explains why employees often remain at the default option, and therefore why automatic enrollment has such a large impact on plan participation. Active choice, because it does not lead to herding at a single default, may be attractive to em-

ployers with highly heterogeneous employee populations, for whom choosing a universal default is particularly problematic.

In other work, we have documented that simplifying the 401(k) enrollment process can also increase saving. In opt-in enrollment, employees must take the initiative and decide how much to save and how to invest their savings.[15] We designed and studied a mechanism called Quick Enrollment, which provides employees with a simplified enrollment form that enables them to check a box to enroll at a preselected contribution rate and investment allocation.

At two large employers, Quick Enrollment increased the 401(k) participation rate (among previously nonparticipating employees) by between 10 and 20 percentage points within three months of implementation.[16] Subsequently, we found that Quick Enrollment was equally effective with a 2 percent, 3 percent, or 4 percent preselected contribution rate, and that a similar Easy Escalation treatment that allowed already-participating employees to increase their contribution rate to a preselected level was also effective.[17]

Effects of 401(k) Automatic Enrollment on Debt and Long-Term Asset Accumulation

Much of our research described above focused on how 401(k) plan design shapes employee outcomes *within* that 401(k) plan. In our recent work, we have taken a broader view and explored how other aspects of individuals' finances and their long-run financial picture are affected.

Prior evidence documents that automatic enrollment increases 401(k) contributions, on average, provided that the default contribution rate is not too low. But how are these incremental contributions financed? One hypothesis is that savers decrease their spending. Another is that they take on additional debt.

We have evaluated the extent to which retirement savings induced by automatic enrollment are accompanied by increased debt in two separate

contexts. We first studied the US Army's introduction of automatic enrollment for new civilian hires in the Thrift Savings Plan (TSP), a federal government DC plan, at a 3 percent default contribution rate. For the first time, we were able to link employees' retirement plan records to their credit files at a national credit bureau.
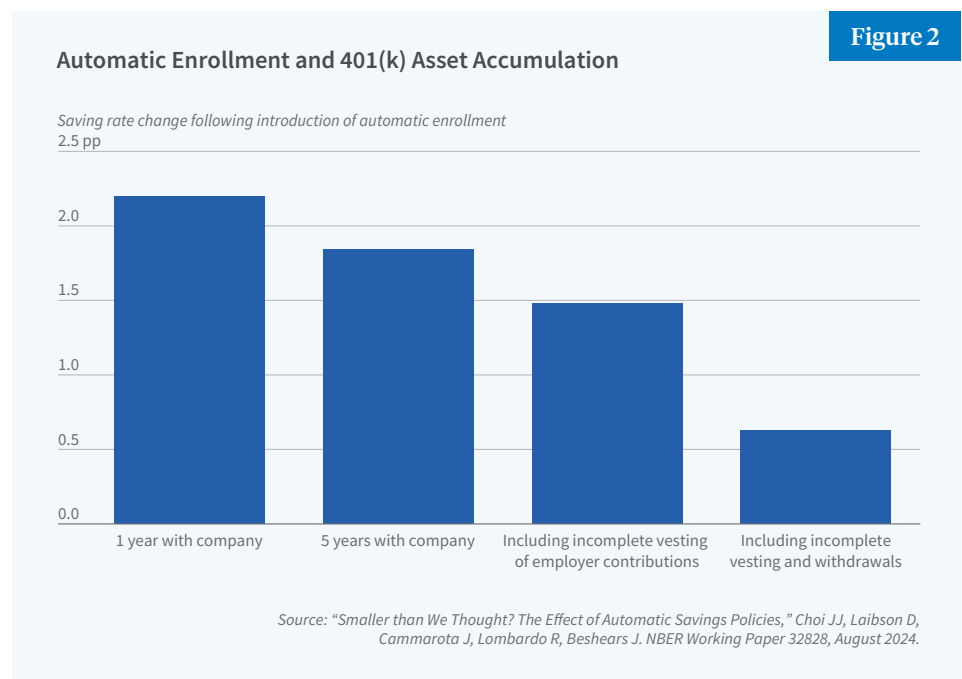
At tenure year 4, automatic enrollment increased cumulative TSP contributions by 4.1 percent of annual pay, with little evidence of attendant increases in financial distress. We did not find statistically significant changes in credit scores, adverse credit outcomes, or most types of debt. We did observe limited, weakly statistically significant increases in total balances on foreclosed first mortgages, but given the large number of hypotheses tested, this finding could be a false positive. Overall, this study suggested that 401(k) automatic enrollment has little to no negative credit effects.[18]

Our more recent work has added nuance to these initial findings. We examined the effect of automatic enrollment on debt outcomes in the context of the UK's introduction of mandatory automatic enrollment in workplace pensions. We focused on a sample of employers with fewer than 30 employees because these employers were randomly assigned an automatic enrollment implementation date.

Exploiting this random variation, we estimated that each month of exposure to automatic enrollment (over the first 3.5 years) increased total pension contributions by £32–£38 and increased unsecured debt by £7, representing an 18 percent to 22 percent crowd-out of new retirement savings. This estimate is not inconsistent with our earlier work because it lies within the 95 percent confidence interval from our analysis of US Army civilian employees. However, the much larger sample size in our UK study allows us to reject the null hypothesis of zero increase of debt.

In the UK analysis, automatic enrollment also caused a modest increase in the average credit score and a *decrease* in loan defaults. At the same time, automatic enrollment increased employees' likelihood of having a mortgage by 0.6 percentage points per year. The implications of this effect for employee net wealth are ambiguous because the addition of a mortgage to the employee balance sheet is accompanied by the addition of a home. In sum, the positive effect of automatic enrollment on retirement plan contributions is partially offset by an increase in unsecured debt.[19]

In another recent paper, we investigated the extent to which the effect of automatic enrollment on retirement wealth accumulation is undermined by a series of factors (other than in-

Figure 2

Automatic Enrollment and 401(k) Asset Accumulation

Saving rate change following introduction of automatic enrollment
2.5 pp

Source: "Smaller than We Thought? The Effect of Automatic Savings Policies," Choi JJ, Laibson D, Cammarota J, Lombardo R, Beshears J. NBER Working Paper 32828, August 2024.

creased debt) that have been under-examined in previous work. Figure 2 summarizes the key results.

In an analysis of four large employers, we found that a naïve extrapolation from the first year of employee tenure to estimate the long-run effect of automatic enrollment would erroneously lead to the conclusion that automatic enrollment increases the average rate of asset accumulation in the 401(k) by an equivalent of a 2.2 percentage point increase in the contribution rate. Incorporating data from the first *five* years of tenure into the calculation reduces the estimated effect to 1.8 percentage points because contribution rates under opt-in enrollment catch up with contribution rates under automatic enrollment as tenure increases. The estimated effect drops to 1.5 percentage points when we also account for the fact that plan rules often cause employees to forfeit a fraction of employer matching contributions if they depart the employer prior to reaching a specified tenure level. Finally, when we adjust our calculations to recognize that individuals often take withdrawals from their 401(k) when they separate from an employer (instead of leaving the balances in the 401(k) or rolling them over to another retirement savings account), the estimated effect of automatic enrollment is only a 0.6 percentage point increase in the contribution rate.

We find similar degrees of attenuation when we analyze the impact of default automatic contribution escalation.[20]

Conclusion

Automatic enrollment in 401(k) plans exerts a powerful influence on employee saving outcomes, but its positive average effect on plan contributions is partially offset by unsecured debt accumulation and preretirement withdrawals at employment separation, among other factors. These offsetting effects are not necessarily detrimental to employee wellbeing. For example, an employee separating from their employer may have a strong demand for liquidity to cover job transition expenses, implying that a preretirement withdrawal from their 401(k) is particularly valuable. However, policymakers looking to improve retirement security may nonetheless wish to counteract the forces that undermine the effect of automatic enrollment on wealth accumulation. For example, balances in the US DC retirement savings system are more liquid than those in substantial DC systems in other developed economies.[21] Policymakers may consider (partially) disallowing preretirement 401(k) withdrawals under a wide range of circumstances to preserve retirement account balances[22,23] while simultaneously encouraging the accumulation of savings earmarked for short-term liquidity needs, perhaps by promoting employer-based emergency savings accounts into which employees automatically contribute a percentage of their pay.[24,25,26] These possibilities merit further study as employers, benefits providers, policymakers, and other stakeholders search for ways to improve individuals' long-run financial security.

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Climate Finance

Stefano Giglio and Johannes Stroebel

Climate change poses a critical global challenge, impacting not only the social and geopolitical spheres but also economic activity, asset values, and financial stability. Addressing this complex issue requires a multisector approach, with financial markets playing a crucial role in advancing a sustainable transition. Financial markets can mitigate climate risks by channeling resources into sustainable activities and green innovation while also facilitating adaptation through the sharing of climate risks. The emerging field of "climate finance" studies these and other contributions of the financial sector to climate solutions. This article reviews key findings from our recent work in this area.

Climate Change and Financial Markets

For financial markets to help address the climate challenge, market participants must recognize and respond to climate risks. In turn, this responsiveness by market participants should lead to the integration of climate risk information into asset prices. Our research in this space examines how asset prices currently reflect, and should ideally reflect, climate risks.[1]

Our work's first contribution is to provide a benchmark theoretical model that illustrates the channels and mechanisms through which climate change

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Stefano Giglio

Stefano Giglio is the Frederic D. Wolfe Professor of Finance and Management at the Yale School of Management. Professor Giglio's research interests span several topics, including asset pricing, macroeconomics, and climate finance, with a particular focus on hedging macroeconomic risks like crash risk, uncertainty risk, and climate risk, using different financial instruments.

Before joining Yale, Professor Giglio was an associate professor of finance at the University of Chicago Booth School of Business, after receiving his PhD in economics from Harvard University. He is a research associate in the Asset Pricing Program at the National Bureau of Economic Research, a fellow of the Centre for Economic Policy Research, and has served as an editor for *The Review of Financial Studies*. He has been awarded several prizes, including the 2021 Carlo Alberto medal, awarded to an Italian economist under the age of 40 for outstanding research contributions to the field of economics, the AQR Insight Award, the Fama-DFA Prize, and the Moskowitz Prize for research on sustainable finance.

Johannes Stroebel

Johannes Stroebel is the David S. Loeb Professor of Finance at the New York University Stern School of Business. He conducts research in climate finance, household finance, social network analysis, macroeconomics, and real estate economics. He is the director of the NYU Stern Climate Finance Initiative.

Professor Stroebel is a research associate at the National Bureau of Economic Research in the Asset Pricing, Corporate Finance, Economic Fluctuations and Growth, and Monetary Economics programs. He was awarded the 2023 Fischer Black Prize by the American Finance Association, given every two years to the top financial economist under the age of 40. He has won numerous other awards, including the AQR Asset Management Institute Young Researcher Award and the Brattle Group Prize for the best paper published in the *Journal of Finance*. He has also earned an Andrew Carnegie Fellowship and an Alfred P. Sloan Research Fellowship in Economics. He has served as an associate editor at the *Journal of Political Economy*, *The Review of Economic Studies*, *The Journal of Finance*, and *Econometrica*.

Professor Stroebel read Philosophy, Politics, and Economics at Merton College, Oxford. In 2012, he earned a PhD in economics at Stanford University, where he held the Bradley and Kohlhagen Fellowships at the Stanford Institute for Economic Policy Research. Before joining NYU Stern in 2013, Professor Stroebel was the Neubauer Family Assistant Professor of Economics at the University of Chicago Booth School of Business.

can affect asset prices. The model features an integrated description of the dynamics of both climate change and the economy, thus incorporating the economy-climate two-way feedback introduced by integrated assessment models. It captures how economic activity generates CO_2, leading to temperature increases and a higher probability of a "climate disaster" scenario (similar to a tipping point that is central in the climate literature). The model also features an asset (calibrated to represent the housing market), which reveals the effects of climate change on asset pricing.

The theoretical analysis emphasizes the importance of understanding the drivers of climate risks and uncertainty for evaluating their pricing implications. One possible scenario considers climate uncertainty as predominantly driven by economic uncertainty. In this view, strong global economic growth leads to increased carbon emissions and potentially severe climate damages, while economic slowdowns naturally reduce emissions and the likelihood of climate damages. This scenario, common in many climate-economics models, suggests that climate damages would occur in favorable economic conditions where it would be easier for society to bear them. Consequently, climate risk would only be moderately bad for agents, which reduces the equilibrium climate risk premium in financial markets.

However, if the fundamental uncertainty is directly about the dynamics of the climate—such as uncertainty about sea level rise, the timing of tipping points, or the economic damage of weather shocks — then climate change can itself become a key driver of economic growth. In that case, the realization of a bad climate scenario could trigger a substantial economic decline, and climate damages would instead coincide with "bad" economic states. As a result, investors would perceive climate risks as particularly threatening and therefore demand high risk premia for exposure to those risks.

This model delineates the channels through which asset prices can move with climate risks and provides a framework for interpreting climate risk premia estimated in the literature in terms of climate exposures and investor preferences. It also emphasizes the importance of this modeling for choosing discount rates to apply to investments that mitigate the effects of climate change. Mitigation investments reduce the probability and damages from climate change and, therefore, act like insurance against climate damages. As finance theory tells us, the appropriate discount rate for these investments will contain a risk premium that will be the *opposite* of the risk premium associated with the risk to be mitigated: calibrations in which climate risk coincides with bad economic outcomes and where it commands a high risk premium will also imply that very low discount rates apply to climate mitigation and adaptation investments (because they will earn a negative risk premium).[2]

Pricing Climate Risks

A direct implication of different climate risk theories is that risk exposures should be reflected in asset prices: everything else equal, assets with higher exposure to climate risk should command a lower price. We test this implication by focusing on the pricing of real estate in Florida, New Jersey, North Carolina, and South Carolina.[3] We analyze property vulnerability to sea level rise by combining transaction-level house price data with flood risk projections from the National Oceanic and Atmospheric Administration for a six-foot sea level increase.

Identifying climate risk pricing in housing markets is challenging as coastal properties — often at risk from sea level rise — have other characteristics affecting their value, such as nicer ocean views or beach access. To address potential confounding factors in valuing vulnerable properties, we developed a "climate attention index" based on the proportion of climate risk mentions in real estate listings by zip code and year. Using a difference-in-differences approach to control for other property characteristics, we compute changes in price differences between exposed and un-

exposed properties when attention to climate change *changes*. We find that properties exposed to sea level rise face more significant (relative) price discounts in markets with high climate risk awareness, indicating a direct climate risk effect on house prices. Additionally, we observe that, conditional on our controls, there is no difference in annual rents between exposed and unexposed properties, suggesting that the observed price impacts likely reflect concerns about future climate risk realizations rather than current property damages, which would also be reflected in current rents. Overall, these findings highlight that climate risks already substantially affect real estate valuations.

We have also conducted a similar analysis studying the pricing of climate risk in equity markets.[4] Firms face two main types of climate risk exposure: physical risks, where extreme weather events disrupt operations and supply chains, and transition risks, mostly related to regulation aimed at pushing towards a net-zero economy. Our theoretical models predict that both types of risk should influence stock prices.

In our work, we find evidence that, indeed, stocks of firms that are more exposed to these risks have relatively lower returns in periods when bad news about future risk realizations becomes available. This finding suggests that equity investors are already considering the possible effects of climate risk realizations when valuing and pricing stocks.

Beyond real estate and equities, there is growing evidence that climate risk exposures are priced across a wide range of asset classes, from municipal and corporate bonds to mortgage-backed securities to options. We have reviewed some of this evidence in our recent work.[5]

While researchers have been able to test and reject the null hypothesis of "no pricing of climate risks," a much more difficult question is whether climate risks are priced adequately: does the current pricing of climate risk *correctly* reflect the climate risk exposures of different assets? This question requires researchers to adopt a stance

on the likelihood of various types of physical and transition risk realizations, their impacts on cash flows, and the appropriate discount rates for different states of the world. Ideally, future work building on integrated asset pricing/climate models like the one we have discussed above will lead to quantitative answers to such questions.

While research to provide this information is ongoing, our recent research has addressed this question from a different angle. We survey professional economists, investors, and policymakers and find that a large majority of respondents believe that climate risks are not yet fully priced in real estate and equity markets.[6]

The Management of Climate Risks: Hedging and Stress Testing

Given that climate risk is priced in asset markets, a natural question is whether investors can exploit this fact to reduce their exposure to these risks.
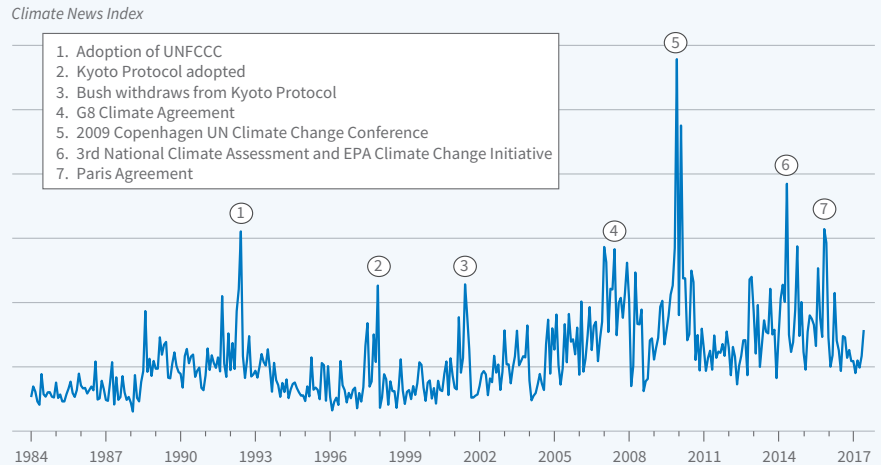
Ideally, investors could hedge climate risk by purchasing long-term insurance-like securities whose payoffs are directly linked to climate outcomes. However, such instruments do not currently exist. Our results on the pricing of climate risk, however, suggest an alternative approach: investors can create synthetic insurance by constructing portfolios long on low-climate-exposure equities and short on high-exposure ones. The key idea is that this strategy would earn returns if climate risks materialize, as highly exposed companies would lose value relative to less exposed ones.

For such a portfolio to succeed, frequent rebalancing to hedge against evolving climate risk information (e.g., news about long-term risks) over time is required. Building on this idea, we construct equity portfolios that best hedge the high-frequency arrival of climate news.

We construct an empirical proxy for the arrival of climate news. We do so by creating a new index of climate news using textual analysis in the *Wall Street Journal*.[7] Figure 1 shows the news series from the *Wall Street Journal*, which peaks concurrently with important climate events.

Wall Street Journal's Reporting on Climate Change

Climate News Index

1. Adoption of UNFCCC
2. Kyoto Protocol adopted
3. Bush withdraws from Kyoto Protocol
4. G8 Climate Agreement
5. 2009 Copenhagen UN Climate Change Conference
6. 3rd National Climate Assessment and EPA Climate Change Initiative
7. Paris Agreement

"Hedging Climate Change News," Engle R, Giglio S, Kelly B, Lee H, Stroebel J.
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Our research explores different methods to construct portfolios that would hedge against innovations in this news series. In our first paper, we propose forming long-short portfolios based on firms' environmental, social, and governance (ESG) scores as proxies of their climate risk exposures. While portfolios tilting towards stocks with high ESG scores (and against stocks with low ESG scores) showed positive correlations with negative climate news, these correlations were small and unstable across time horizons, possibly due to well-known data quality issues with available ESG scores. Statistical approaches inferring climate risk exposures from past correlations of asset prices with news realizations also proved unreliable, hampered by short time series and relatively infrequent aggregate climate news.

Our more recent work proposes a new approach to determining optimal hedge portfolios against climate news. This method combines information on individual traders' idiosyncratically varying climate change concerns — measured, for example, by the tone of their climate risk discussions in investor disclosures — and their trading responses.[8] The premise is that assets bought by investors as their climate risk concerns increase should do well when aggregate climate news materializes. As more investors become concerned and demand those assets, this increased demand will push the price up, increasing returns for the climate risk hedging portfolio that had held those assets. Our work shows that this approach tends to outperform traditional methods of hedging aggregate climate news.

While financial investors can manage exposures to climate risk realizations using the approaches described above, banks and financial regulators focus on understanding the risks to financial stability through banks' loan books. Globally, regulatory stress tests and "scenario analyses" have become widespread, requiring banks to assess the impacts of particular climate risk scenarios (e.g., a hurricane hitting the Northeastern US) on their loan books. Given the importance of these types of stress tests in managing the effects of climate risk on financial stability, we advocate for more academic research on optimizing the methodologies of scenario design and stress tests.[9]

Retail Investor Views of Climate Risks

The work in the previous section highlights that various assets — including traditional "green" assets such

Figure 2

Expected 10-Year Annualized ESG Returns

Density

Expected annualized 10-year ESG returns in excess of the market

Source: "Four Facts About ESG Beliefs and Investor Portfolios," Giglio S, Maggiori M, Stroebel J, Tan Z, Utkus S, Xu X. NBER Working Paper 31114, April 2023.
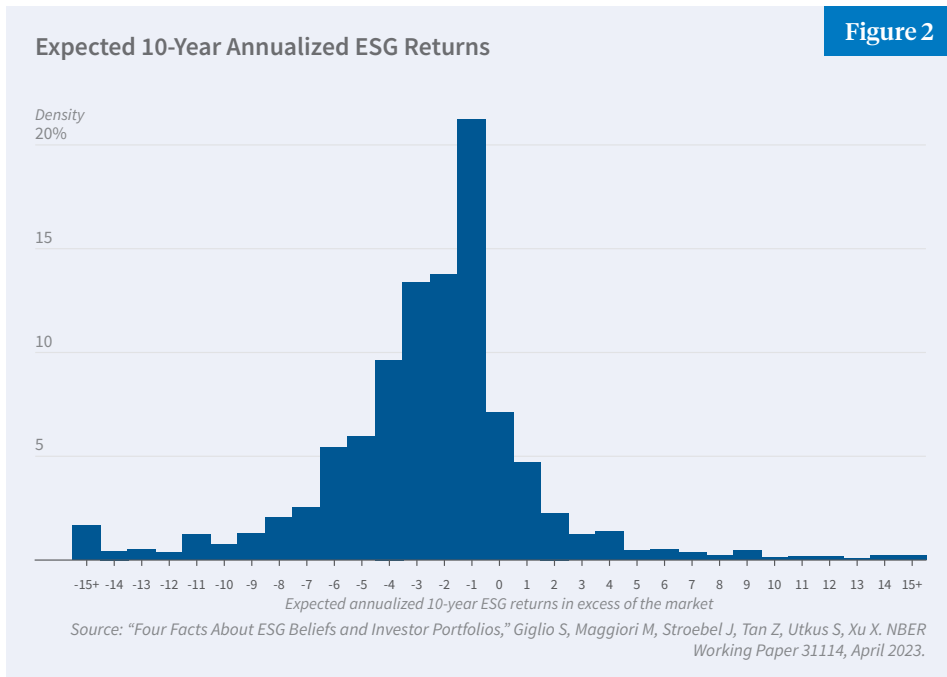
as renewable energy firms — have returns that covary with news about climate risks. According to standard asset pricing theory, these stocks should have lower expected returns than the aggregate market, with the lower returns approximating an "insurance premium" that investors are willing to pay due to the assets' covariance with aggregate climate risks.

In recent work, we consider whether retail investors understand these trade-offs and whether they are still willing to hold these assets even if they understand their return properties.[10] We collaborated with Vanguard to survey retail investors about their motives and expectations regarding ESG investments and linked these to their portfolio holdings. We document large heterogeneity both in the motivations retail investors associate with ESG investing (e.g., ethical motives, climate-hedging motives, or pecuniary motives) and in the returns they expect from these investments. For example, Figure 2 reports the histogram of the annualized 10-year returns expected by our respondents for ESG investments, in excess of the market return, across all survey waves and all respondents. On average, investors in our sample expect significant (2 percent per year) underperformance of ESG investments relative to the market, consistent with standard theories about equilibrium returns. What is also

striking is the considerable heterogeneity in expected excess returns visible in Figure 2.

In addition to studying investors' beliefs about ESG investments, we also explore how ESG motivations and expectations are linked to actual ESG investment behavior. Most interestingly, we find that investors' portfolio choices strongly reflect a trade-off between nonpecuniary motivations and pecuniary ones (expected returns from ESG investments). While it is expected that investors would invest more in ESG assets when they anticipate higher re-

turns, this preference remains strong even for investors who argue for ESG investments for nonpecuniary reasons. Figure 3 shows that holdings of ESG investments drop very significantly when investors are pessimistic about ESG returns. Furthermore, Figure 4 highlights that this trend holds even for investors who report ethical reasons to hold ESG investments. These results underscore the importance of understanding the full range of motivations for ESG investments (both pecuniary and nonpecuniary) in order to better comprehend investor behavior and inform climate-related policies.

Biodiversity and Nature Risks — The Next Frontier

Much of the research on the interaction between nature and economic activity has focused on the role played by climate change. However, a similarly large but less well understood risk to economic activity comes from the significant and ongoing loss of nature and biodiversity over the past decades. While biodiversity loss and climate change are heavily correlated, biodiversity loss has distinct effects on the economy. In survey data, we find that these risks are an increasing source of concern for investors and regulators around the world.

Unlike climate risks, where the

Figure 3

Portfolio Holdings of Retail Investors in ESG Funds

Share of portfolio in ESG investments

Expected annualized 10-year ESG returns in excess of the market

Source: "Four Facts About ESG Beliefs and Investor Portfolios," Giglio S, Maggiori M, Stroebel J, Tan Z, Utkus S, Xu X. NBER Working Paper 31114, April 2023.

Portfolio Holdings of ESG-Motivated Investors

Share of portfolio in ESG investments

Figure 4

Expected annualized 10-year ESG returns in excess of the market
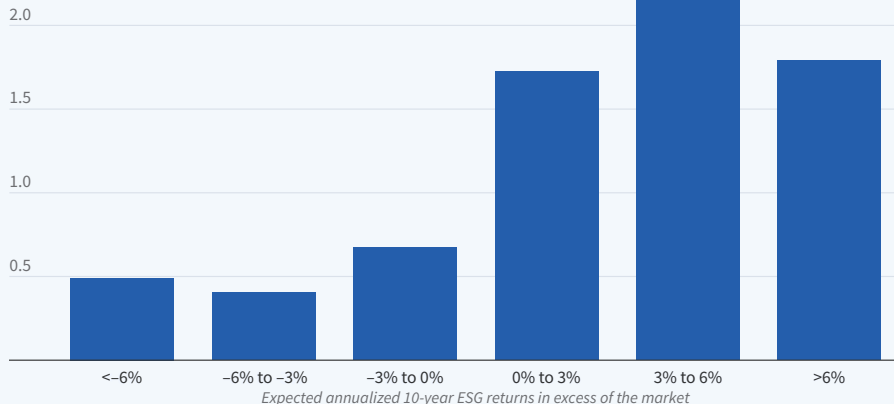
Sample is retail investors who stated motivation for ESG investments was "It's the right thing to do."
Source: "Four Facts About ESG Beliefs and Investor Portfolios," Giglio S, Maggiori M, Stroebel J, Tan Z, Utkus S, Xu X. NBER Working Paper 31114, April 2023.

channels through which physical risk affects economic activity are relatively clear, the mechanisms through which biodiversity loss, such as species extinctions, affect economic output are less well understood. Part of the challenge is that economic models typically consider nature as a single, monolithic "stock of natural capital" within the aggregate production function rather than account for its diverse and complex configuration.

In recent work, we thus develop a new ecologically founded model of the economic effects of biodiversity loss that explicitly considers the interaction of different species in the production of the aggregate "ecosystem services" that enter the production function.[11]

In our model, aggregate ecosystem services are produced by combining several non-substitutable ecosystem functions such as pollination and water filtration, each provided by many substitutable species playing similar roles. As a result, economic output is an increasing and concave function of species richness.

The marginal economic value of a species depends on three factors: (i) the number of similar species within its ecosystem function, (ii) the marginal importance of the species' affected function for overall ecosystem productivity, and (iii) the extent to which ecosystem services constrain econom-

ic output in the economy. Using our framework, we derive expressions for the fragility of ecosystem service provision and its evolution over time, influenced by the distribution of biodiversity losses across ecosystem functions.

We discuss how these fragility measures can help policymakers assess the risks induced by biodiversity loss and prioritize conservation efforts. We also integrate our model of ecosystem service production with a standard economic model to study optimal land use when land use raises output at the cost of reducing biodiversity. We find that even in settings where species loss does not reduce output substantially today, it lowers growth opportunities and reduces resilience to future species loss, especially when past species loss has been asymmetric across functions.

There is increasing evidence that investors are recognizing and pricing assets' exposure to biodiversity risk.[12] Along with our work on climate risk, we have developed a measure of negative aggregate news about biodiversity loss. We make this time series, along with other data, available at www.biodiversityrisk.org.

At the country level, we observe that credit default swap (CDS) spreads move with negative realizations of biodiversity news. Consistent with our model described above, this effect is

more pronounced in countries with more depleted ecosystems. These findings highlight that investors in CDS markets appear to appreciate that biodiversity loss affects economic tail risk probabilities for countries.

We also find that biodiversity risk affects US stock prices. In our analysis, we measure the biodiversity risk exposures across different firms and industries using information from firms' 10-K statements. We further demonstrate that portfolios that underweight firms that are negatively exposed to biodiversity risks increase in value upon the realization of negative biodiversity news, thus providing investors with a new approach to constructing biodiversity-hedge portfolios akin to the ones aimed at hedging climate risks that we explored in previous research.

1 "Climate Finance," Giglio S, Kelly B, Stroebel J. NBER Working Paper 28226, December 2020, and *Annual Review of Financial Economics* 13, November 2021, pp. 15–36.
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2 "Climate Change and Long-Run Discount Rates: Evidence from Real Estate," Giglio S, Maggiori M, Stroebel J, Weber A. NBER Working Paper 21767, November 2015, and *Review of Financial Studies* 34(8), August 2021, pp. 3527–3571.
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3 Giglio S, Maggiori M, Stroebel J, Weber A, ibid.
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4 "A Quantity-Based Approach to Constructing Climate Risk Hedge Portfolios," Alekseev G, Giglio S, Maingi Q, Selgrad J, Stroebel J. NBER Working Paper 30703, December 2022.
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5 Giglio S, Kelly B, Stroebel J, ibid.
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6 "What Do You Think About Climate Finance?" Stroebel J, Wurgler J. NBER Working Paper 29136, August 2021, and *Journal of Financial Economics* 142(2), October 2021, pp. 487–498.
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7 "Hedging Climate Change News," Engle R, Giglio S, Kelly B, Lee H,

Stroebel J. NBER Working Paper 25734, April 2019, and *Review of Financial Studies*, 33(3), February 2020, pp. 1184–1216.
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8 Alekseev G, Giglio S, Maingi Q, Selgrad J, Stroebel J, ibid.
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9 "Climate Stress Testing," Acharya V, Berner R, Engle R, Jung H, Stroebel J, Zeng X, Zhao Y. NBER Working Paper 31097, April 2023, and *Annual Review of Financial Economics*, 15, November 2023, pp. 291–326.
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10 "Four Facts About ESG Beliefs and Investor Portfolios," Giglio S, Maggiori M, Stroebel J, Tan Z, Utkus S, Xu X. NBER Working Paper 31114, April 2023.
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11 "The Economics of Biodiversity Loss," Giglio S, Kuchler T, Stroebel J, Wang O. NBER Working Paper 32678, July 2024.
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12 "Biodiversity Risk," Giglio S, Kuchler T, Stroebel J, Zeng X. NBER Working Paper 31137, April 2023.
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SNAP Eligibility Enforcement and Program Adoption

Tatiana Homonoff

The US safety net provides a wide variety of supports for low-income families from food assistance like the Supplemental Nutrition Assistance Program (SNAP) to wage subsidies like the Earned Income Tax Credit. However, receipt of these benefits among eligible households is not automatic — households must actively apply to each program from which they seek benefits. Enrollment processes often include lengthy procedures associated with demonstrating need or complying with other eligibility criteria during both the initial application and recertification periods.

The benefits of completing these administrative requirements are substantial — for example, the average SNAP participant receives roughly $2,500 per year in benefits. However, recent research on administrative burdens in government programs suggests that seemingly small barriers to program access, such as additional forms or the distance to a program office, significantly depress take-up rates.

My collaborators and I contribute to the literature in two related papers by exploring the effect of a common program application requirement — the caseworker interview — on SNAP participation.
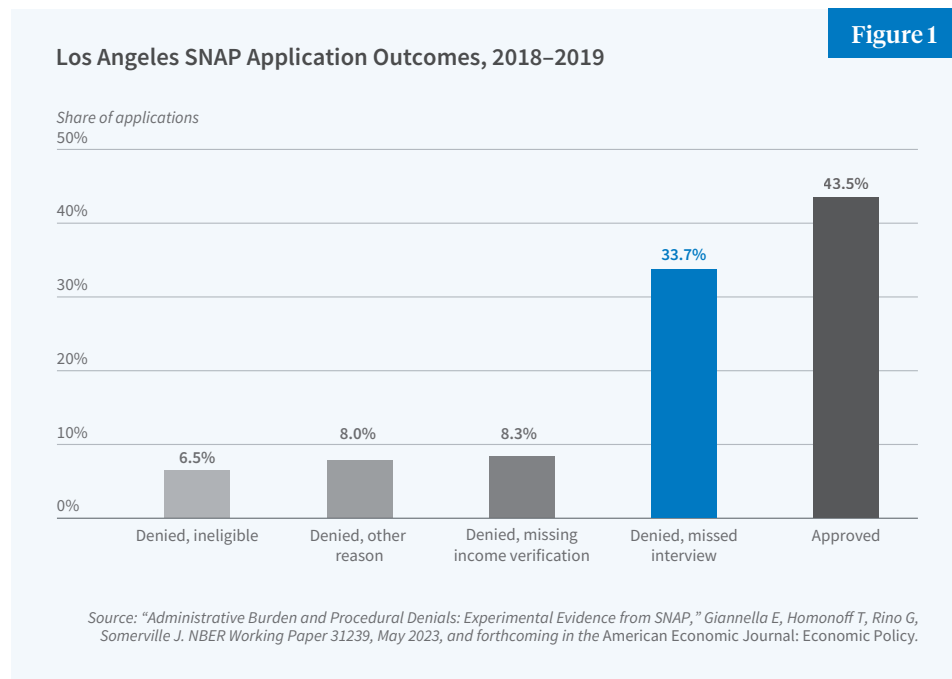
SNAP Enrollment Process

SNAP is the largest nutrition assistance program in the US, providing food vouchers worth $113 billion to over 40 million low-income individuals in fiscal year 2023. Benefits vary by income and household size, with maximum benefits for a family of four at just under $1,000 per month.

Applicants must complete three steps in order to enroll in the program. First, they must submit an application providing details required to assess the eligibility of all potential recipients in the household, such as residency, immigration status, and income. Applicants must then provide documentation verifying the information listed in the application, such as a driver's license or pay stubs. As a final step, the applicant must complete an interview, either over the phone or in person, with a SNAP caseworker. These interviews provide a touchpoint with a SNAP administrator to help guide the applicant through the process or resolve any discrepancies in the application. At the same time, the interview is a regulatory requirement. This means that applicants who fail to complete an interview within 30 days of submitting an application are *procedurally denied*, even if they are otherwise deemed eligible.

Procedural denials are not a rare occurrence. Figure 1 shows that in Los Angeles County, the county with the second highest SNAP caseload in the country, one-third of all applications are denied due to a missed interview—more than for all other reasons for denial combined.[1] This suggests that administrative barriers, especially those related to the caseworker interview, are a key factor leading to incomplete take-up.

Figure 1

Los Angeles SNAP Application Outcomes, 2018–2019

Share of applications

- Denied, ineligible: 6.5%
- Denied, other reason: 8.0%
- Denied, missing income verification: 8.3%
- Denied, missed interview: 33.7%
- Approved: 43.5%

Source: "Administrative Burden and Procedural Denials: Experimental Evidence from SNAP," Giannella E, Homonoff T, Rino G, Somerville J. NBER Working Paper 31239, May 2023, and forthcoming in the American Economic Journal: Economic Policy.

Tatiana Homonoff

Tatiana Homonoff is an associate professor of economics and public policy at NYU's Robert F. Wagner Graduate School of Public Service. Her research identifies areas in which behavioral economics can improve public policy, with a focus on issues affecting low-income households. She is a research associate of the National Bureau of Economic Research affiliated with the Public Economics, Children and Families, and Economics of Education programs. Professor Homonoff serves on the editorial boards of the *American Economic Journal: Economic Policy, National Tax Journal*, and *Behavioural Public Policy*. Homonoff received a bachelor's degree from Brown University and a PhD in economics from Princeton University.

Los Angeles Flexible Interview Experiment

One potential reason for the high rates of denials associated with missed interviews relates to how the interviews are conducted. In California, as in the majority of states, interviews are scheduled by program administrators without input from the applicant regarding availability. Applicants are informed of their interview date via an appointment letter sent to their home address, which they may or may not receive before their scheduled appointment. Applicants who miss their appointment may reschedule their interview but often cite difficulties connecting with their local SNAP offices to do so.

Eric Giannella, Gwen Rino, Jason Somerville, and I study the impact of an overhaul to the SNAP interview process in Los Angeles County, which allowed for flexible, client-initiated interviews. We evaluate this programmatic change using a randomized controlled trial involving 65,000 SNAP applicants. Applicants assigned to the control group received an appointment letter along with business-as-usual texts and email communications letting them know they should expect a call from the county to complete their interview. Applicants assigned to the treatment group received modified communications providing them with the number of a newly established call center they could call to complete an interview at their convenience in lieu of the scheduled interview in their appointment letter.

We find that access to the flexible interview process expedited the time to approval, increased approval rates, and increased long-term SNAP participation. To show this, Figure 2 presents the difference in the SNAP participation rate between the treatment and control groups by days since initial application submission.[2] Early approvals are twice as high in the treatment group as in the control group (27 versus 14 percent at day 5), and treatment group members are over 6 percentage points more likely ever to be approved by day 30, the deadline for completing the application process. After the
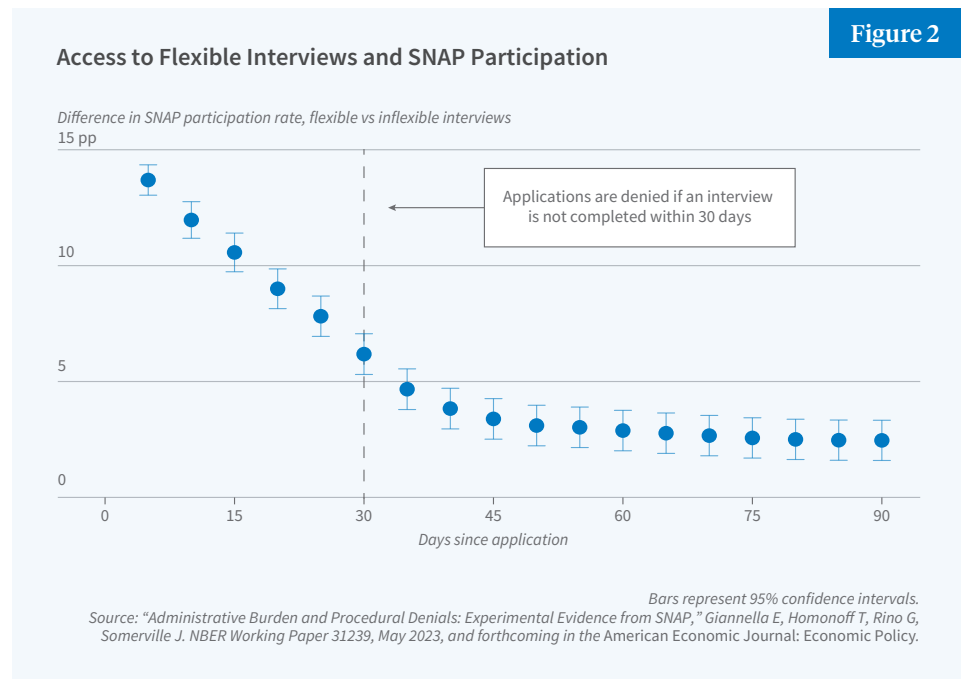
deadline, initially denied control group members partially catch up to the treatment group through successful reapplication to the program. However, the gap between the two groups does not disappear: treatment group members are over 2 percentage points more likely to receive SNAP benefits even several months after the initial application.

SNAP Recertification and Interview Timing

The initial application process establishes that SNAP enrollees are eligible for the program at the time of application. To ensure that SNAP recipients have maintained eligibility over time, they must periodically recertify for the program, typically every six to twelve months. The recertification process closely mirrors the steps required for initial enrollment: participants must complete a recertification application, submit supporting documentation, and complete a caseworker interview. Many studies document high rates of SNAP exit at recertification, yet it remains unclear whether these households left the program because they were no longer eligible or procedurally denied.

Somerville and I provide evidence that a sizeable fraction of program exits at recertification were among eligi-

ble cases.[3] Using administrative data on the universe of recertification cases in San Francisco over a two-year window, we show that roughly half of all cases fail recertification, yet the vast majority (94 percent) of rejected cases have earnings below the eligibility threshold and roughly two-thirds of rejected cases have no wage earnings at all. Moreover, half of the recertification failures successfully reenter the program in the following months, an outcome referred to as "program churn." For these exit patterns to be driven solely by fluctuations in eligibility, it would imply that one-quarter of all SNAP cases are ineligible at the time of recertification yet once again eligible almost immediately after being discontinued from the program.

An alternative explanation for the high observed rate of program churn is that the recertification requirements create another administrative hurdle that results in the loss of benefits among eligible households. We explore this possibility by once again analyzing the administration of the caseworker interview requirement, this time focusing on the timing of the scheduled recertification interview. In San Francisco, SNAP cases must recertify for the program each year, with all certification periods closing at the end of the calendar month. Initial interview assignments are staggered throughout the calendar month and randomly

Figure 3

SNAP Benefits Interview Day and Recertification Rate

Recertification rate

Start of the month

Interview day of the month
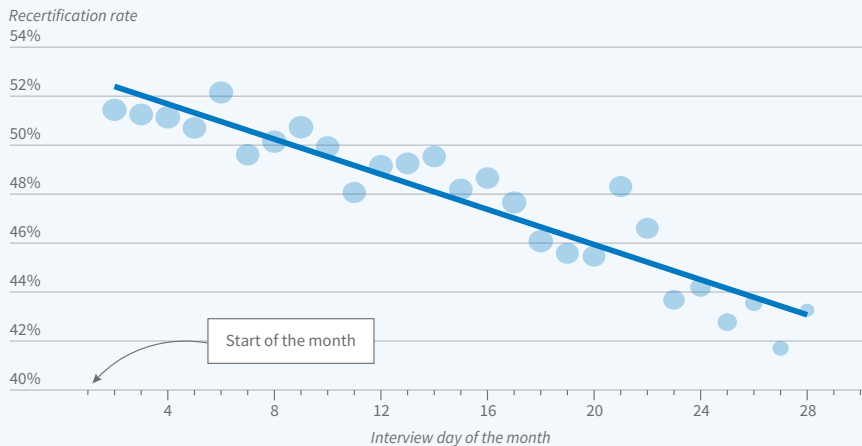
The size of each circle indicates the relative number of observations per calendar day.
Source: "Program Recerification Costs: Evidence from SNAP," Homonoff T, Somerville J. NBER Working Paper 27311, June 2020,
and American Economic Journal: Economic Policy, 13(4), November 2021, pp. 271–298.

the costs associated with enforcement of these program integrity policies: incomplete program take-up. Among likely eligible households, we document sizeable losses in SNAP benefits and exits from the program associated with the interview requirement. It is worth noting that the caseworker interview is only one potential barrier to program access — enrollment and recertification procedures entail many other steps to establish eligibility that may also decrease take-up. Our findings, therefore, provide just one example of how seemingly minor elements of program integrity policies can generate outsize effects on benefit access among eligible households, and underscore the importance of weighing these costs against the targeting benefits of the regulation when designing safety net policies.

assigned to each case in an effort to smooth caseworker workloads. This means that cases assigned to the earliest interview date have four weeks before the recertification deadline to reschedule a missed interview or gather any missing documentation, while cases assigned to the latest date have only a few days.

Figure 3 plots the relationship between the assigned interview day and the recertification rate.[4] Cases assigned to interviews at the end of the month are 20 percent less likely to successfully recertify than cases assigned to interviews at the start of the month. We also find that the relationship between interview assignment timing and SNAP participation persists long term. Cases assigned to the latest interview date are over 2 per-

centage points less likely to participate in SNAP at any point in the year after recertification than cases assigned to the earliest date. This suggests that while the majority of cases who exit the program due to later interview assignments eventually reenter the program, roughly one-quarter of the cases who fail recertification due solely to the timing of their interview remain off the program long term. The benefit losses are sizeable: on average, the marginal disenrolled case loses $550 in SNAP benefits in the first year alone.

Conclusion

Programs that target benefits toward low-income households require eligibility standards to ensure that benefits are received only by the intended individuals. Our research highlights

1 "Administrative Burden and Procedural Denials: Experimental Evidence from SNAP," Giannella E, Homonoff T, Rino G, Somerville J. NBER Working Paper 31239, May 2023, and forthcoming in the *American Economic Journal: Economic Policy*.
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2 Giannella E, Homonoff T, Rino G, Somerville J, ibid.
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3 "Program Recertification Costs: Evidence from SNAP," Homonoff T, Somerville J. NBER Working Paper 27311, June 2020, and *American Economic Journal: Economic Policy* 13(4), November 2021, pp. 271–298.
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4 Homonoff T, Somerville J, ibid.
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NBER News

Three New Directors Elected to NBER Board

R. Glenn Hubbard, Angelo Melino, and John Pepper were elected to the NBER Board of Directors at the Board's September 23 meeting.

Hubbard will represent Columbia University. He is the Russell L. Carson Professor of Finance and Economics and the Director of the Jerome A. Chazen Institute for Global Business at the Columbia Business School. He is also the Dean Emeritus of the School. Between 2001 and 2003, he served as the chairman of the President's Council of Economic Advisers, and between 1991 and 1993, as the Deputy Assistant Secretary for Tax Policy at the US Treasury Department. He was a Research Associate in four NBER programs — Corporate Finance, Economic Fluctuations and Growth, Monetary Economics, and Public Economics — prior to joining the Board. Hubbard received his undergraduate degree in economics from the University of Central Florida and his PhD from Harvard.

Melino will represent the University of Toronto. He is a professor of economics at the university and a Research Fellow at the C.D. Howe Institute. In the 1980s, Melino was a faculty research fellow and a research associate in the NBER Financial Markets and Monetary Economics program. His research focuses on financial markets, macroeconomics, and time series econometrics. He previously served on the NBER Board as the representative of the Canadian Economics Association. He received his undergraduate degree from the University of Toronto and his PhD from Harvard University.

Pepper will represent the University of Virginia. He is the Merrill S. Bankard Professor of Economics, and the past chair of the university's economics department. His research focuses on applied econometrics and public finance, with particular emphasis on social safety net programs that are designed to provide food security, and on the measurement and economic analysis of criminal behavior. Pepper received his undergraduate degree in quantitative economics from Tufts University, and his PhD from the University of Wisconsin, Madison.

Valerie Ramey to Chair Business Cycle Dating Committee

Valerie Ramey, an NBER Research Associate in the Economic Fluctuations and Growth and Monetary Economics Programs, Senior Fellow at the Hoover Institution at Stanford University, and Professor of Economics, Emeritus, at the University of California, San Diego, has been named chair of the Business Cycle Dating Committee (BCDC). She is an expert on the sources of business cycles and the macroeconomic impact of monetary and fiscal policies, and has served on the Committee since 2017. Ramey succeeds Robert Hall, who has chaired the Committee since it was launched in its current form in 1978. The BCDC chair is appointed by the NBER President with the approval of the Executive Committee of the NBER Board of Directors.

Seven Postdoctoral Scholars Awarded Fellowships

Seven postdoctoral scholars have been awarded NBER fellowships for the 2024–25 academic year, following widely disseminated calls for applications.

Woojin Kim, who received his PhD from the University of California, Berkeley, and Chika O. Okafor, who received his PhD from Harvard University, hold fellowships in aging and health economics supported by the National Institute on Aging. Kim is studying the interaction between physicians' political allegiance and practice patterns, while Okafor will investigate how the criminal legal system impacts health outcomes and disparities.

Sean Kiely, who received his PhD from the University of California, Davis, holds a fellowship in agricultural economics supported by the US Department of Agriculture. His research focuses on the impact of information and food labeling policies on household demand for food products.

Michael A. Navarrete, who received his PhD from the University of Maryland, holds the NBER postdoctoral fellowship to support diversity in the economics profession. Navarrete is analyzing heterogeneity in the inflation rates facing different population subgroups and its effect on real income inequality.

Rainer Kotschy, who received his PhD from Harvard University, holds a fellowship on the economics of an aging workforce, sponsored by the Alfred P. Sloan Foundation. His research examines health status and aging in a life cycle framework, considering both household-level and macroeconomic issues.

Brandon M. Enriquez, who received his PhD from the Massachusetts Institute of Technology, holds a fellowship on racial and ethnic disparities in economic outcomes, also sponsored by the Alfred P. Sloan Foundation. Enriquez is studying the effects of labor market institutions and trade shocks on racial inequality in the US.
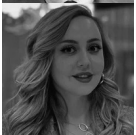
Bahareh Eftekhari, who received their PhD from Howard University, holds a fellowship on retirement and disability policy sponsored by the US Social Security Administration. They are studying the impact of the Children's Health Insurance Program on the financial well-being of Supplemental Security Income beneficiaries.

15 Graduate Students Receive Dissertation Fellowships for 2024–25

Each year, the NBER provides dissertation fellowships for a number of doctoral students in economics and finance, in each case after a widely disseminated call for applications.

Fellowships for dissertation writers in aging and health economics, supported by the National Institute on Aging and the NBER, have been awarded to Michael B. Briskin of Boston University; Marema Gaye and Graeme P. Peterson of Harvard University; and Theodore L. Caputi, Rebekah A. Dix, Dean Li, Kelsey Moran, and James C. Okun of the Massachusetts Institute of Technology.

Briskin is studying the widespread adoption of private health insurance in the 1940s and 1950s and its effects on physician labor markets and health outcomes in the US. Caputi's research focuses on behavioral aspects of public health, such as drug use, violence, and crime, and their effects on economic outcomes. Dix is investigating externalities in medical innovation and how interoperability and technological frictions affect patients and healthcare providers. Gaye is studying mental healthcare and the nonparticipation of some clinicians in public health insurance. Li is examining the effects of outsourcing, technological change, and consolidation on healthcare labor markets and healthcare delivery. Moran is investigating the determinants of hospital provision of charity care as well as the effects of health information exchange on patients and organizations. Okun is studying the effects of government buyer power on healthcare markets as well as the quality of publicly financed nursing home care in the United States and how it interacts with selective admissions practices. Peterson's dissertation addresses health insurance markets, environmental health, and the causes and consequences of racial disparities in the US healthcare system.

Fellowships for graduate students studying behavioral macroeconomics, sponsored by the Alfred P. Sloan Foundation, have been awarded to Lingxuan Sean Wu of Harvard University, Michael D. Cai of Northwestern University, and Matteo Saccarola of the University of California, Berkeley.

Cai is studying the estimation of macroeconomic models that accommodate wide classes of nonrational expectations. Saccarola is analyzing the formation of beliefs about inflation, exchange rates, and prices. Wu is studying the implications of misunderstanding of economic relations for economic fluctuations and stabilization policy.

Fellowships to support research on consumer financial management, funded by the Institute of Consumer Money Management, have been awarded to Justin Katz of Harvard University and Grace Ortuzar of the University of Notre Dame.

Katz is studying frictions in household debt repayment decisions, with a particular focus on the mortgage and housing sector. Ortuzar is examining the effects of a range of policies that are designed to benefit low-income tenants and reduce homelessness.

Fellowships for the study of retirement and disability policy research, sponsored by the Social Security Administration, have been awarded to Melissa D. Gentry of Texas A&M University and Sydney Gordon of the University of California, Irvine.

Gentry is studying the role of access to transportation in affecting the employment of individuals with disabilities. Gordon is investigating how Social Security Administration field office staffing affects benefit enrollment patterns.

The NBER posts calls for **fellowship applications** each fall. Application closing dates are usually in early December. Those interested in receiving fellowship announcements can **sign up to receive notices**.

Summer Institute 2024

More than 2,700 researchers, hailing from 40 countries, traveled to Cambridge for the **47th annual NBER Summer Institute**, which was held over the three-week period July 8–26. Nearly 490 additional researchers registered to participate virtually. The Summer Institute consisted of 49 distinct meetings and workshops arranged by 143 organizers. Most of the meetings also were streamed on the **NBER's YouTube channel**.

The in-person participants represented 455 universities, central banks, think tanks, businesses, and government agencies. Only about one-third were NBER affiliates, and nearly 500 were first-time Summer Institute participants.

The 582 research papers presented during the course of the Summer Institute were selected from 3,575 submissions — an acceptance rate of about 16 percent.

Cecilia E. Rouse, the president of the Brookings Institution, a Princeton faculty member, and the past chair of the Council of Economic Advisers, delivered the 2024 Martin Feldstein Lecture on "Lessons for Economists from the Pandemic." Her presentation highlighted the challenges to policy design when there was great uncertainty about the public health trajectory of COVID-19 and described policy trade-offs associated with some of the key pandemic-era policies. A **recording of her lecture** can be found on the NBER website and a transcript appears in this issue of the Reporter as well as on the website lecture page.

NBER Research Associates Susan Athey and Guido Imbens of Stanford University presented the 2024 Methods Lectures on "**Analysis and Design of Multi-Armed Bandit Experiments and Policy Learning**" and "**Inference and Spillovers in Randomized Experiments**." Their lectures described both the econometric theory behind, and the application of, a range of new tools for experimental design in economics as well as other fields.

Six Robert Summers Fellowships Awarded to Attend CRIW Meeting

The NBER awarded six Summers fellowships to enable economic statisticians from government agencies and international organizations to attend the Conference on Research in Income and Wealth (CRIW) meeting on July 15–16, 2024, in Cambridge, MA. The fellows participated in the meeting and had an opportunity to interact with leading scholars and practitioners in the field of economic measurement. Founded in 1936 by Simon Kuznets, the CRIW provides a forum for academics, government representatives, and business economists to present and discuss the latest research in this area.

The fellowship program honors Robert Summers, a distinguished CRIW member and professor at the University of Pennsylvania, who made substantial contributions to the study of international price and output comparisons. Summers, together with Alan Heston and Irving Kravis, developed the Penn World Table (PWT), a comprehensive dataset that provides consistent national income and economic data across a wide range of countries and years. Today, the PWT includes information from 190 countries and serves as a critical resource for cross-country economic analysis.

The 2024 fellowship recipients are: Flavio Calvino from the Organization for Economic Cooperation and Development; Mahsa Gholizadeh from the US Department of Commerce's Bureau of Economic Analysis; Josh Martin from the Bank of England; Doron Sayag of Bar-Ilan University, previously the director of price measurement at the Israel Central Bureau of Statistics; Jakob Schneebacher from the UK Competition and Markets Authority; and Klaas de Vries from Statistics Netherlands. The fellows work on a range of issues, including international comparisons and price measurement.

The fellowship program, which promotes research on economic measurement and strengthens ties between academics and practitioners, is ongoing. A call for applications for 2025 Summers fellows will be posted on the NBER website in January 2025.

Sesquicentennial of Wesley Clair Mitchell's Birth

August 5th marked the sesquicentennial of the birth of Wesley Clair Mitchell (1874–1948), who played a formative role in creation of the NBER and served as the organization's director of research from its founding in 1920 until 1945.

Recruiting a group of researchers dedicated to improving economic measurement, Mitchell guided early projects estimating labor's share of national income, measuring the unemployment rate, and tracking business cycle fluctuations. His 1927 monograph *Business Cycles: The Problem and Its Setting* introduced the term "recession" for economic contractions and provided the framework for much subsequent NBER work on turning points in macroeconomic activity.

One of Mitchell's students, Simon Kuznets, led the NBER research that laid the foundation for modern national income accounting.

Mitchell was the first recipient of the American Economic Association's Francis A. Walker Medal recognizing the economist who had made the most significant contributions to economics over the course of their career. Mitchell's research accomplishments are celebrated in a volume edited by another of his students, Arthur Burns, who followed him as the NBER's director of research and later became chair of the Board of Governors of the Federal Reserve System.

Conferences and Meetings

Detailed programs for NBER conferences are available at nber.org/conferences

Title of Conference/Meeting	Organizers	Dates
Corporate Finance	Antoinette Schoar and Amir Sufi	July 8–9, 2024
Capital Markets and the Economy	Janice C. Eberly and Deborah J. Lucas	July 8–10, 2024
International Trade & Investment	Cecile Gaubert and Oleg Itskhoki	July 8–10, 2024
Development of the American Economy	Martha J. Bailey, Leah Platt Boustan, William J. Collins, Joshua K. Hausman, and Taylor Jaworski	July 8–11, 2024
Monetary Economics	Emi Nakamura and Jón Steinsson	July 8–12, 2024
Impulse and Propagation Mechanisms	Lawrence Christiano and Martin S. Eichenbaum	July 8–12, 2024
International Trade & Macroeconomics	Yan Bai and Javier Cravino	July 9, 2024
International Finance & Macroeconomics	Stephanie Schmitt-Grohé and Pablo Ottonello	July 9–12, 2024
Forecasting & Empirical Methods	Allan Timmermann and Jonathan H. Wright	July 9–12, 2024
International Finance and Macroeconomics Data Session	Jesse Schreger and Chenzi Xu	July 10, 2024
Macro, Money and Financial Frictions	Markus K. Brunnermeier, Arvind Krishnamurthy, and Guillermo Ordoñez	July 10–11, 2024
International Economics and Geopolitics	Matteo Maggiori and Jesse Schreger	July 11, 2024
Workshop on Methods and Applications for Dynamic Equilibrium Models	S. Borağan Aruoba, Luigi Bocola, Jesús Fernández-Villaverde, Frank Schorfheide, and Christian K. Wolf	July 11–12, 2024
Asset Pricing	Ralph S. J. Koijen and Sydney C. Ludvigson	July 11–12, 2024
Innovation Research Boot Camp	Benjamin Jones and Heidi L. Williams	July 12–18, 2024
Big Data and High-Performance Computing for Financial Economics	Toni Whited and Mao Ye	July 13, 2024
Economic Fluctuations and Growth	Ellen McGrattan and Ludwig Straub	July 13, 2024
Entrepreneurship	Yael Hochberg, Josh Lerner, and David T. Robinson	July 15, 2024
Macroeconomics Within and Across Borders	Mark A. Aguiar, Cristina Arellano, Patrick J. Kehoe, and Mark L.J. Wright	July 15, 2024
Conference on Research in Income and Wealth	Katharine G. Abraham, Susanto Basu, and David M. Byrne	July 15–16, 2024
Economic Growth	Ufuk Akcigit, Francisco J. Buera, and David Lagakos	July 15–16, 2024
The Micro and Macro Perspectives of the Aggregate Labor Market	Philipp Kircher, Guido Menzio, and Giuseppe Moscarini	July 15–18, 2024
Micro Data and Macro Models	Erik Hurst, Greg Kaplan, and Giovanni L. Violante	July 15–18, 2024
Entrepreneurship Research Boot Camp	David T. Robinson	July 15–19, 2024
Macroeconomics and Productivity	Susanto Basu, Nicholas Bloom, Raffaella Sadun, and Chad Syverson	July 16, 2024

Title of Conference/Meeting	Organizers	Dates
Innovation	Adam B. Jaffe, Benjamin Jones, and Heidi L. Williams	July 16–17, 2024
Political Economy	Wioletta Dziuda, Georgy Egorov, Ilyana Kuziemko, and Guo Xu	July 16–17, 2024
Inequality and Macroeconomics	Roland Bénabou, Raquel Fernández, and Jonathan Heathcote	July 16–17, 2024
Digital Economics and Artificial Intelligence	Erik Brynjolfsson, Avi Goldfarb, and Catherine Tucker	July 17–19, 2024
Macro Public Finance	Dirk Krueger, Florian Scheuer, Stefanie Stantcheva, and Aleh Tsyvinski	July 18, 2024
Science of Science Funding	Megan MacGarvie, Paula Stephan, and Reinhilde Veugelers	July 18–19, 2024
Industrial Organization	C. Lanier Benkard, Tobias Salz, Pietro Tebaldi, and Daniel C. Waldinger	July 18–19, 2024
Household Finance	Paul Goldsmith-Pinkham, Adair Morse, and Stephen P. Zeldes	July 18–19, 2024
Behavioral Macro	Andrew Caplin and Ulrike Malmendier	July 19, 2024
Environmental & Energy Economics	Douglas Almond, Ashley Langer, Joseph S. Shapiro, and Catherine Wolfram	July 22–23, 2024
Development Economics	Shawn Cole, Oeindrila Dube, Andrew Foster, Seema Jayachandran, Supreet Kaur, Kaivan Munshi, and Daniel Xu	July 22–23, 2024
Workshop on Aging	David M. Cutler, Kosali I. Simon, and Jonathan S. Skinner	July 22–23, 2024
Labor Studies	David Autor, Sydnee Caldwell, Andrew Garin, Patrick M. Kline, Thibaut Lamadon, Alexandre Mas, Evan K. Rose, and Melanie Wasserman	July 22–25, 2024
Gender in the Economy	Jessica Goldberg, Claudia Goldin, Pamela Jakiela, Claudia Olivetti, and Barbara Petrongolo	July 23–24, 2024
Public Economics	Augustin Bergeron, Raj Chetty, Eric Chyn, Benjamin B. Lockwood, Maria Polyakova, Mathilde Muñoz, and Tatiana Homonoff	July 23–24, 2024
Economics of Social Security	Manasi Deshpande and James M. Poterba	July 24, 2024
Economics of Education	Caroline M. Hoxby	July 24, 2024
Real Estate	Tomasz Piskorski and Benjamin J. Keys	July 24–25, 2024
Personnel Economics	Mitchell Hoffman and Lisa B. Kahn	July 24–25, 2024
Law and Economics	Christine Jolls	July 24–25, 2024
Economics of Health	Christopher S. Carpenter, Amy Finkelstein, Joshua D. Gottlieb, Timothy Layton, Mario Macis, Analisa Packham, Maria Polyakova, and Barton Willage	July 24–25, 2024
Urban Economics	Edward L. Glaeser	July 25–26, 2024

Title of Conference/Meeting	Organizers	Dates
Economics of Crime	Jens Ludwig and Crystal Yang	July 25–26, 2024
Children and Families	Janet Currie and Anna Aizer	July 25–26, 2024
Japan Project Meeting	Shiro P. Armstrong, Charles Yuji Horioka, Tsutomu Watanabe, and David Weinstein	July 30–31, 2024
Chinese Economy Working Group Meeting	Hanming Fang, Zhiguo He, Shang-Jin Wei, and Wei Xiong	August 22–23, 2024

All meetings in this table, except the last two, were held as part of the NBER Summer Institute.

Tax Policy and the Economy, Volume 38

Robert A. Moffitt, editor

This volume presents new research on taxation and public expenditure programs, with particular focus on how they affect economic behavior.

John Guyton, Kara Leibel, Dayanand Manoli, Ankur Patel, Mark Payne, and Brenda Schafer study the disallowance of Earned Income Tax Credit (EITC) benefits as a result of IRS audits and find that in post-audit years, audited taxpayers are less likely than similar non-audited taxpayers to claim EITC benefits.

Janet Holtzblatt, Swati Joshi, Nora Cahill, and William Gale provide new empirical evidence on racial differences in the income tax penalty, or bonus, associated with a couple being married.

Haichao Fan, Yu Liu, Nancy Qian, and Jaya Wen evaluate how computerizing value-added tax transactions in China affected the tax revenue collected from large manufacturing firms.

Niels Johannesen, Daniel Reck, Max Risch, Joel Slemrod, John Guyton, and Patrick Langetieg study data on the ownership of foreign bank accounts and other financial accounts as reported on income tax returns. They find that many of these accounts are in tax havens, and they discuss the impact of the Foreign Account Tax Compliance Act on tax compliance and government revenue.

Louis Kaplow integrates charitable giving into an optimal income tax framework and shows that the externalities associated with such giving are key to determining its optimal tax treatment.

Finally, Roger Gordon compares caps or quantity targets on emissions with carbon taxes and points out that which one dominates can be situation-specific and depend on a number of features of the economy.

The Economics of Privacy

Avi Goldfarb and Catherine Tucker, editors

The falling costs of collecting, storing, and processing data have allowed firms and governments to improve their products and services, but have also created databases with detailed individual-level data that raise privacy concerns. The Economics of Privacy summarizes the research on the economics of privacy and identifies open questions on the value of privacy, the roles of property rights and markets for privacy and for data, the relationship between privacy and inequality, and the political economy of privacy regulation.

Several themes emerge across the chapters. One is that it may not be possible to solve privacy concerns by creating a market for the right to privacy, even if property rights are well-defined and transaction costs are low. Another is that it is difficult to measure and to value the benefits of privacy, particularly when individuals have an intrinsic preference for privacy. Most previous attempts at valuation have focused only on quantifiable economic outcomes, such as innovation. Finally, defining privacy through an economics lens is challenging.

The broader academic and legal literature includes many distinct definitions of privacy, and different definitions may be appropriate in different contexts. The chapters explore a variety of frameworks for examining these questions and provide a range of new perspectives on the role of economics research in understanding the benefits and costs of privacy and of data flows.