

# NBER Reporter

NATIONAL BUREAU OF ECONOMIC RESEARCH

A quarterly summary of NBER research

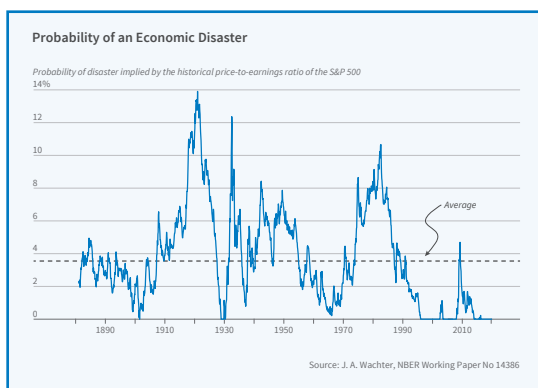
No. 1, March 2020

---

## Program Report

---

### ALSO IN THIS ISSUE



Rare Events and Financial Markets	7
The Impact of Land Institutions and Misallocation on Agricultural Productivity	11
Firm-Level Risk, Lifetime Earnings Uncertainty, and Household Savings	15
The Benefits of Rehabilitative Incarceration	18
NBER News	22
Conferences	25
Program and Working Group Meetings	29
NBER Books	34

## Public Economics

Raj Chetty and Amy Finkelstein\*

Public economics is the study of government intervention in the market economy, designed to move outcomes away from the market equilibrium. The two primary motivations for such interventions are improving market efficiency and redistributing resources across populations. The field is principally concerned with analyzing the effects of various tools — such as tax policies and social insurance programs — that are designed to achieve these aims.

The NBER Public Economics Program has made significant progress in understanding these issues during the eight years since the last program report. Between January 1, 2012 and the present — the time period covered by the current report — there were almost 2,000 NBER working papers in public economics. Much of this work has been fueled by the availability of new data sources that permit researchers to study longstanding questions with unprecedented precision and granularity.

Rather than attempting to summarize this entire corpus of work, this report focuses on two areas of research: Determinants of the take-up of government programs and the impacts of these programs on behavior and economic outcomes. These examples are not meant to be exhaustive; they focus on a limited, and admittedly somewhat arbitrary, subset of the exciting research being undertaken by program affiliates. However, they illustrate some of the main themes and richness in analysis that have emerged from recent work. All of the recent working papers by program affiliates may be found here: [conference.nber.org/papersbyprog/PE.html](http://conference.nber.org/papersbyprog/PE.html).

---

*\*Raj Chetty is the William A. Ackman Professor of Public Economics at Harvard University and the director of Opportunity Insights, an institute which uses big data to identify and develop scalable ways to overcome barriers to economic opportunity. Amy Finkelstein is the John & Jennie S. MacDonald Professor of Economics at the Massachusetts Institute of Technology and co-founder and co-scientific director of J-PAL North America, a research center that encourages and facilitates randomized evaluations of important domestic policy issues.*

The National Bureau of Economic Research is a private, nonprofit research organization founded in 1920 and devoted to objective quantitative analysis of the American economy. Its officers and board of directors are:

President and Chief Executive Officer — *James M. Poterba*  
Controller — *Kelly Horak*  
Corporate Secretary — *Alterra Milone*

## BOARD OF DIRECTORS

Chair — *Karen N. Horn*  
Vice Chair — *John Lipsky*  
Treasurer — *Robert Mednick*

## DIRECTORS AT LARGE

Peter Aldrich	Jacob A. Frenkel	Michael H. Moskow
Elizabeth E. Bailey	Robert S. Hamada	Alicia H. Munnell
Susan M. Collins	Peter Blair Henry	Robert T. Parry
Kathleen B. Cooper	Karen N. Horn	Douglas Peterson
Charles H. Dallara	Lisa Jordan	James M. Poterba
George C. Eads	John Lipsky	John S. Reed
Jessica P. Einhorn	Laurence H. Meyer	Mark Weinberger
Mohamed El-Erian	Karen Mills	Martin B. Zimmerman
Diana Farrell		

## DIRECTORS BY UNIVERSITY APPOINTMENT

Timothy Bresnahan, <i>Stanford</i>	Benjamin Hermalin, <i>California, Berkeley</i>
Pierre-André Chiappori, <i>Columbia</i>	Samuel Kortum, <i>Yale</i>
Maureen Cropper, <i>Maryland</i>	George Mailath, <i>Pennsylvania</i>
Alan V. Deardorff, <i>Michigan</i>	Joel Mokyr, <i>Northwestern</i>
Graham Elliott, <i>California, San Diego</i>	Cecilia Elena Rouse, <i>Princeton</i>
Edward Foster, <i>Minnesota</i>	Richard L. Schmalensee, <i>MIT</i>
John P. Gould, <i>Chicago</i>	Ingo Walter, <i>New York</i>
Bruce Hansen, <i>Wisconsin-Madison</i>	David B. Yoffie, <i>Harvard</i>

## DIRECTORS BY APPOINTMENT OF OTHER ORGANIZATIONS

Timothy Beatty, *Agricultural and Applied Economics Association*  
Martin Gruber, *American Finance Association*  
Philip Hoffman, *Economic History Association*  
Arthur Kennickell, *American Statistical Association*  
Jack Kleinhenz, *National Association for Business Economics*  
Robert Mednick, *American Institute of Certified Public Accountants*  
Peter L. Rousseau, *American Economic Association*  
Gregor W. Smith, *Canadian Economics Association*  
William Spriggs, *American Federation of Labor and Congress of Industrial Organizations*  
Bart van Ark, *The Conference Board*

The NBER depends on funding from individuals, corporations, and private foundations to maintain its independence and its flexibility in choosing its research activities. Inquiries concerning contributions may be addressed to James M. Poterba, President & CEO, NBER, 1050 Massachusetts Avenue, Cambridge, MA 02138-5398. All contributions to the NBER are tax-deductible.

The *Reporter* is issued for informational purposes and has not been reviewed by the Board of Directors of the NBER. It is not copyrighted and can be freely reproduced with appropriate attribution of source. Please provide the NBER's Public Information Department with copies of anything reproduced.

Requests for subscriptions, changes of address, and cancellations should be sent to *Reporter*, National Bureau of Economic Research, Inc., 1050 Massachusetts Avenue, Cambridge, MA 02138-5398 (please include the current mailing label), or by email to [subs@nber.org](mailto:subs@nber.org). Print copies of the *Reporter* are only mailed to subscribers in the U.S. and Canada; those in other nations may request electronic subscriptions at [www.nber.org/drsubscribe/](http://www.nber.org/drsubscribe/).

## Take-up and Targeting of Government Programs

A natural assumption when designing government programs — one made in much of the theoretical literature in public finance for decades — is that everyone who is eligible for the program in question participates. But enrollment in social safety net programs is typically not automatic: individuals must apply for the programs and demonstrate eligibility. Often, eligibility rules are complicated, application forms long, and documentation requirements substantial. Perhaps as a result, many people who are eligible for social safety net programs do not participate. Common hypotheses for this “incomplete take-up puzzle” include lack of information about eligibility, transaction costs associated with enrollment, and stigma associated with applying for or enrolling in the programs.

Recent research has examined two empirical questions that relate to take-up: identifying barriers to take-up and estimating how those barriers affect the characteristics of applicants and enrollment, known as the “targeting” property of the barrier. Economists have posited very different hypotheses for what kinds of eligible individuals are deterred from enrolling. Drawing on neoclassical theory, some have argued that those deterred might be the least needy among the eligible, while recent work in behavioral economics has suggested that deterrent ordeals may have exactly the opposite targeting effect, discouraging precisely those applicants the social planner would most like to enroll.

This ambiguity about whether targeting tends to exclude the most or the least needy potential beneficiaries has made empirical work on the topic all the more important. Much of this empirical work has been conducted in the form of randomized controlled trials of particular interventions, their impact on take-up, and the characteristics of those who take up, but there have also been important quasi-experimental papers. We summarize findings from selected papers in what follows.<sup>1</sup>

Reductions in informational barriers have been found to be quantitatively important in generating take-up in some contexts but not in others. In a recent series of randomized interventions aimed at increasing take-up of the Earned Income Tax Credit (EITC) among likely eligible individuals, Dayanand Manoli and co-authors have found that take-up is highly sensitive to both the frequency and nature of reminder letters sent by the Internal Revenue Service, although the effects of the reminder do not persist into the following year when the indi-

viduals would have to sign up again.<sup>2</sup> Likewise, Susan Dynarski and collaborators find that an information intervention that informed high-achieving students about a tuition-free college scholarship increased enrollment at a flagship state university.<sup>3</sup> There is also quasi-experimental evidence that information is an important barrier to take-up of post-secondary enrollment among unemployment insurance recipients.<sup>4</sup> However, Hunt Allcott and Michael Greenstone find in a randomized evaluation of informational interventions that lack of awareness is not a contributor to low take-up of home energy efficiency audits.<sup>5</sup>

Reductions in transactional barriers have been found to be important for increasing enrollment in several different programs. Amy Finkelstein and Matthew Notowidigdo find that for elderly individuals eligible for the Supplemental Nutrition Assistance Program (SNAP), information alone can have an effect on take-up, but that pairing it with assistance doubles the impact.<sup>6</sup> Manasi Deshpande and Yue Li find that the closing of local field offices where Social Security Disability Insurance and Supplemental Security Income applications can be submitted substantially reduces both applications and enrollment.<sup>7</sup> Vivi Alatas and co-authors present evidence from a randomized evaluation across Indonesian villages that increasing the transaction cost of applying for a conditional cash trans-

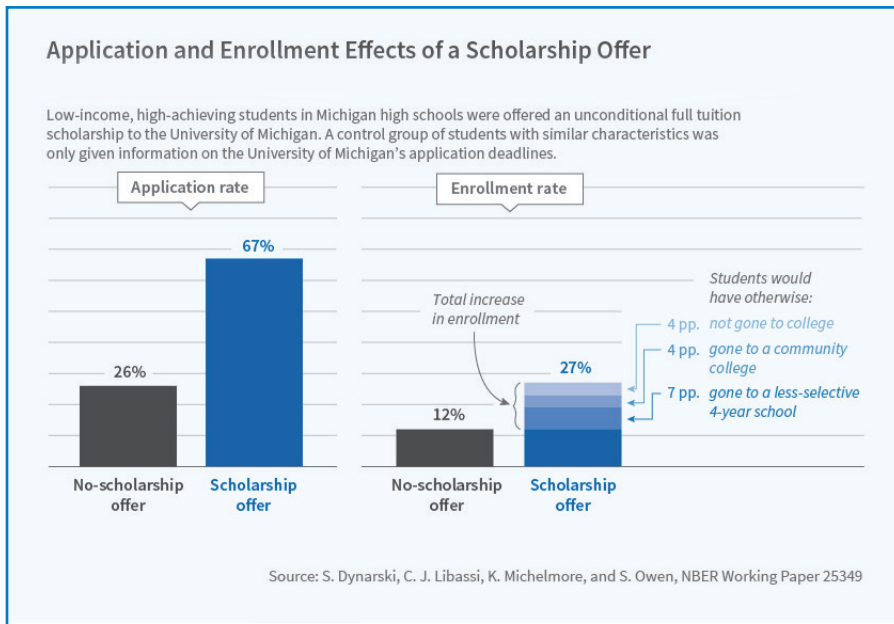


Figure 1

fer program reduces enrollment.<sup>8</sup>

In addition to investigating how barriers to enrollment affect take-up rates, recent research has focused on how these barriers may affect the characteristics of applicants and enrollees. From information interventions, there is evidence that complexity disproportionately deters EITC enrollment of lower-income potential recipients, and that, due at least in part to a lack of insurance literacy, some lower-income employees

choose health insurance plans which, while more expensive than other options, do not offer any additional coverage.<sup>9</sup> Information about eligibility disproportionately encourages enrollment among eligible, relatively higher socioeconomic status applicants in the SNAP program.<sup>10</sup>

Studies have found that making it more burdensome to access benefits — that is, imposing transaction costs — increases targeting on some but not all dimensions. Alatas et al. find that introducing

transaction costs by requiring individuals to apply for a conditional cash transfer in Indonesian villages rather than have the government automatically screen the individuals for eligibility improves targeting; specifically, it results in enrolling substantially poorer people.<sup>11</sup> However, marginally increasing the transaction costs does not further affect the characteristics of enrollees. Deshpande and Li find that increasing the transaction costs associated with US disability programs worsens targeting among applicants, as evidenced by an increase in the share of applicants with only moderately severe disabilities, but improves targeting among enrollees, as evidenced by a decrease in the share of enrollees with the least severe disabilities (conditional on being severe enough to be eligible).<sup>12</sup> However, they also find that the increased transaction costs reduce the share of enrollees with low education levels and low pre-application earnings, suggest-

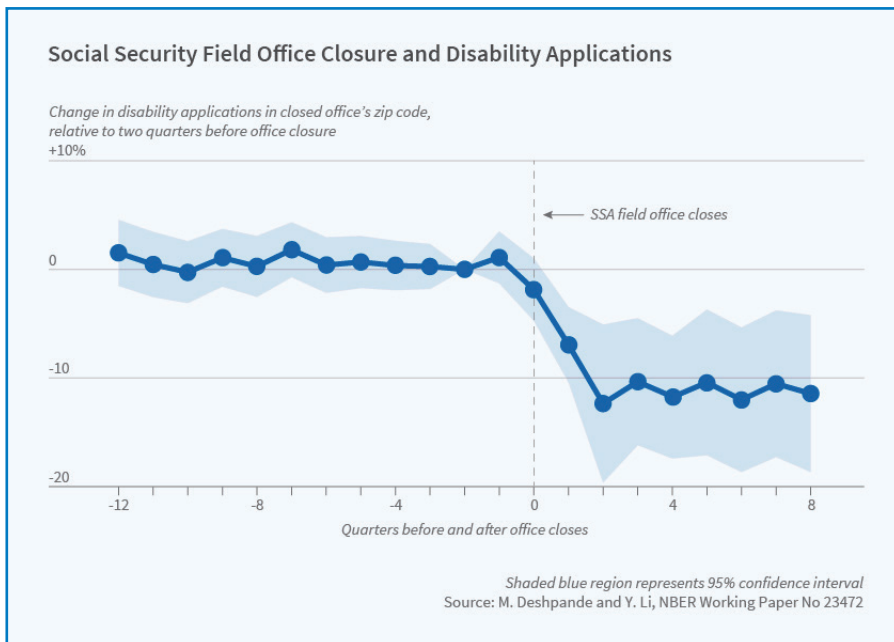


Figure 2

ing a reduction in targeting. Finkelstein and Notowidigdo, in contrast, find that reducing transaction costs decreases targeting on all dimensions, and at all stages (application and enrollment).<sup>13</sup>

In summary, recent work has uncovered evidence not just of the importance of barriers to take-up in general, but on precisely how those barriers may vary across programs and subgroups. Although there are no universal lessons in terms of the determinants of take-up and targeting, these studies pave the way for further work that can be conducted by government agencies and practitioners to understand take-up in the context of the particular policy under consideration. The normative implications of different targeting properties are unclear and also remain an important and likely fruitful topic for further work.

## Impacts of Government Programs and Tax Policies

Much as there has been great progress in understanding how take-up varies across government programs, the past eight years have seen tremendous progress in understanding program impacts. Much of this work has been fueled by the growing availability of population-level administrative tax data from the Department of the Treasury and the Census Bureau. Over these years, the Public Economics Program has fostered collaborative research between members of the group and members of government agencies such as the Office of Tax Analysis, the IRS, the Census Bureau, and others through an annual meeting on research using administrative tax data. Here, we summarize some examples of progress that has been made in understanding the causal effects of government programs using such data.

Several studies have analyzed how changes in tax incentives affect the behavior of individuals and corporations. For example, researchers have analyzed how local income and estate taxes affect the location of inventors, entrepreneurs, and wealthy individuals using modern administrative data sources. These studies have found that increases in top income tax rates and wealth taxes on the very wealthy induce significant migratory responses between states and even across countries.<sup>14</sup> However, evidence on whether such tax increases induce “real” changes in aggregate business activity or innovation is more limited. Moreover, when inventors and entrepreneurs have strong ties to a research hub in a given area, their responsiveness to tax changes becomes much smaller.<sup>15</sup>

tunities for upward income mobility.<sup>16</sup> Some well-designed affordable housing programs, in particular, those that provide customized search assistance, can be highly effective in helping families move to higher-opportunity neighborhoods. Focusing on a different program, Rebecca Diamond and Timothy McQuade show that the Low-Income Housing Tax Credit, a subsidy given to developers of affordable housing, revitalizes low-income neighborhoods by increasing property values and reducing crime rates, but has more negative effects in higher-income areas.<sup>17</sup>

Finally, a third strand of research using administrative tax data has focused on improving measures of income, taking into account tax and transfer programs. Bruce Meyer and collaborators conducted a series of studies linking admin-

istrative data to survey data to show that surveys often understate income at the bottom of the income distribution because of underreporting of transfers, leading to an overstatement of the number of households living in extreme poverty.<sup>18</sup> At the other end of the income distribution, recent studies have provided a more comprehensive picture of top income and wealth inequality, showing for instance that much of the wealth being accrued at the top

comes from human capital rather than financial capital.<sup>19</sup> Thomas Piketty, Emmanuel Saez, and Gabriel Zucman look across the entire income distribution and construct distributional national accounts that allocate GDP to income groups.<sup>20</sup> These studies all examine income distributions at a single point in time. The growing availability of panel data has also enabled researchers to make progress in the measurement of income dynamics over time, documenting, for instance, that rates of intergener-

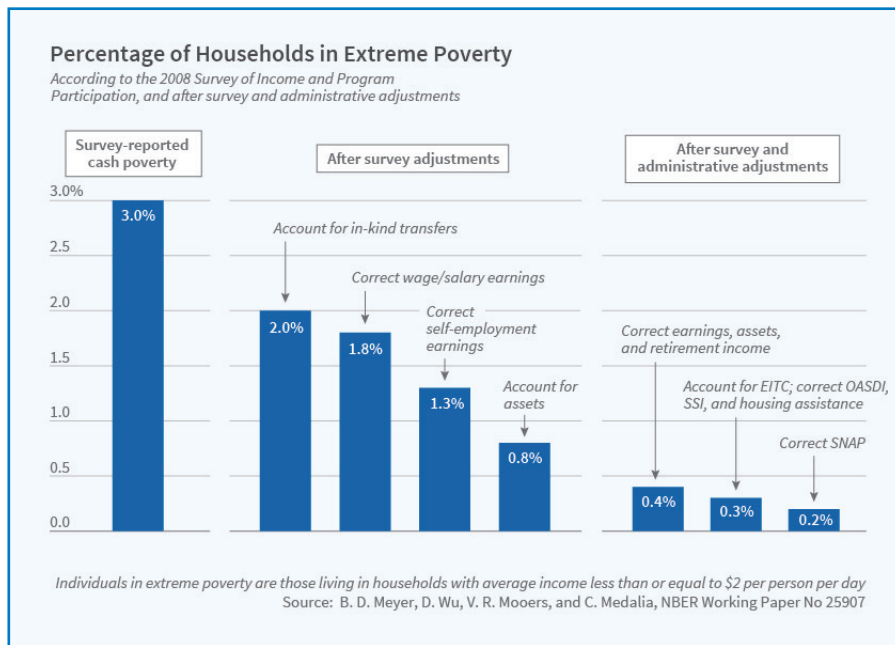


Figure 3

In a different vein, a series of studies have examined how affordable housing programs implemented by the government affect behavior and outcomes. Using methods ranging from randomized experiments to estimation of structural models, a series of studies have shown that there are large search frictions — a lack of information and support in the housing search process — that hamper low-income families’ ability to find affordable housing in neighborhoods that provide good oppor-

ational mobility vary sharply across geographic areas.<sup>21</sup> These studies pave the way for further work understanding why income levels and mobility vary so sharply across areas and how government policies can influence mobility and growth.

No single unifying result about the causal effects of government programs emerges from these studies. Some tax policies induce large behavioral responses; others do not. In some cases, the same program has very different effects in different settings, depending upon how it is implemented.<sup>22</sup>

Perhaps the general lesson that public economists have learned in recent years is that there are important differences in the effect of public policies on households and firms. There may be no “one size fits all” answer to policy design questions. The context and specifics matter tremendously. Fortunately, the field is increasingly poised to tackle this richness and complexity, thanks to progress in data availability and empirical methods. This bodes well for the future of public economics, with much remaining to be discovered and the tools to do so now in hand.

---

<sup>1</sup> “The Take Up of Social Benefits,” Currie J. NBER Working Paper 10488, May 2004, provides an overview of some of the earlier literature, while our review starts with working papers published in 2012.

[Return to Text](#)

<sup>2</sup> “Psychological Frictions and the Incomplete Take-Up of Social Benefits: Evidence from an IRS Field Experiment,” Bhargava S, Manoli D. *American Economic Review* 105(11), November 2015, pp. 3489–3529; “Nudges and Learning: Evidence from Informational Interventions for Low-Income Taxpayers,” Manoli D, Turner N. NBER Working Paper 20718, November 2014, revised January 2016; “Reminders & Recidivism: Evidence from Tax Filing & EITC Participation among Low-Income Nonfilers,” Guyton J, Manoli D, Schafer B, Sebastiani M. NBER Working Paper 21904, January 2016.

[Return to Text](#)

<sup>3</sup> “Closing the Gap: The Effect of a Targeted, Tuition-Free Promise on College Choices of High-Achieving, Low-Income Students,” Dynarski S, Libassi CJ, Micheltmore K, Owen S. NBER Working Paper 25349, December 2018.

[Return to Text](#)

<sup>4</sup> “A Letter and Encouragement: Does Information Increase Post-Secondary Enrollment of UI Recipients?” Barr A, Turner S. NBER Working Paper 23374, April 2017.

[Return to Text](#)

<sup>5</sup> “Measuring the Welfare Effects of Residential Energy Efficiency Programs,” Allcott H, Greenstone M. NBER Working Paper 23386, May 2017.

[Return to Text](#)

<sup>6</sup> “Take-up and Targeting: Experimental Evidence from SNAP,” Finkelstein A, Notowidigdo MJ. NBER Working Paper 24652, May 2018.

[Return to Text](#)

<sup>7</sup> “Who Is Screened Out? Application Costs and the Targeting of Disability Programs,” Deshpande M, Li Y. NBER Working Paper 23472, June 2017, revised October 2017.

[Return to Text](#)

<sup>8</sup> “Ordeal Mechanisms in Targeting: Theory and Evidence from a Field Experiment in Indonesia,” Alatas V, Banerjee A, Hanna R, Olken BA, Purnamasari R, Wai-Poi M. NBER Working Paper 19127, June 2013.

[Return to Text](#)

<sup>9</sup> “Psychological Frictions and the Incomplete Take-Up of Social Benefits: Evidence from an IRS Field Experiment,” Bhargava S, Manoli D. *American Economic Review* 105(11), November 2015, pp. 3489–3529; “Do Individuals Make Sensible Health Insurance Decisions? Evidence from a Menu with Dominated Options,” Bhargava S, Loewenstein G, Sydnor J. NBER Working Paper 21160, May 2015.

[Return to Text](#)

<sup>10</sup> *ibid.*, endnote 6.

[Return to Text](#)

<sup>11</sup> “Ordeal Mechanisms in Targeting: Theory and Evidence from a Field Experiment in Indonesia,” Alatas V,

Banerjee A, Hanna R, Olken BA, Purnamasari R, Wai-Poi M. NBER Working Paper 19127, June 2013.

[Return to Text](#)

<sup>12</sup> “Who Is Screened Out? Application Costs and the Targeting of Disability Programs,” Deshpande M, Li Y. NBER Working Paper 23472. June 2017, revised October 2017.

[Return to Text](#)

<sup>13</sup> *ibid.*, endnote 6.

[Return to Text](#)

<sup>14</sup> “Taxing Billionaires: Estate Taxes and the Geographical Location of the Ultra-Wealthy,” Moretti E, Wilson DJ. NBER Working Paper 26387, October 2019; “Behavioral Responses to State Income Taxation of High Earners: Evidence from California,” Rauh J, Shyu RJ. NBER Working Paper 26349, October 2019; “Taxation and the International Mobility of Inventors,” Akcigit U, Baslandze S, Stantcheva S. NBER Working Paper 21024, March 2015, revised October 2015.

[Return to Text](#)

<sup>15</sup> “Taxation and Migration: Evidence and Policy Implications,” Kleven H, Landais C, Muñoz M, Stantcheva S. NBER Working Paper 25740, April 2019.

[Return to Text](#)

<sup>16</sup> “Waiting for Affordable Housing in New York City,” Sieg H, Yoon C. NBER Working Paper 26015, June 2019; “Affordable Housing and City Welfare,” Favilukis J, Mabilie P, Van Nieuwerburgh S. NBER Working Paper 25906, May 2019; “Creating Moves to Opportunity: Experimental Evidence on Barriers to Neighborhood Choice,” Bergman P, Chetty R, DeLuca S, Hendren N, Katz LF, Palmer C. NBER Working Paper 26164, August 2019.

[Return to Text](#)

<sup>17</sup> “Who Wants Affordable Housing in their Backyard? An Equilibrium Analysis of Low Income Property Development,” Diamond R, McQuade T. NBER Working Paper 22204, April 2016.

[Return to Text](#)

<sup>18</sup> “The Use and Misuse of Income Data and Extreme Poverty in the United States,” Meyer BD, Wu D, Mooers

VR, Medalia C. NBER Working Paper 25907, May 2019.

[Return to Text](#)

<sup>19</sup> “[Capitalists in the Twenty-First Century](#),” Smith M, Yagan D, Zidar OM, Zwick E. NBER Working Paper 25442, January 2019, revised June 2019.

[Return to Text](#)

<sup>20</sup> “[Distributional National Accounts: Methods and Estimates for the United](#)

[States](#),” Piketty T, Saez E, Zucman G. NBER Working Paper 22945, December 2016.

[Return to Text](#)

<sup>21</sup> “[The Opportunity Atlas: Mapping the Childhood Roots of Social Mobility](#),” Chetty R, Friedman JN, Hendren N, Jones MR, Porter SR. NBER Working Paper 25147, October 2018, revised February 2020; “[Intergenerational](#)

[Mobility of Immigrants in the US Over Two Centuries](#),” Abramitzky R, Boustan LP, Jácome E, Pérez S. NBER Working Paper 26408, October 2019.

[Return to Text](#)

<sup>22</sup> “[Site Selection Bias in Program Evaluation](#),” Allcott H. NBER Working Paper 18373, September 2012, revised September 2014.

[Return to Text](#)

---

## Research Summaries

---

### Rare Events and Financial Markets

Jessica Wachter

A rare disaster is an event for which there is a small probability of an extremely bad outcome, leading to a large deterioration in the quality of life. Examples of rare disasters include global warfare, pandemics, and financial crises. Indeed, a pandemic illustrates a key principle about the distribution of possible outcomes of such events. The laws of geometric growth imply that many contagious illnesses die out. Some however spread quickly and pervasively, in a devastating manner. By definition, rare events do not occur very often, but when they do, they have profound economic consequences. These events are difficult to learn about because of their infrequent occurrence. While at any single point in time the probability of such an event occurring is low, nonetheless, they do occur eventually.

What can financial markets teach us about such events? The markets are forward-looking. A case in point is the 2008–09 financial crisis and the ensuing Great Recession. Financial markets reflected elevated probabilities of a disaster as early as 2007. Even with the onset of the financial crisis itself in 2008, it took months before real outcomes reflected what had been anticipated by aggregate stock indices. More recently, markets anticipated the wreckage caused by the current COVID-19 pandemic with steep declines at the end of February. At the time of this writing, the stock market has fallen by about 30 percent, pricing in an event that is worse than the Great Depression, even in the absence of official economic statistics on the impact of the pandemic in the United States.

Conversely, there is the possibility that these events can teach us something about financial markets, since beliefs about rare events may be one of the drivers of asset val-

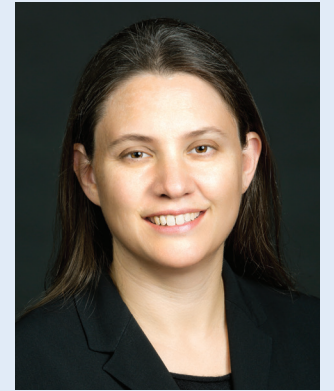
uations. These considerations led me to a line of research focused on rare events and financial markets.

#### Rare Disasters and Volatility

As John Campbell and Robert Shiller demonstrated in a seminal study, aggregate stock market fluctuations appear not to be driven by variations in expected future cash flows or interest rates. In a present-value framework, the only alternative explanation is fluctuations in risk premia and, indeed, low valuations predict high excess returns.<sup>1</sup> This raises the question: what drives risk premia? Why do investors not take advantage of what appear to be good times to buy stocks?

My research suggests that risk premia are determined by investors' beliefs about rare disasters.<sup>2</sup> There is some probability that the aggregate economy will suffer a large decline comparable to the Great Depression.<sup>3</sup> This probability fluctuates over time. When risk premia are high and valuations are low, investors do not jump in because they fear a low-probability but severe event that will jointly impact corporate earnings and their own economic prospects. Most of the time, the feared event does not actually occur. This explains the evidence that earnings, dividends, and consumption are not, in general, predictable by financial markets. What is predictable is return: Risk premia need to be higher for financial markets to clear. This framework for analyzing risk and return also accounts for the high average equity premium (on average, investors require compensation to hold stocks) and low interest rates (precautionary saving keeps the risk-free rate low).

An implication is that one can use financial markets to back out the probability of



Jessica Wachter is the Richard B. Worley Professor of Financial Management at the Wharton School of Business at the University of Pennsylvania. She holds a PhD in business economics and an undergraduate degree in mathematics from Harvard University. She is currently serves on the board of the Western Finance Association and as an associate editor of *Quantitative Economics*. Previously, she served as associate editor at *The Review of Financial Studies* and the *Journal of Economic Theory* and as a board member of the American Finance Association.

Wachter's research interests include asset pricing models that incorporate rare events and behavioral finance. She has published numerous papers in the *Journal of Finance*, the *Journal of Financial Economics*, *The Review of Financial Studies*, and other journals.

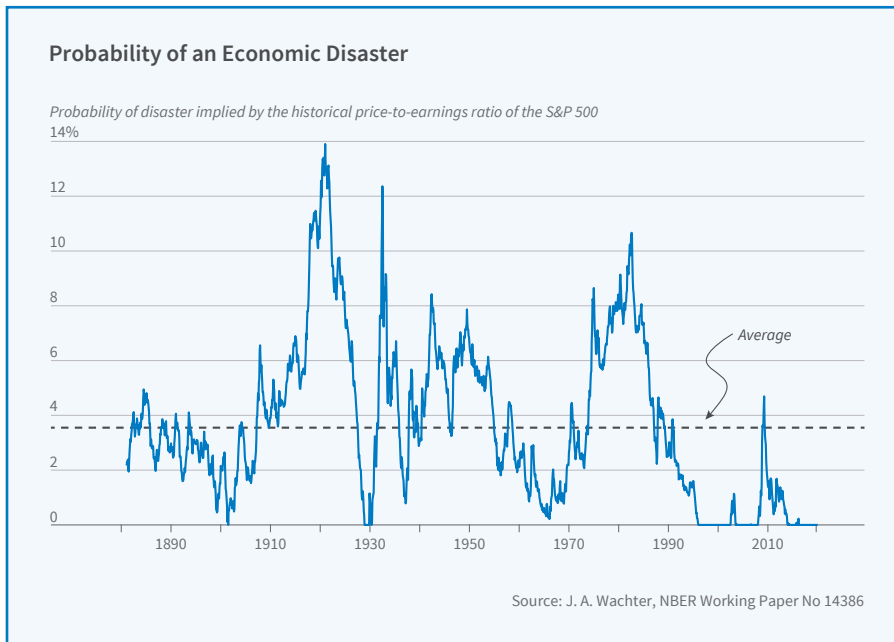
a rare event. Figure 1 shows the probability of an economic disaster implied by the price-earnings ratio of the S&P 500. This probability was very high and volatile in the 1910–45 period, peaking at 14 percent and reflecting two World Wars and a Great Depression that was global in scope. It was high, though not as high, during the 1970s and early 1980s, and then fell steadily until the most recent financial crisis.

An intriguing finding regarding macroeconomic announcements suggests the importance of disaster risk. Over half of the equity premium — the excess return on equities relative to safe assets such as Treasury bills — is realized on days of scheduled macroeconomic announcements. Yet these days do not exhibit greater stock market volatility. Yicheng Zhu and I show that this finding is hard to reconcile with rational expectations unless there is a small chance that investors will learn very bad news about the macroeconomy on such days.<sup>4</sup> That is, part of what macroeconomic announcements communicate is the susceptibility of the economy to economic disaster.

### Other Asset Classes

For further evidence of the role of rare disasters in asset markets, one can look to options data.

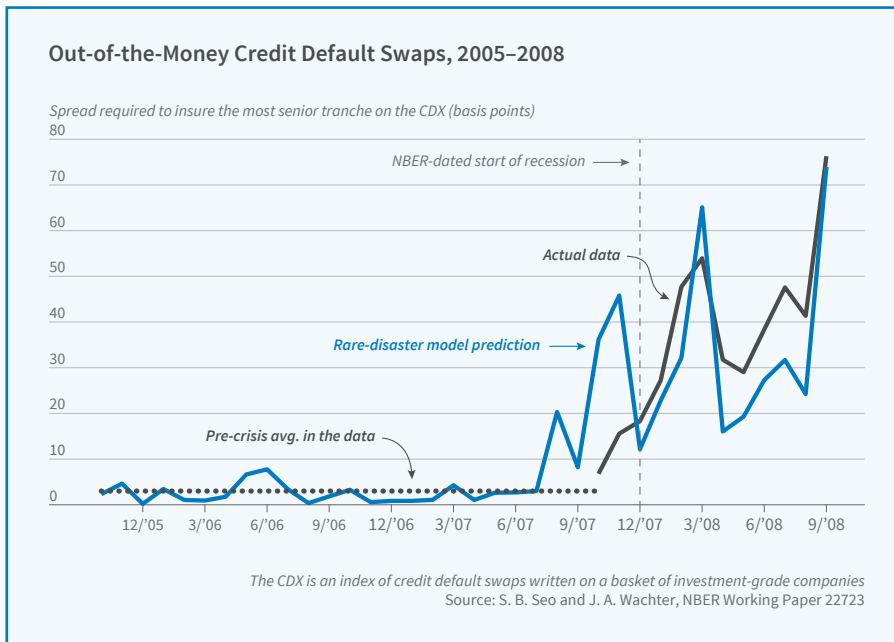
A put option on



**Figure 1**

a stock index gives the holder the right to sell a basket of stocks for a fixed value known as the strike price. Put options are therefore insurance against a decline in the stock market. Prices of put options, particularly “out-of-the-money” options for which the strike is low relative to the current index value, are an important place to look for the probabilities market participants place on rare disasters.

out-of-the-money ones? The rare-disaster framework offers a unified explanation of this puzzle and the behavior of the aggregate stock market. Sang Byung Seo and I show that the same rare-disaster-based model that accounts for aggregate stock market behavior also explains put prices.<sup>5</sup> Puts are expensive because investors place a non-trivial probability on stock market crashes that have systemic consequences.



**Figure 2**

What about the most extreme rare events? Prior to the crisis, one could look for the probabilities of such events in the prices of the senior tranches on the CDX, an index of credit default swaps written on a basket of investment-grade companies. Figure 2 shows the time series of spreads required to insure the most senior tranche on the CDX. Prior to 2007, the spread was essentially zero. In early 2008, by contrast, investors were willing



to pay close to \$1 to insure \$100 of a portfolio consisting of large, investment-grade firms. For the tranche to be affected, roughly 40 percent of these firms would need to go into default. Could these prices possibly be rational? A rare-disaster model, because it allows for equilibrium pricing, can speak to prices across asset classes. Indeed, Seo and I show that a rare-disaster model fitted to the time series of option prices can also explain the behavior of the CDX tranche spreads.<sup>6</sup> These prices can be reconciled with rational expectations provided that investors anticipated an increased probability of a second Great Depression in 2007–08.

## Rare Disasters, Unemployment, and Investment

A longstanding puzzle in macroeconomics concerns the volatility and cyclical patterns in unemployment. Unemployment is negatively correlated with vacancies and uncorrelated with labor market productivity, contrary to the prediction of standard models.<sup>7</sup> However, it strongly correlates with the stock market. To explain these facts, Mete Kilic and I build a model in which firms invest in finding workers.<sup>8</sup> Firm owners base their decision to invest in workers on forecasts of labor productivity—productivity that will be disrupted in the case of a rare disaster. During periods of elevated disaster risk, the stock market declines, and firms cease to invest in hiring. The model thus explains how fears of a financial crisis or depression could lead to sharply increased unemployment, even as productivity remains high. It also explains why unemployment strongly correlates with the stock market.

Disaster fears can also explain corporate issuance and repayment patterns. João F. Gomes, Marco Grotteria, and I revisit the empirical finding that relative quality of bond issuance predicts future bond excess returns: when this quality is low, future bond returns are also predictably low.<sup>9</sup> This find-

ing is puzzling: if low bond returns are predicted, why don't investors shun bond markets, and why doesn't issuance dry up? We show first that variance in issuer quality is driven by the quality of firms repaying their debt. This suggests an investment-based explanation, and indeed the data appear to be driven by investment rather than bond issuance per se. If some firms are more exposed to rare disasters than others, then these firms will cease investing and repay their debt when disaster risk is highest. It follows that high disaster-risk periods are times when the riskiest firms repay debt. Net issuer quality appears high in these periods because repaying firms are the riskiest firms. At the same time, future bond returns are high—an equilibrium result because investors require higher returns to compensate for the elevated risk.

A second credit-market puzzle is that sharp run-ups in consumer debt predict financial crises. Gomes, Grotteria, and I show that this too can be understood in terms of value-maximizing behavior of financial institutions.<sup>10</sup> When disaster probabilities are high, the continuation value for the financial institution is low. In the absence of moral hazard, this would lead the firm to reduce investments, as in the foregoing discussion. Yet moral hazard, due to an explicit or implicit government guarantee, adds an important wrinkle. The loss of franchise value in a rescue deters institutions from inefficient investment. When the risk of a rare event diminishes franchise value, this deterrent also diminishes. Engaging in risky lending, paradoxically, protects equity holders at the expense of depositors. We show that such a model can account for the observed connection between risky household credit and financial crises.

## Conclusion

Ignoring rare events in asset pricing may be just as much of a mistake as ignoring risk itself. Indeed, the risk associated with small probabili-

ties of large shocks can often dominate other, more-standard sources of risk. A short perusal of any newspaper shows that rare events are an important part of what average investors think about. The fact that asset valuation combines expectations, risk, and covariance implies that rare macroeconomic outcomes cannot but be important for asset prices.

Because rare events are difficult to learn about, particularly if their probabilities are non-constant, much work remains to be done in understanding the dynamics of these rare-event beliefs. Are these beliefs consistent with rational Bayesian updating? How do we think about rare-event beliefs in an economy with a wider range of outcomes than even the richest of models that we can create? These are interesting questions for future research.

---

<sup>1</sup> “The Dividend-Price Ratio and Expectations of Future Dividends and Discount Factors,” Campbell J, Shiller R. NBER Working Paper 2100, December 1986, and *The Review of Financial Studies* 1(3), Fall 1988, pp. 195–228.  
[Return to Text](#)

<sup>2</sup> “Can Time-Varying Risk of Rare Disasters Explain Aggregate Stock Market Volatility?” Wachter J. NBER Working Paper 14386, October 2008, revised March 2012, and *The Journal of Finance* 68(3), 2013, pp. 987–1035.  
[Return to Text](#)

<sup>3</sup> The model is calibrated to international consumption and GDP data; see “Macroeconomic Crises since 1870,” Ursua J, Barro R. NBER Working Paper 13940, April 2008, and *Brookings Papers on Economic Activity*, 39(1), Spring 2008, pp. 255–350.  
[Return to Text](#)

<sup>4</sup> “The Macroeconomic Announcement Premium,” Wachter J, Zhu Y. NBER Working Paper 24432, March 2018.  
[Return to Text](#)

<sup>5</sup> “Option Prices in a Model with Stochastic Disaster Risk,” Seo S, Wachter J. NBER Working Paper 19611, November 2013, revised August 2015,

and *Management Science* 65(8), August 2019, pp. 3449–3469.

[Return to Text](#)

<sup>6</sup> “Do Rare Events Explain CDX Tranche Spreads?” Seo S, Wachter J. NBER Working Paper 22723, October 2016, and *The Journal of Finance* 73(5), October 2018, pp. 2343–2383.

[Return to Text](#)

<sup>7</sup> “The Cyclical Behavior of Equilibrium Unemployment and Vacancies,” Shimer R. *American Economic Review* 95(1), March 2005,

pp. 25–49.

[Return to Text](#)

<sup>8</sup> “Risk, Unemployment, and the Stock Market: A Rare-Event-Based Explanation of Labor Market Volatility,” Kilic M, Wachter J. NBER Working Paper 21575, September 2015, revised May 2016, and *The Review of Financial Studies* 31(12), December 2018, pp. 4762–4814.

[Return to Text](#)

<sup>9</sup> “Cyclical Dispersion in Expected Defaults,” Gomes J, Grotteria M, Wachter J. NBER Working Paper

23704, August 2017, and *The Review of Financial Studies* 32(4), April 2019, pp. 1275–1308. For related findings, see: “Issuer Quality and Bond Returns,” Greenwood R, Hanson S. *The Review of Financial Studies* 26(6), June 2013, pp. 1483–1525.

[Return to Text](#)

<sup>10</sup> “Foreseen Risks,” Gomes J, Grotteria M, Wachter J. NBER Working Paper 25277, November 2018, revised July 2019.

[Return to Text](#)

# The Impact of Land Institutions and Misallocation on Agricultural Productivity

Diego Restuccia

Differences in agricultural systems are highly relevant to the large income differences between rich and poor countries. There are two complementary reasons for this: poor countries are much less productive in agriculture than in the rest of the economy when compared with rich countries, and poor countries allocate most of their labor to agriculture. Whereas in rich countries less than 5 percent of the labor force works in agriculture, more than 70 percent is employed there in poor countries. At the same time, the disparity between rich and poor countries in real labor productivity is more than 35-fold in agriculture, while less than fivefold in non-agricultural sectors.<sup>1</sup>

Because low productivity constrains more labor to be engaged in agriculture in order to meet subsistence food constraints, the key question is: what are the fundamental reasons for low productivity in agriculture in poor countries? Since measured factor inputs, such as land endowments or quality, physical capital, and intermediates, among others, do not account for much of the productivity disparity across countries, the challenge is to determine what other factors may be relevant.<sup>2</sup>

An important development in the macroeconomics literature has been the recognition that production takes place among heterogeneous produc-

tion units and that resource misallocation across these units can matter for aggregate outcomes.<sup>3</sup> This insight has given relevance to many policies and institutions that affect resource allocation even if their influence cannot be detected from aggregate data. Consider, for instance, a regulation that on paper applies to all establishments but is effectively only enforced on large, more-productive producers, creating idiosyncratic effects across producers and hence misallocation; or the level of financial development that is common to all producers but may

production systems; they include subsidized credit and intermediate inputs directed toward small or poor farm households. As a result, a symptom of low productivity in agriculture in poor countries is the prevalence of small-scale farming. Figure 1 shows the striking differences in average farm size between rich and poor countries.

## Evidence of Misallocation

Is there evidence of misallocation in agriculture in poor and developing countries, and if so does it matter? To interpret the evidence from farm-level data, consider the situation in which a homogeneous agricultural good is produced by a set of heterogeneous farms that differ in their total factor productivity (TFP). Farm production features decreasing returns to variable inputs such as land, capital, labor, and intermediates. As a result, it would not be optimal to allocate all inputs to the most productive farm. This simple structure generates a non-degenerate farm-size distribu-

tion based on productivity differences. In the absence of any market imperfections or distortions, aggregate output and productivity are maximized when factors of production are allocated in proportion to farm productivity; that is, more productive farms are larger and farms of the same productivity oper-

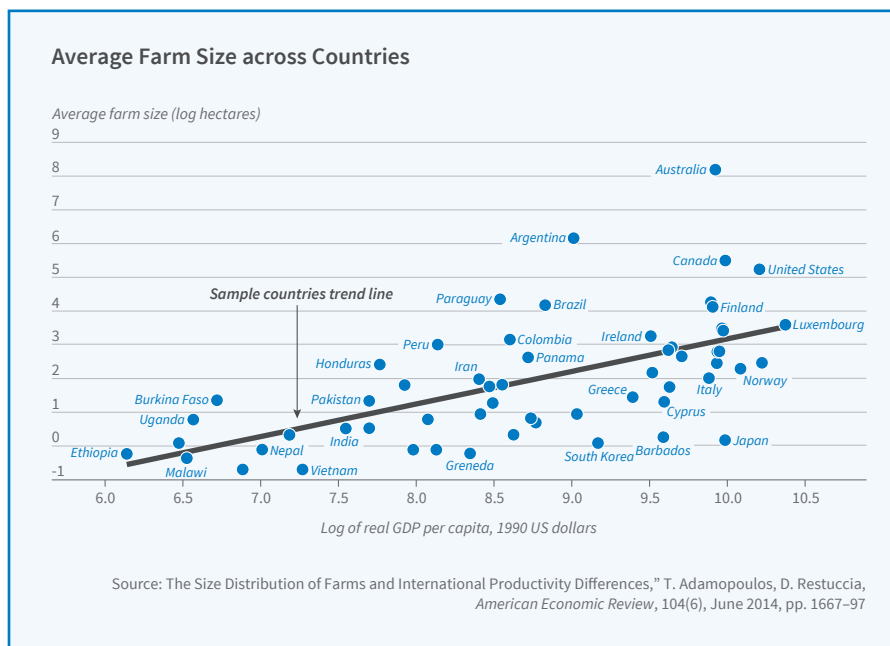


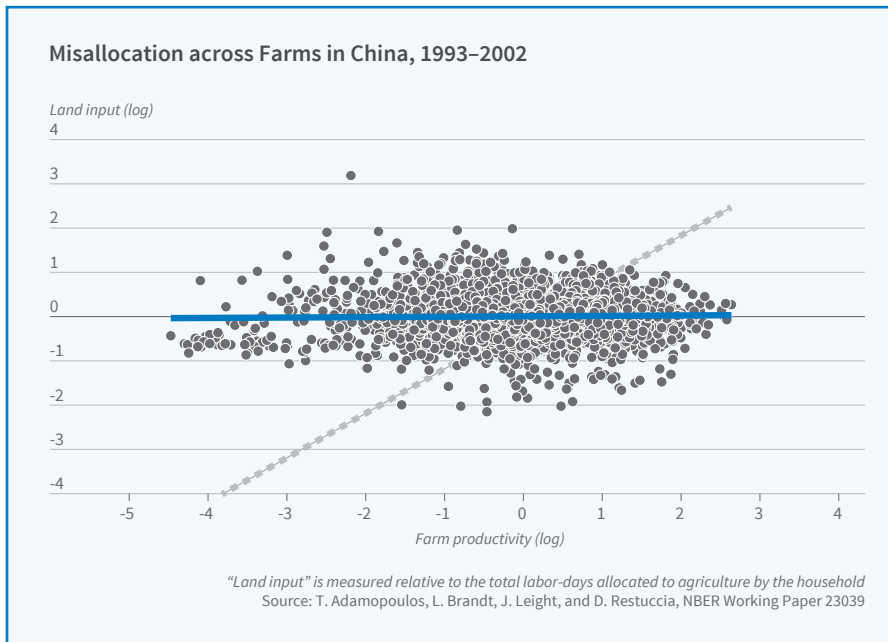
Figure 1

effectively constrain more-productive producers who want to expand.

There is ample evidence that policies and institutions that have idiosyncratic effects across producers are prevalent in the agricultural sector in poor and developing countries.<sup>4</sup> Many of these policies tend to favor smallholder

ate at the same scale. Importantly, any deviation from this allocation would lower agricultural productivity, even if allocating more resources to farms with higher productivity. A key insight is that a weak correlation of farm inputs and farm productivity is indicative of misallocation.

Measuring farm TFP requires detailed microdata and is subject to several relevant measurement issues. Fortunately, high-quality microdata are available for many poor and developing countries. One such data source for many countries in Africa is the Living Standards Management Study-Integrated Survey of Agriculture (LSMS-ISA), developed by the Gates Foundation and collected by the World Bank. Households are asked about all their agricultural outputs and inputs into farm production, with detailed information about the land operated by the household, including in some cases land quality characteristics.



**Figure 2**

Using these data, farm-level productivity can be estimated or measured using a specific production function.<sup>5</sup>

Despite differences in institutional detail and data quality, the overwhelming finding is that in poor and developing countries, farm inputs are not strongly associated with farm productivity. In most cases there is no systematic relationship between farmland input and farm productivity, contrary to the strong association that arises in

an efficient allocation and in observed allocations in developed countries.

Consider for instance the allocation of land in farms in China, as documented in Figure 2. Whereas an efficient allocation would require a strong association between farm TFP and land input (as illustrated by the light grey line), the actual allocation of land in farms in China (dots) is, on average, essentially flat with respect to productivity

(dark blue line). In this specific context, if land and other complementary inputs were reallocated to best uses, agricultural productivity could increase by 24 percent within villages and up to 53 percent if resources could also be reallocated across villages.<sup>6</sup> These are large productivity increases just from static reallocation. The same pattern of land misallocation arises in many other countries, such as Malawi, Ethiopia, Uganda, and others.



**Diego Restuccia** is a professor of economics and a Canada Research Chair in Macroeconomics and Productivity at the University of Toronto. He is a research associate in the NBER's Economic Fluctuations and Growth Program and a research director in the Macroeconomic Development group at the Research Institute for Development, Growth, and Economics. He serves on the advisory committee of the Trade, Integration, and Growth Network of the Latin American and Caribbean Economic Association and as an editor of the *Review of Economic Dynamics*. He is also a Fellow at the Bank of Canada.

Restuccia's research interests lie at the intersection of macroeconomics, development, and labor economics. His recent work focuses on macroeconomic growth and development, in particular the role of resource allocation across firms or sectors in accounting for aggregate outcomes. More broadly, his work has emphasized the impact of productivity in structural transformation across countries, the contribution of misallocation to differences in establishment size across sectors and countries, and the role of human capital in a variety of contexts, including cross-country development, the intergenerational transmission of economic status and inequality, and gender differences in employment and wages. His work has appeared in leading economic journals.

He received a PhD and MA in economics from the University of Minnesota and an undergraduate degree from Universidad Católica Andrés Bello in Caracas, Venezuela. He was born in Montevideo, Uruguay and grew up in Caracas. He lives in Toronto with his wife and son.

## Connecting Misallocation with Land Institutions

The finding of substantial land misallocation should not be surprising, given the institutional context in which land allocations take place in many poor and developing countries. Consider for example the prevalent form of land rights in Africa — communal land rights — where ownership resides with the state or the commune, and rural households are allocated land-use rights on a fairly egalitarian basis. This is the case in Malawi and Ethiopia. Or consider the allocation of land under the household responsibility system in China — a component of the *hukou* system — where households are allocated land-use rights by village officials to provide an equitable distribution of land among households in the village. Even though rentals of land are not prohibited in China, frequent land reallocations to accommodate changes in demographics have likely contributed to the implicit “use-it-or-lose-it” rules that have prevented any substantial rental activity to disassociate the distribution of use rights from farm operational scales.

A direct approach to assessing the role of misallocation arising from restrictive land institutions is to study how variations in these institutions over time and space have affected agricultural productivity. Tasso Adamopoulos and I study a comprehensive land reform in the Philippines that imposed a maximum farm-size ceiling and redistributed excess land to the landless and smallholders.<sup>7</sup> This land reform substantially reduced both average farm size and agricultural productivity. Most of the negative productivity effects arise because of the gov-

ernment’s intervention in the redistribution of above-ceiling lands. A market reallocation would have generated only one-third as large a productivity loss. Lax enforcement of the farm ceiling prevented the productivity losses from being substantially larger.

Another reform case comes from Ethiopia, where land is owned by the state and land sales are prohibited by law. Ethiopia implemented an ambitious land-certification program of use rights intended to provide stronger tenure secu-

productivity at the production unit level. There are important reasons to be concerned with measurement issues, which are likely to be present in survey data, but the key question is whether these issues alter the big picture of misallocation that emerges. I argue that it does not. In all the studies mentioned above, the unit of analysis is the farm household and not an individual plot operated by a household. In agriculture this distinction is important, since it is common for households in the developing world to

operate several plots of land. In Ethiopia, for example, households operate seven plots on average. The farm is the relevant unit of analysis in this context for two reasons. First, measuring productivity at the plot level is challenging because some inputs are shared across plots, inputs and output measures may be subject to measurement and reporting errors, and reported output may depend on shocks that are difficult to control in survey data, to list just a few issues. Aggregating all

plot level data to the farm level can mitigate these potential measurement issues. Second, the institutional allocation of land is based on farm households.

The distinction between the plot and the farm matters for assessing the cost of misallocation but not for the pattern of misallocation that emerges. Consider, for example, the microdata from Ethiopia. Dispersion in productivity and distortions are both much higher at the plot than at the farm level, implying reallocation gains that are almost four times larger at the plot than at the farm level. But while the cost of misallocation varies, in both cases there is hardly any association of land input with farm TFP. This is shown in Figure 3; it is precisely the evidence of misallocation discussed earlier.

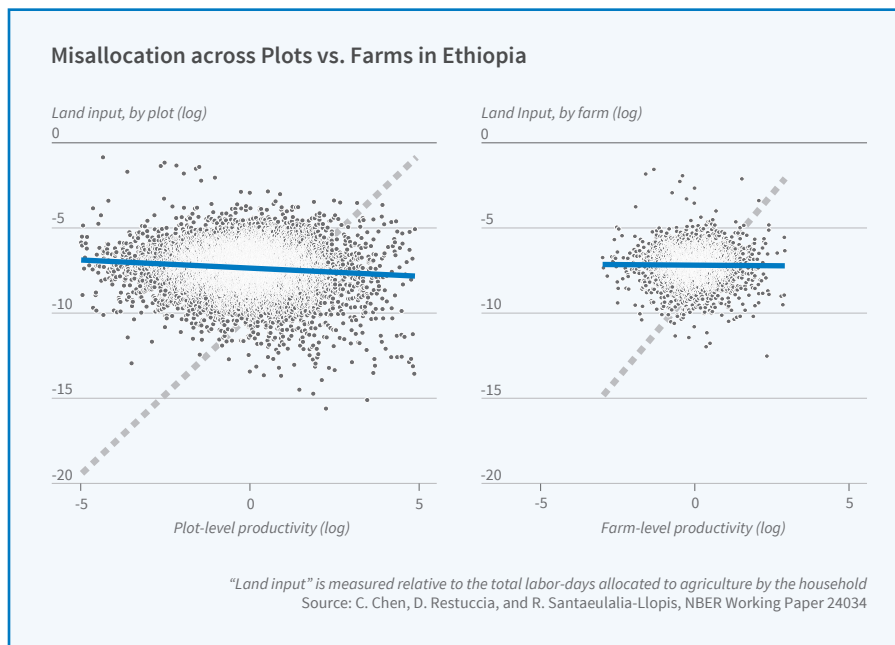


Figure 3

rity to farmers. The program, however, has to various degrees allowed land rentals to separate assigned land rights from land use. The reform was decentralized across regions with different timing, creating relevant variation in land rental activity across space and time. This context permits studying the effects of land rentals on misallocation and productivity.<sup>8</sup> The overwhelming finding both empirically and through a quantitative model is that increased land rental market activity has a significant positive effect on agricultural productivity.

## Relevance of Measurement Error and Other Issues

Quantifying the effects of misallocation in agriculture relies on measures of

The distinction between the plot and the farm is also relevant when comparing with measurement error in other sectors. A plant in the manufacturing sector compares more closely with a plot in the agricultural sector, with the distinction that most businesses operate a single plant. Plant-level data can exhibit substantial measurement error.<sup>9</sup> Instead, farm-level data from China indicate a much smaller degree of measurement error.

### Misallocation and the Inverse Farm Size-Productivity Relationship

A negative relationship between farm size and land productivity or yield is a well-established empirical fact in development economics. There are at least two possible interpretations of this fact. The conventional interpretation is that small farms are more productive than large farms and, hence, efficiency and food availability would be enhanced by redistributing factors toward small-scale farming. This interpretation has had an enormous influence on development policy.

Another interpretation is that differences in land productivity reflect in part misallocation. Detailed farm-level data from Uganda indicate that while farm size is negatively related to land productivity, consistent with the empirical fact, it is positively related to estimated farm TFP.<sup>10</sup> The negative size-yield relationship becomes positive when accounting for misallocation and key features of the farm production function. The role of misallocation can also be assessed by comparing regions in Uganda with sharply different land tenure regimes: the customary land tenure regime based on communal land in the north/east region and the more modern non-customary land tenure regime in the central/west region. Misallocation is higher and there is a stronger negative size-yield relationship under communal land allocation.

More generally, how useful is the inverse farm size-productivity relationship? In the case of Uganda and other poor and developing countries, there is as much dispersion in farm productivity within a farm-size class as across the

entire distribution of farms. As a result, because of distortions in the agricultural sector in poor countries, farm size is not a useful instrument for policy implementation. An important general insight of the misallocation literature is that distortions deeply confound the relationship between establishment size and productivity.

### Broader Implications

The misallocation approach generates several broad implications. For instance, it is often argued that an egalitarian distribution of land rights is effective at redistributing income. However, the evidence is that the inability of households to reallocate land-use rights sustains large income inequality, since the return to land reflects differential farming ability. An alternative allocation of resources can achieve substantial gains in agricultural productivity and at the same time reduce inequality. Another implication is that restrictive land markets tend to disproportionately affect the more able farmers, who would like to expand or choose instead to work outside agriculture. These effects can further reduce agricultural productivity by disincentivizing the use and adoption of modern technologies in agriculture and by distorting occupational selection. Secure land rights are not sufficient to generate a better allocation of resources and growth if land cannot be reallocated across households, potentially explaining the failure of many reforms emphasizing only secure rights.

---

<sup>1</sup> “Agriculture and Aggregate Productivity: A Quantitative Cross-Country Analysis,” Restuccia D, Yang D, Zhu X. *Journal of Monetary Economics* 55(2), March 2008, pp. 234–250.  
[Return to Text](#)

<sup>2</sup> “Geography and Agricultural Productivity: Cross-Country Evidence from Micro Plot-Level Data,” Adamopoulos T, Restuccia D. NBER Working Paper 24532, April 2018.  
[Return to Text](#)

<sup>3</sup> “Policy Distortions and Aggregate Productivity with Heterogeneous

Establishments,” Restuccia D, Rogerson R. NBER Working Paper 13018, April 2007, and *Review of Economic Dynamics* 11(4), pp. 707–720; “The Causes and Costs of Misallocation,” Restuccia D, Rogerson R. NBER Working Paper 23422, May 2017, and *Journal of Economic Perspectives* 31(3), Summer 2017, pp. 151–174.

[Return to Text](#)

<sup>4</sup> “The Size Distribution of Farms and International Productivity Differences,” Adamopoulos T, Restuccia D. *American Economic Review* 104(6), June 2014, pp. 1667–1697.

[Return to Text](#)

<sup>5</sup> “Land Misallocation and Productivity,” Restuccia D, Santaaulalia-Llopis R. NBER Working Paper 23128, February 2017.

[Return to Text](#)

<sup>6</sup> “Misallocation, Selection, and Productivity: A Quantitative Analysis with Panel Data from China,” Adamopoulos T, Brandt L, Leight J, Restuccia D. NBER Working Paper 23039, January 2017, revised January 2020.

[Return to Text](#)

<sup>7</sup> “Land Reform and Productivity: A Quantitative Analysis with Micro Data,” Adamopoulos T, Restuccia D. NBER Working Paper 25780, April 2019, and *American Economic Journal: Macroeconomics*, forthcoming.

[Return to Text](#)

<sup>8</sup> “The Effects of Land Markets on Resource Allocation and Agricultural Productivity,” Chen C, Restuccia D, Santaaulalia-Llopis R. NBER Working Paper 24034, November 2017, revised March 2020.

[Return to Text](#)

<sup>9</sup> “Misallocation or Mismeasurement?” Bills M, Klenow P, Ruane C. NBER Working Paper 26711, January 2020.

[Return to Text](#)

<sup>10</sup> “Are Small Farms Really More Productive than Large Farms?” Aragon Sanchez F, Restuccia D, Rud J. NBER Working Paper 26331, September 2019.

[Return to Text](#)

# Firm-Level Risks, Lifetime Earnings Uncertainty, and Household Savings

Luigi Pistaferri

In the workhorse competitive labor market model used by economists, knowing whom we work for is irrelevant for understanding the sources of wage risk and wage inequality. Workers carry the risk of shocks to their productivity wherever they work, and they bear it fully.

But imperfections in the labor, credit, and insurance markets weaken this extreme view. Job search costs on the two sides of the labor market, as well as the presence of non-monetary components that workers or firms value, such as job amenities or employee loyalty, imply rents from the employment relationship. Wages deviate from marginal productivity and become dependent on firm characteristics, such as profits, value added, or other measures of performance. Alternatively, asymmetries in access to credit or insurance may lead to the establishment of long-term employment relationships in which firms partially insure workers' wages against productivity risks, with the transmission of firm shocks onto wages becoming a function of differences in risk tolerance

as well as limits on the feasible set of contracts, such as workers' inability to make some types of commitments.

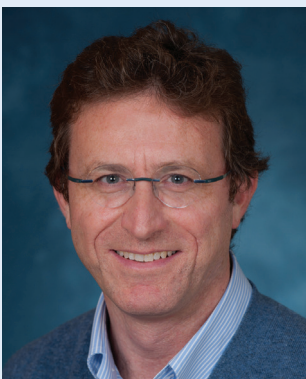
A growing literature in labor economics has thus tried to quantify the role of the firm in explaining the structure and evolution of wages, the types of risks that individuals face over the life cycle, how individuals respond to these risks, and important welfare and policy questions. This summary describes some of my recent work on these issues.

## Measuring Shocks and Pass-Through

Measuring the linkages between wages and firm performance is challenging due to various confounding factors, such as aggregate, geographic, or industry shocks that alter workers' outside options rather than the rents from the employment relationship. Recent work has tackled these challenges using administrative employer-employee data with detailed information on both wages and firm performance. A strand of the empirical lit-

erature started by John Abowd, Francis Kramarz, and David Margolis documents systematic firm effects on wages and a positive correlation between firm and worker fixed effects consistent with production complementarities arising from assortative matching of highly productive workers and highly productive firms.<sup>1</sup>

A related literature studies the pass-through of firm-related shocks onto wages. An early example of the pass-through literature using employer-employee data is my paper with Luigi Guiso and Fabiano Schivardi, which analyzes worker social security and firm balance sheet records from Italy.<sup>2</sup> One challenge, common to the entire literature, is how to measure firm shocks. We use unexplained variation in value added, which we argue is a sensible metric of firm performance as it measures the volume of contractible output that remains once intermediate inputs have been remunerated. An important novelty of our work is the distinction between permanent and transitory firm shocks, which in principle may help separate rent sharing from partial insur-



Luigi Pistaferri is a professor of economics at Stanford University and the Ralph Landau Senior Fellow at the Stanford Institute for Economic and Policy Research. Pistaferri has studied various topics in labor, macro, and public economics, encompassing the measurement of labor market risks (including firm-level risks) and the implications for household consumption and savings, the importance of return heterogeneity for wealth inequality, the welfare implications of screening errors in disability insurance programs, and the link between partial insurance and consumption inequality. He is a research associate in the NBER's Economic Fluctuations and Growth and Labor Studies programs.

Pistaferri has served as coeditor of the *American Economic Review* and is a member of the Panel Study of Income Dynamics Board of Overseers and a Fellow of the Econometric Society. In 2018–19 he was the Modigliani Visiting Professor at the University of Naples and in 2011–12 he held the Bajola Parisani Visiting Chair in Economics and Institutions at the Einaudi Institute for Economics and Finance in Rome.

Pistaferri's research has been funded by the National Science Foundation, the National Institutes of Health, the European Research Council, the Research Council of Norway, and the Washington Center for Equitable Growth. He is the author with Tullio Jappelli of the book *The Economics of Consumption*.

Pistaferri did his undergraduate studies in Italy (IUN Naples and Bocconi Milan), received a PhD in economics from University College London, and joined the Stanford faculty in 1999.

ance interpretations of the pass-through coefficient. A key finding is that wages appear insulated from transitory shocks but respond, albeit partially, to permanent changes in the firm's fortunes. One explanation is that diversified access to insurance or credit markets allows firms to absorb transitory shocks, but bankruptcy constraints prevent full insurance of permanent shocks, requiring wages to adjust. We also find that the estimated pass-through effect is larger for workers with greater responsibilities in the firm, such as high-level executives, and for firms with lower performance variance. Remarkably, these qualitative findings have been replicated for several other countries, including the United States.<sup>3</sup> Recent studies have departed from a pure statistical methodology of measuring firm shocks and searched instead for quasi experiments in which the firm faces exogenous shifts in its fortunes, such as a product market or technology shock. For instance, Patrick Kline, Neviana Petkova, Heidi Williams, and Owen Zidar measure firm shocks with the allowance of patent applications by US firms.<sup>4</sup>

### Implications for Lifetime Risk

Two implications of the foregoing evidence are that firm risk may represent a significant component of the lifetime uncertainty faced by workers, and that firm-induced wage risk can help us understand how consumers respond to uncertainty shocks. A positive pass-through means that workers partake of the bad as well as the good fortunes of the firm. Under standard assumptions about preferences, workers are more willing to pay to avoid bad states of nature than to increase the chance of good ones. Guiso, Schivardi, and I calculated that firm-related shocks could explain about half of the workers' permanent unexplained wage risk, which is more welfare-relevant than transitory wage risk. A limitation of this calculation is that it is based on a sample of job stayers, which may understate the role of firm shocks, since part of the adjustment may come from job-to-job switches or movements across employment states. Wage risk and employment risk indeed go hand in hand, as emphasized in the literature on the persistent wage scarring effects of job displacement.

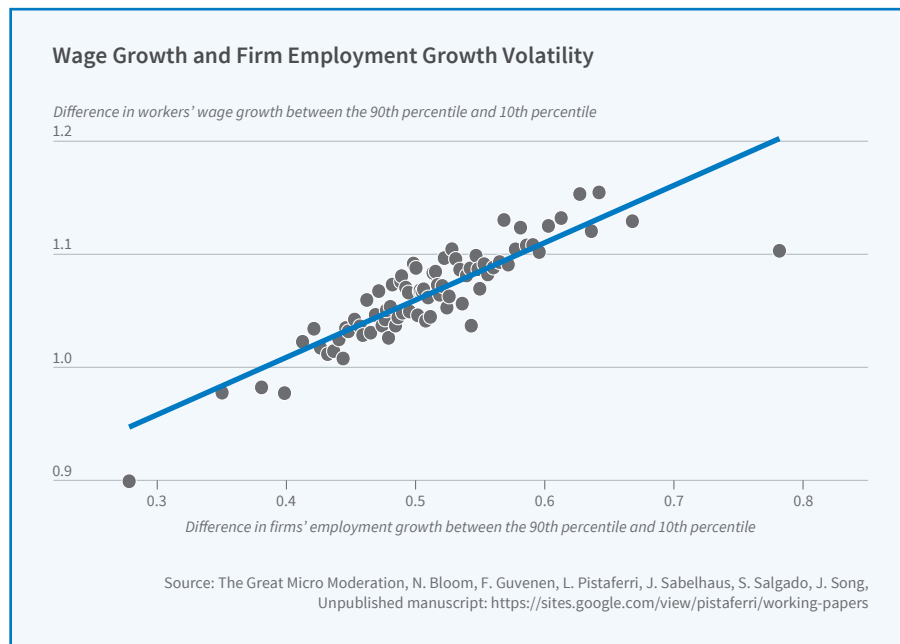
Benjamin Friedrich, Lisa Laun, Costas Meghir, and I use administrative data from Sweden to account for the effect of firm-specific shocks on both wages and labor market transitions.<sup>5</sup> We calculate that by age 55 about 40 percent of the cross-sectional variance in wages of high-skill workers is attributable to firm-level shocks. For unskilled workers this is only about 6 percent, a finding potentially consistent with union protection — an important institutional feature of the Swedish labor market — being more important for them.

To better understand the implications of our findings, we simulate our model of counterfactual scenarios in which we change the nature of wage variability over the life cycle of a worker. In one scenario, we eliminate any pass-through of firm shocks onto wages but keep match effects such as those attributable to production complementarities across workers. In another scenario, we shut down all

firm effects. We find that the variance of wages over the life cycle declines substantially when eliminating firm shocks, but less so when only match productivity shocks are eliminated.

Given that the impact of firm shocks on earnings can be attenuated through job mobility, in another counterfactual experiment we eliminate job-to-job moves or quits into unemployment. If workers cannot move or quit, shocks stay with them longer and cannot be avoided, resulting in higher variances over the life cycle. This is mostly due to pass-through of firm-specific shocks. Hence, workers' mobility represents an implicit form of insurance against the transmission of firm-specific risk. This insurance is imperfect, however, since mobility is significantly limited by job market frictions.

A decrease in the frequency of job-to-job moves has been shown to indicate declining labor market fluidity and firm-level employment volatility.<sup>6</sup> Nicholas Bloom, Fatih Guvenen, John Sabelhaus, Sergio Salgado, Jae Song and I use administrative US Social



**Figure 1**

Security data to document that the “Great Moderation”—the period of reduced economic volatility between the mid-1980s and the onset of the Great Recession observed at the firm and macro levels—extends to workers' wages as well, contradicting earlier evidence from survey data.<sup>7</sup> We show that declining wage volatility can be reconciled with the well-known finding of increasing wage inequality because of a strong simultaneous decline in mobility across the wage distribution. We also find that the two “micro” forms of moderation appear related, consistent with a pass-through of firm-related shocks onto wages. Figure 1 shows the relationship between wage growth volatility and firm employment growth volatility, measured by the 90–10 percentile difference, in data aggregated at the industry/year level. These findings are confirmed when looking at firm-level variation, which allows us to control more convincingly for sorting of high-risk workers into high-risk firms, and hence to better assess the causality of the relationship.



## Implications for Saving Behavior

Andreas Fagereng, Guiso, and I go beyond the question of how much firm shocks matter for wages and analyze the implications of these shocks for household finance. In particular, we study how firm-induced wage risk, which is outside the control of the worker, affects wealth accumulation and financial portfolio composition. In a first study, we use Norwegian administrative data to test whether consumers respond to the increased wage risk that is induced by a decline in the firm's fortunes by accumulating precautionary savings.<sup>8</sup> Our estimates are consistent with the presence of a moderate degree of prudence, even in a setting, like Norway, where the government provides substantial social insurance. This is because wage risk, unlike unemployment risk, remains largely uninsured. In a second study, we test whether households tilt their portfolio away from risky assets when facing greater human capital risk because they work for a particular employer.<sup>9</sup> We document that the effects of background risk are heterogeneous across the wealth distribution. This heterogeneity comes from two sources: a pass-through channel, whereby the effect of firm shocks is larger for wealthier workers, either because they have a greater ability to self-insure and hence demand less insurance from the firm, or because they have greater bargaining power when splitting rents from the employment relationship; and a background risk channel whereby wealthier workers are less sensitive at the margin to an increase in background risk. We conclude that background risk is an important determinant of portfolio allocations, and that it discourages stockholding significantly only for those at the bottom of the wealth distribution. For those at the top it has negligible effects. This has an important implication for asset prices: because most stocks are held by the wealthy, background risk has little effect on aggregate demand for stocks, and thus on stock returns.

## Future Directions

There is convincing and relatively uncontroversial evidence that idiosyncratic firm shocks transmit onto wages. The evidence is consistent with several theoretical explanations, and more research on which one best fits the data would certainly be useful. More research could also be directed at studying how firm-related risk affects other important household finance decisions, such as why households hold very heterogeneous risky portfolios, contrary to the predictions of standard models such as the Capital Asset Pricing Model. One prominent explanation is hedging of human capital risk, which significantly depends on firm-induced risk. The long-term nature of the employer-employee relationship also implies repeated interactions among workers employed at the same firm. Giacomo De Giorgi, Anders Frederiksen, and I studied consumption network effects using firm shocks as a source of exogenous varia-

tion in peers' consumption.<sup>10</sup> In principle, the firm may also facilitate coworkers' insurance exchanges with respect to specific wage and consumption shocks, although the empirical relevance of this activity is yet to be established.

---

<sup>1</sup> "High Wage Workers and High Wage Firms," Abowd JM, Kramarz F, Margolis DN. NBER Working Paper 4917, November 1994, and *Econometrica* 67(2), March 1999, pp. 251–333.

[Return to Text](#)

<sup>2</sup> "Insurance within the Firm," Guiso L, Pistaferri L, Schivardi F. *Journal of Political Economy* 113(5), October 2005, pp. 1054–1087.

[Return to Text](#)

<sup>3</sup> One example of such a study is "Imperfect Competition, Compensating Differentials and Rent Sharing in the US Labor Market," Lamadon T, Mogstad M, Setzler B. NBER Working Paper 25954, June 2019.

[Return to Text](#)

<sup>4</sup> "Who Profits from Patents? Rent-Sharing at Innovative Firms," Kline P, Petkova N, Williams H, Zidar O. NBER Working Paper 25245, revised March 2019, and *Quarterly Journal of Economics* 134(3), August 2019, pp. 1343–1404.

[Return to Text](#)

<sup>5</sup> "Earnings Dynamics and Firm-Level Shocks," Friedrich B, Laun L, Meghir C, Pistaferri L. NBER Working Paper 25786, April 2019.

[Return to Text](#)

<sup>6</sup> "Labor Market Fluidity and Economic Performance," Davis S, Haltiwanger J. NBER Working Paper 20479, September 2014, revised December 2014.

[Return to Text](#)

<sup>7</sup> "The Great Micro Moderation," Bloom N, Guvenen F, Pistaferri L, Sabelhaus J, Salgado S, Song J. Unpublished manuscript, [sites.google.com/view/pistaferri/working-papers](https://sites.google.com/view/pistaferri/working-papers).

[Return to Text](#)

<sup>8</sup> "Firm-Related Risk and Precautionary Saving Response," Fagereng A, Guiso L, Pistaferri L. NBER Working Paper 23182, February 2017, and *American Economic Review* 107(5), May 2017, pp. 393–397.

[Return to Text](#)

<sup>9</sup> "Portfolio Choices, Firm Shocks, and Uninsurable Wage Risk," Fagereng A, Guiso L, Pistaferri L. NBER Working Paper 22883, December 2016, and *Review of Economic Studies* 85(1), January 2018, pp. 437–474.

[Return to Text](#)

<sup>10</sup> "Consumption Network Effects," De Giorgi G, Frederiksen A, Pistaferri L. NBER Working Paper 22357, June 2016, and *Review of Economic Studies* 87(1), January 2020, pp. 130–163.

[Return to Text](#)

# The Benefits of Rehabilitative Incarceration

Gordon B. Dahl and Magne Mogstad

Since the 1980s, incarceration rates have risen substantially in most countries, tripling in the United States and nearly doubling in many European countries. These trends raise important questions about the effectiveness of prisons and how well ex-convicts reintegrate into society.

Time spent in prison can deter offenders from future crime or rehabilitate offenders by providing vocational training or wellness programs. However, incarceration can also lead to recidivism and unemployment due to human capital depreciation, exposure to hardened criminals, or societal and

workplace stigma. Incarceration can also have effects beyond those on the offenders themselves, with spillovers to other family members or the offenders' criminal networks. Importantly, the effects of incarceration may well depend on both prisoner characteristics and prison conditions.

The sharp rise in incarceration, particularly in the United States, occurred shortly after the release of an influential report by the sociologist Robert Martinson.<sup>1</sup> The report examined the existing evidence on prisoner rehabilitation programs and came to the conclusion that “nothing works.” Ensuing

policy discussions gradually led to rehabilitation programs playing a subordinate role to policies emphasizing punishment and incapacitation. While some scholars and policymakers have questioned the “nothing works” doctrine, convincing empirical work on the question remained scarce until recently. As summarized roughly a decade ago, “Remarkably little is known about the effects of imprisonment on reoffending. The existing research is limited in size, in quality, [and] in its insights into why a prison term might be criminogenic or preventative.”<sup>2</sup> We also know little about spillovers to other family



**Gordon B. Dahl** is a research associate in the NBER's Labor Studies Program. He currently is a professor of economics at the University of California, San Diego and began his career at the University of Rochester. He serves as Area Director for Labor Economics for the CESifo Network, and is affiliated with the Norwegian School of Economics, the Institute of Labor Economics (IZA), and the Stanford Center on Poverty and Inequality. He is an associate editor for the *American Economic Review* and *Economic Inquiry*.

Dahl's research interests are in labor economics and applied microeconomics, including a wide set of issues that range from how income affects child achievement, to peer effects among coworkers and family members, to the impact of incarceration on recidivism and employment, to intergenerational links in welfare use. He received a bachelor's degree from Brigham Young University in 1993 and a PhD from Princeton University in 1998.

Gordon and his wife, Katherine, have four daughters, all of whom enjoy the sunshine of San Diego and traveling abroad.

**Magne Mogstad** is the Gary S. Becker Professor in Economics and the College in the Kenneth C. Griffin Department of Economics at the University of Chicago. He also is the director of the Ronzetti Initiative for the Study of Labor Markets at the university's Becker Friedman Institute. His work is motivated by the broad question of how to address market failures and equalize opportunities. Countless policies — taxation, subsidized education, social insurance — have been implemented in an effort to achieve those objectives. A key challenge is to distill each policy's unique impact so that it can be understood which ones actually work and which do not. This challenge motivates Mogstad's work, which aims at providing credible empirical evidence that informs policymakers. This is made possible by combining theory and econometric methods with large administrative datasets that can be linked to supplementary data sources.

Mogstad has published extensively in leading scholarly journals. He is a current coeditor of the *Journal of Political Economy*, and he previously served as a coeditor of the *Journal of Public Economics* and a foreign editor of *The Review of Economic Studies*. He is a recipient of the Alfred P. Sloan Foundation Fellowship and the 2017 IZA Young Labor Economist Award.



members or criminal networks.

The lack of convincing evidence is primarily due to two factors. First, there are few panel datasets that can track offenders both before and after their time in prison. There are even fewer panel datasets that can link the required labor market, crime, family, and criminal network outcomes. Second, there is selection bias in who is sent to prison. The average convict already has a criminal record and a weak attachment to the labor market, and negative shocks such as job loss often precede imprisonment. The fact that incarceration is not random suggests that analyses based on observational data are unlikely to capture causal effects.

In a series of papers with Manu Bhuller and Katrine V. Løken, we overcome these data challenges and the non-randomness of imprisonment, offering new insights into how incarceration affects recidivism, employment, children, and criminal networks.

## The Norwegian Setting

Our work studies the effects of incarceration in Norway, a setting with two key advantages. First, we are able to link several administrative data sources to construct a panel dataset containing complete records of the criminal behavior and labor market outcomes of every Norwegian who has been incarcerated. We can further link this information to other family members, including children and siblings. Moreover, we have information on co-offending that allows us to map out criminal networks for observed crimes.

Second, we can leverage the ran-

dom assignment of criminal cases to judges who differ in their propensities to send defendants to prison. Roughly half of all randomly assigned cases result in imprisonment. But some

the prison system. Norway, like many other European countries, has short spells rather than lengthy sentences, and emphasizes rehabilitation rather than punishment.

In Norway, the average time spent in prison is a little over six months, which is similar to most other Western European countries. This contrasts with average US prison time of almost three years, which is in large part the reason the United States is an outlier in its incarceration rate compared with the rest of the world [Figure 1]. Norway places low-level offenders in open prisons with more freedoms and responsibilities than in US

prisons, and high-level offenders in closed prisons with more security. This provides much more separation between minor and hardened criminals than exists in the United States.

There is no overcrowding in Norwegian prisons and better personal safety, with each prisoner being assigned to their own cell and a higher inmate-to-staff ratio than in the United States. Prisons in Norway also offer well-funded education, drug treatment, mental health, and job training programs. Finally, Norway places an emphasis on helping ex-convicts integrate back into society, with access to social-support services and active labor market programs.

## Recidivism, Employment, and Job Training

Our research on the effects of incarceration on the offender, using the random assignment of judges as an instrument, yields three key findings.<sup>3</sup> First, imprisonment discourages fur-

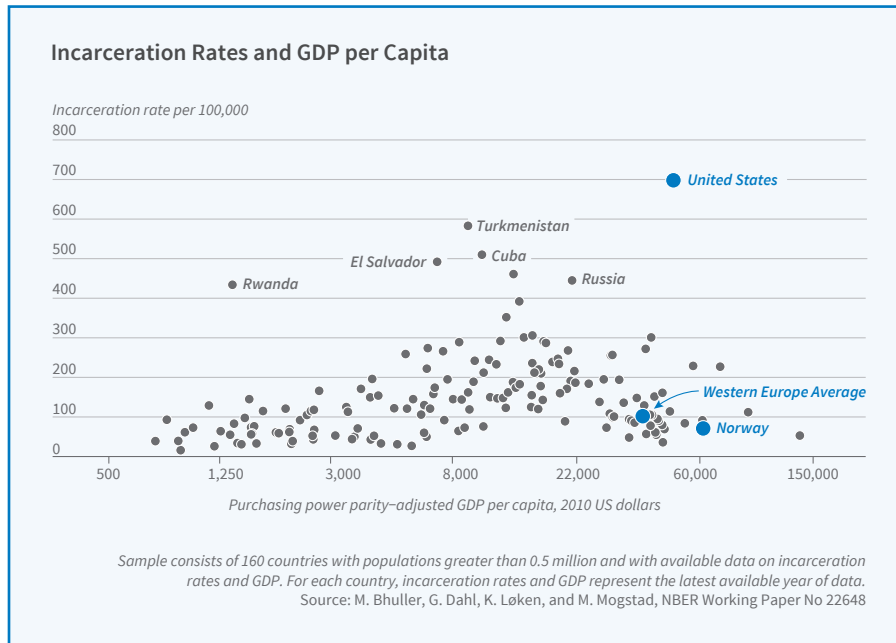


Figure 1

judges send defendants to prison at a high rate, while others are more lenient. We measure a judge's stringency as the average incarceration rate for all other cases a judge handles, after controlling for court and year fixed effects, which is the level of random assignment. This quasi-random assignment of judge stringency can be used as an instrument for incarceration, as it strongly predicts the judge's decision in the current case, but is uncorrelated with other case characteristics both by design and empirically.

In interpreting the findings from our work, it is useful to know how Norway compares with other countries. Characteristics of prisoners, including demographics and crime categories, are broadly similar in Norway and other countries, including the United States, with the exceptions that the US homicide rate is much higher, and race plays a larger role there as well. What stands out as different, especially compared with the United States, is

ther criminal behavior. We find that incarceration lowers the probability that an individual will reoffend within five years by 27 percentage points and reduces the corresponding number of criminal charges per individual by 10 charges. These reductions are not simply due to an incapacitation effect. We find sizable decreases in reoffending probabilities and cumulative charged crimes even after defendants are released from prison.

Our second result is that bias due to selection on unobservable individual attributes, if ignored, leads to the erroneous conclusion that time spent in prison is criminogenic. If we simply compare criminal defendants sent to prison versus those not sent to prison, we find positive associations between incarceration and subsequent crime. This is true even when we control for a rich set of demographics, the type of crime committed, previous criminal history, and past employment. This stands in contrast to our analysis based on the random assignment of judges, which finds an opposite-signed result.

Third, the reduction in crime is driven by individuals who were not working prior to incarceration. Among these individuals, imprisonment increases participation in programs directed at improving employability and reducing recidivism, and this ultimately raises employment and earnings while discouraging criminal behavior.

The effects of incarceration for this group are large and economically important. Imprisonment causes a 34 percentage point increase in participation in job training programs for the previously nonemployed, and within five years their employment rate increases by 40 percentage points.

At the same time, the likelihood of reoffending within five years is cut by 46 percentage points, and there is a decline of 22 in the average number of criminal charges.

A very different pattern emerges for individuals who were previously attached to the labor market. Among this group, there is no significant effect of incarceration on either the probability of reoffending or the number of charged crimes. Moreover, they experi-

## Family and Criminal Network Spillovers

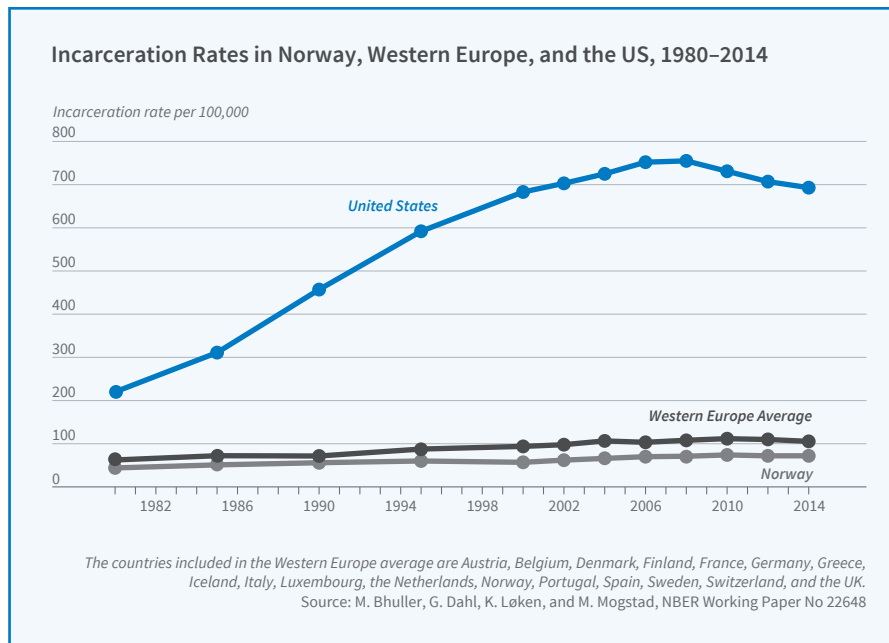
While understanding the effects of incarceration on the offender is an important first step, capturing spillover effects is also important for evaluating criminal justice policy and designing effective prison systems. Children in particular could be affected either positively or negatively by having a parent incarcerated, a matter we explore.<sup>4</sup>

How children are affected will likely depend on whether imprisonment was rehabilitative for their parent. Using our judge stringency instrument, we find that incarceration has no effect on a father's probability of committing future crime. But it does reduce their employment by 20 percentage points. Fathers are eight years older on average and significantly more likely to be employed prior to incarceration in general, which helps

explain the heterogeneous effects for fathers versus other defendants.

We look at two child outcomes: The probability the child commits a crime up to 10 years later and school grades. Ordinary least squares estimates reveal that children of incarcerated fathers are 1 percentage point more likely to be charged with a crime, relative to a mean of 13 percent, and show no effect on school grades. Using our judge stringency instrument, we find no statistical evidence that a father's incarceration affects a child's own crime or school grades, but we are not able to rule out modest-sized effects.

We also use our judge stringency instrument to explore the effect of incarceration on both preexisting criminal networks and brothers.<sup>5</sup> We define criminal groups based on network links to prior



**Figure 2**

ence an immediate 25 percentage point drop in employment due to incarceration, and this effect continues out to year five. This drop is almost entirely explained by defendants losing their jobs with their previous employers while they are in prison.

How do the findings for Norway compare to findings of recent research on the United States? A handful of papers in the US use similar random judge assignment designs; these studies find either no effect or the opposite result, namely that incarceration results in higher recidivism and worse labor market outcomes. A plausible explanation for the difference is that Norway's prison system differs markedly, both in terms of prison-term length and prison conditions, from the US prison system.

criminal cases. Our analysis yields three main findings. First, when a criminal network member is incarcerated, their peers' probability of being charged with a future crime decreases by 51 percentage points over the next four years. Likewise, having an older brother incarcerated reduces the probability his younger brother will be charged with a crime by 32 percentage points over the next four years.

Second, these peer effects are concentrated in networks where the links between individuals are likely to be active and salient, defined as living close by geographically and having network ties for recently committed crime. For the brother network, the spillover passes only from older to younger brothers, and not the other way around. More generally, we find no spillover effects for other family members such as sisters and spouses.

Third, bias due to selection on unobservables matters. While ordinary least squares estimates show positively signed spillover effects for both networks, the instrumental variables estimates find that incarceration of a defendant has a strong preventative effect on network peers. A policy simulation that increases average judge stringency by 1 standard deviation illustrates the relevance of these spillover effects. Failing to account for incarceration spillover effects provides misleading projections of total policy impact and post-reform recidivism rates, as the network reductions in future crimes commit-

ted are larger than the direct effect on the incarcerated defendant.

## Feasibility of Reform

Our research on Norway's criminal justice system serves as a proof of concept that time spent in prison with a focus on rehabilitation can result in positive outcomes. The Norwegian prison system increases job training, raises employment, and reduces crime, mostly due to changes for individuals who were not employed prior to imprisonment. While there are no discernible spillovers to children, there are large spillovers for both criminal networks and brothers that provide additional benefits in terms of crime reduction.

It should be noted that Norway's prison system is expensive. However, prison reform is more affordable than it may initially appear in the United States, and could even save money if prison sentences were shortened. The United States is an outlier in incarceration rates, with sentence lengths that are roughly five times longer than the international average. Our calculations suggest that a European-style prison system, with its higher costs but shorter sentences, would result in significant US cost savings. Moreover, to the extent that prison increases post-release employment, this would indirectly reduce expenditures on safety net programs and possibly increase

tax revenue. And while it is difficult to monetize the benefits from fewer crimes being committed, the gains from reduced victimization are likely to be large.

---

<sup>1</sup> "What Works? Questions and Answers about Prison Reform," Martinson R. *The Public Interest* 35, Spring 1974, pp. 22–54.

[Return to Text](#)

<sup>2</sup> "Imprisonment and Reoffending," Nagin DS, Cullen FT, Jonson CL. *Crime and Justice* 38(1), 2009, pp. 115–200.

[Return to Text](#)

<sup>3</sup> "Incarceration, Recidivism and Employment," Bhuller M, Dahl GB, Løken KV, Mogstad M. NBER Working Paper 22648, September 2016, revised February 2019, and *Journal of Political Economy*, forthcoming.

[Return to Text](#)

<sup>4</sup> "Intergenerational Effects of Incarceration," Bhuller M, Dahl GB, Løken KV, Mogstad M. NBER Working Paper 24227, January 2018, and *AEA Papers and Proceedings* 108, May 2018, pp. 234–240.

[Return to Text](#)

<sup>5</sup> "Incarceration Spillovers in Criminal and Family Networks," Bhuller M, Dahl GB, Løken KV, Mogstad M. NBER Working Paper 24878, August 2018.

[Return to Text](#)

## Annual Report of Awards to NBER Affiliates

**Olivier Blanchard** was named a Distinguished Fellow of the American Economic Association.

**Katharine G. Abraham** was the inaugural recipient of the Society of Labor Economists' Prize for Contributions to Data and Measurement.

**Lee Alston, Jeremy Atack, Michael Bordo, Barry Eichengreen, Stanley Engerman, Price Fishback, Claudia Goldin, Naomi Lamoreaux, Gary Libecap, Peter Lindert, Robert A. Margo, Joel Mokyr, Larry Neal, Hugh Rockoff, Richard Steckel, Richard Sylla, Peter Temin, Thomas Weiss, and Jeffrey Williamson** were elected into the inaugural class of Economic History Association Fellows.

**Nikhil Agarwal** received an Alfred P. Sloan Foundation Research Fellowship.

**Ann Bartel** was elected a Fellow of the Society of Labor Economists.

**Howard Bodenhorn** was the runner-up for the Georgescu-Roegen Prize for best article published in the *Southern Economic Journal*.

**Axel Börsch-Supan** received an honorary doctorate from Rostock University.

**Leah P. Boustan** received the Institute for Labor Economics (IZA) Young Labor Economist Award, recognizing an outstanding labor economist within 15 years of PhD award.

**Dennis W. Carlton** received a 2019 Antitrust Writing Award for Academic Articles—Economics for “Vertical Most-Favored-Nation Restraints and Credit Card No-Surcharge Rules,” (with Ralph Winter) in the *Journal of Law and Economics*.

**William Collins** and **Gregory Niemesh** won the 2018 Integrated Public Use Microdata Series (IPUMS) Research Award for the best research using these data to advance or deepen understanding of social and demographic processes.

**Dalton Conley** was elected a Fellow of the American Association for the Advancement of Science.

**Philip Cook** received the Stockholm Prize in Criminology for 2020, which is awarded for outstanding achievements in criminological research.

**Zack Cooper** received a 2019 Andrew Carnegie Fellowship from the Carnegie Corporation of New York.

**Janet Currie** was elected to the National Academy of Sciences.

**Thomas S. Dee** received the Raymond Vernon Memorial Award from the Association for Public Policy Analysis and Management (APPAM) for “The Effects of Accountability Incentives in Early Childhood Education,” (with Daphna Bassok and Scott Latham), published in the *Journal of Policy Analysis and Management*.

**Roger Farmer** was honored with a special issue of the *International Journal of Economic Theory* on “Market Frictions in Macroeconomic Dynamics.”

**Joshua Gans** received the Public Utility Research Center Distinguished Service Award, recognizing cumulative impact of research and policy analyses on both the academic community and regulatory policymakers.

**Gopi Shah Goda** received the Financial Literacy Research Award from the Global Financial Literacy Excellence Center for “Who Is a Passive Saver under Opt-In and Auto-Enrollment?” (with Matthew Levy, Colleen Flaherty Manchester, Aaron Sojourner, and Joshua Tasoff).

**Claudia Goldin** received the BBVA Foundation Frontiers of Knowledge Award in Economics, Finance, and Management.

**Farley Grubb** received the 2019 Lawrence Brewster Faculty Paper Award from the North Carolina Association of Historians.

**Bronwyn H. Hall** received the inaugural Special Award from the Conference on Corporate R&D and Innovation at the Joint Research Centre of the European Commission.

**Oliver Hart** was named a Distinguished Fellow of the American Economic Association and received an honorary Doctor of Science degree from the London School of Economics.

**David Hirshleifer** served as president of the American Finance Association.

**Louis Kaplow** received the National Tax Association's Daniel M. Holland Medal for lifetime achievement in the study of public finance.

**Amanda Kowalski** received the 2019 ASHEcon Medal from the American Society of Health Economists, recognizing an economist, age 40 or under, who has made the most significant contributions to the field of health economics.

**Kevin Lang** was elected vice president of the Society of Labor Economists (2019–20) and will serve as its president-elect (2020–21) and president (2021–22).

**Edward Lazear** was named a Distinguished Fellow of the American Economic Association.

**Lee Lockwood** won the 2019 TIAA Paul A. Samuelson Award for Outstanding Scholarly Writing on Lifelong Financial Security.

**Guido Lorenzoni** was elected a fellow of the Econometric Society.

**Brigitte Madrian** received the Skandia Research Prize for outstanding research on “Long-Term Savings” with relevance for banking, insurance, and financial services.

**Matteo Maggiori** received a Guggenheim Fellowship and was awarded the Carlo Alberto Medal, awarded biennially to the best Italian economist under 40.

**Pinar Karaca Mandic's** PRISM project (PROMIS Reporting and Insight System from Minnesota) received the grand prize in the Step-up App Challenge of the Agency for Healthcare Research and Quality (AHRQ) and placed second at the Fast Healthcare Interoperability Resources App competition of the American Medical Informatics Association (AMIA).

**N. Gregory Mankiw** received the John R. Commons Award from Omicron Delta Epsilon, the economics honor society.

**James Markusen** received an honorary doctorate from the University of Tübingen.

**Isaac McFarlin's** paper "Education for All? A Nationwide Audit Study of School Choice," (with Peter Bergman) won the Best Education Research Study of 2019 Award from the Thomas B. Fordham Institute.

**Loukas Karabarbounis** and **Stelios Michalopoulos** shared the biennial Distinguished Scientist Award in Social-Economic Sciences from the Bodossaki Foundation, awarded to scholars of Greek descent under the age of 40.

**Bridget Terry Long** and **Diane Whitmore Schanzenbach** were elected to the National Academy of Education.

**Olivia S. Mitchell** was elected vice president of the American Economic Association and was awarded the 2019 Financial Industry Regulatory Authority Investor Education Foundation Ketchum Prize.

**Robert Moffitt** was elected to membership in the National Academy of Sciences, and is the president-elect of the Society of Labor Economists.

**John Mullahy** was awarded the 2019 Willard G. Manning Memorial Award for Best Research in Health Econometrics by the American Society

of Health Economists for his paper "Individual Results May Vary: Inequality-Probability Bounds for Some Health-Outcome Treatment Effects" in the *Journal of Health Economics*.

**Casey Mulligan** received the National Tax Association's Richard A. Musgrave Prize for his paper on "Wedges, Labor Market Behavior, and Health Insurance Coverage under the Affordable Care Act" (with Trevor S. Gallen) in the *National Tax Journal* and was awarded the 2019 Wolfram Innovator Award for his innovative work on automated economic reasoning.

**Emi Nakamura** was awarded the John Bates Clark Medal by the American Economic Association.

**David Neumark** was elected a Fellow of the American Association for the Advancement of Science.

**Kevin O'Rourke** was elected a Fellow of the Academy of Social Science.

**Christopher Palmer** won the Society for Financial Studies Cavalcade Award for the Best Paper in Corporate Finance for "The Capitalization of Consumer Financing into Durable Goods Prices" (with Bronson Argyle, Taylor Nadauld, and Ryan Pratt).

**Michaela Pagel** and **Michael Weber** won the AQR London Business School Asset Management Institute Young Researcher Award for new academics producing relevant, innovative, and impactful research in the field of asset management.

**Ariel Pakes** was named a Distinguished Fellow of the American Economic Association.

**Ricardo Perez-Truglia** received an Alfred P. Sloan Foundation Research Fellowship.

**James Poterba** received an honorary Doctor of Laws degree from the University of Notre Dame.

**Hélène Rey** was named a Foreign Honorary Member of the American Economic Association.

**Adam Sacarny** received the AcademyHealth Publication of the Year Award, and was a finalist for the National Institute for Health Care Management Health Care Research Award, for his paper "Effect of Peer Comparison Letters for High-Volume Primary Care Prescribers of Quetiapine in Older and Disabled Adults: A Randomized Clinical Trial" (with Michael L. Barnett, Jackson Le, Frank Tetkoski, David Yokum, and Shantanu Agrawal) in *JAMA Psychiatry*.

**José A. Scheinkman** delivered the 2019 Arrow Lecture at the Israel Institute for Advanced Studies.

**John Michael Van Reenen** won the National Institute for Health Care Management Foundation Award for his paper "The Price Ain't Right? Hospital Prices and Health Spending on the Privately Insured" (with Zack Cooper, Stuart Craig and Martin Gaynor) in the *Quarterly Journal of Economics*.

**Angelino Viceisza** was selected as the W. Glenn Campbell and Rita Ricardo-Campbell National Fellow and the John Stauffer National Fellow at the Hoover Institution.

**Marianne H. Wanamaker** received the Kenneth J. Arrow Award from the International Health Economics Association for the best health economics paper published in 2018.

**Michael Woodford** received the Banque de France/Toulouse School of Economics Senior Prize in Monetary Economics and Finance.

**Lu Zhang** received the Spängler IQAM Best Paper Prize for the best investments paper in the *Review of Finance* for "Which Factors?" (with Kewei Hou, Haitao Mo, and Chen Xue).

## NBER Pre- and Post-Doctoral Fellows for 2020–21 Academic Year

Thirteen researchers, eight post-doctoral scholars and three pre-doctoral students, have been named to NBER fellowships for the 2020–21 academic year. These fellows are selected by review panels following widely disseminated calls for applications.

### Post-Doctoral Fellowships

**Emilie Jackson**, who is analyzing how the shift from traditional employment to self-employment affects tax revenues and the demand for government benefits, and **Sean Myers**, who studies the funding of state and local defined-benefit pension plans, have been awarded fellowships for research on long-term fiscal policy. These fellowships are supported by the Peter G. Peterson Foundation. Both Jackson and Myers are completing PhDs at Stanford University.

**Victoria Marrone**, who studies the design and regulation of health insurance markets, and **Francis Wong**, who is analyzing how medical debt affects mental and physical health and health care utilization, will be supported by the NBER's National Institute on Aging

Fellowship Program in Aging and Health Research. Marrone is finishing her PhD at Northwestern University, and Francis Wong is finishing hers at the University of California, Berkeley.

The Social Security Administration supports two fellows through the NBER's Retirement and Disability Policy Research Program. For the coming academic year, the fellows will be **Adrienne Sabety**, who is studying the increase in opioid prescriptions of 30 days or more for older patients, and **Mingli Zhong**, who is analyzing the wealth and welfare consequences of retirement saving policies, including features of automatic enrollment plans and default options. Sabety is completing her PhD at Harvard University, Zhong hers at the University of Pennsylvania.

**Adelina Yanyue Wang**, who is completing her doctoral studies at Stanford University, will be the NBER's Post-Doctoral Fellow on the Economics of an Aging Workforce. This fellowship is supported by the Alfred P. Sloan Foundation. Wang studies how access to affordable and quality long-term care services for the elderly affects the retirement decisions of their adult children.

**Caitlin Gorback**, who is completing her PhD at the Wharton School at the University of Pennsylvania, will be a post-doctoral researcher on the NBER's Transportation in the 21st Century Initiative. Gorback studies how transportation innovations such as ride-sharing affect the distribution of economic activities in urban areas.

### Pre-Doctoral Fellowships

The Alfred P. Sloan Foundation supports three pre-doctoral fellows who are studying energy economics. For 2020–21, these fellows are **Sarah Armitage** of Harvard University, who is studying technology transitions and the timing of environmental policy, **Nafisa Lohawala** of the University of Michigan, who is studying the effects of electric vehicle subsidies on vehicle demand, and **Aspen**

**Fryberger Underwood** of Clemson University, who is analyzing the factors that affect the adoption and usage of electric vehicles.

The Alfred P. Sloan Foundation also supports two pre-doctoral fellows studying behavioral macroeconomics. The fellows for the coming year will be **Miguel Acosta** of Columbia University, whose dissertation studies the aggregate

demand effects of monetary policy, and **Peter Maxted** of Harvard University, who is examining the effects of business and consumer sentiment in a macro-financial model.

Calls for fellowship applications are posted each fall, and application closing dates are usually in early December.

[Register for announcements of future fellowship opportunities](#)



---

## Conferences

---

### The Role of Innovation and Entrepreneurship in Economic Growth

An NBER conference on The Role of Innovation and Entrepreneurship in Economic Growth took place in Mountain View, California, January 7–8. Research Associates Aaron Chatterji of Duke University, Josh Lerner of Harvard University, and Scott Stern of MIT, and Michael J. Andrews of NBER organized the meeting, which was sponsored by the Ewing Marion Kauffman Foundation. These researchers' papers were presented and discussed:

- **Erica Fuchs**, Carnegie Mellon University and NBER; **Kate S. Whitefoot** and **Christophe B. Combemale**, Carnegie Mellon University; and **Britta M. Glennon**, University of Pennsylvania, “The ‘Weighty’ Manufacturing Sector: Transforming Raw Materials into Physical Goods”
- **Joel Waldfogel**, University of Minnesota and NBER, “Digitization and the Welfare Benefits of New Products in Music, Movies, and Books”
- **Joshua R. Bruce**, University of Illinois at Urbana-Champaign, and **John M. de Figueiredo**, Duke University and NBER, “Innovation in the US Federal Government”
- **Francine Lafontaine** and **Jagadeesh Sivadasan**, University of Michigan, “The Recent Evolution of Physical Retail Markets: Online Retailing, Big Box Stores, and the Rise of Restaurants”
- **Chris Forman**, Cornell University, and **Avi Goldfarb**, University of Toronto and NBER, “Agglomeration and Scaling in IT Entrepreneurship: Evidence from First-Time Patenters”
- **Edward Kung**, California State University, Northridge, “Innovation and Entrepreneurship in Housing and Real Estate”
- **David Popp**, Syracuse University and NBER; **Jacquelyn Pless**, MIT; and **Ivan Hascic** and **Nick Johnstone**, OECD, “Innovation and Entrepreneurship in the Energy Sector”
- **Derrick Choe** and **Robert Seamans**, New York University, and **Alexander Oettl**, Georgia Institute of Technology and NBER, “What’s Driving Entrepreneurship and Innovation in the Transportation Sector?”
- **Mercedes Delgado**, MIT; **Daniel Kim**, University of Pennsylvania; and **Karen G. Mills**, Harvard University, “The Servicification of the US Economy: The Role of Startups versus Incumbent Firms”
- **Barbara Biasi**, Yale University and NBER; **David J. Deming**, Harvard University and NBER; and **Petra Moser**, New York University and NBER, “Education and Innovation”
- **Julian Alston**, University of California, Davis, and **Phillip Pardey**, University of Minnesota, “Innovation, Growth and Structural Change in American Agriculture”
- **Amitabh Chandra**, Harvard University and NBER, “Innovation and Entrepreneurship in Health Care”

Summaries of these papers are at [www.nber.org/conferences/2020/RIEs20/summary.html](http://www.nber.org/conferences/2020/RIEs20/summary.html)

## Conference on Measuring and Understanding the Distribution and Intra/Inter-Generational Mobility of Income and Wealth

An NBER conference on Measuring and Understanding the Distribution and Intra/Inter-Generational Mobility of Income and Wealth took place in Bethesda, Maryland, March 5–6. Program Director Raj Chetty of Harvard University, Research Associate John N. Friedman of Brown University, Janet C. Gornick of The City University of New York, Barry Johnson of the Internal Revenue Service, and Arthur Kennickell of Stone Center, CUNY Graduate Center, organized the meeting, which was sponsored by the Stone Center for Socio-Economic Inequality at CUNY, the Stone Project for Wealth and Income Inequality at Brown University, and Opportunity Insights. These researchers' papers were presented and discussed:

- **Dennis Fixler** and **Marina Gindelsky**, Bureau of Economic Analysis, and **David Johnson**, University of Michigan, “Distributing Personal Income: Trends Over Time”
- **Patrick Langetieg**, **Mark Payne**, and **Alan Plumley**, Internal Revenue Service; **Carla Medalia**, US Census Bureau; **Bruce D. Meyer**, University of Chicago and NBER; and **Derek Wu** and **Grace Finley**, University of Chicago, “The Receipt and Distributional Effects of Transfers and Tax Credits Using the Comprehensive Income Dataset”
- **John Guyton** and **Patrick Langetieg**, Internal Revenue Service; **Daniel Reck**, London School of Economics; **Max Risch**, University of Michigan; and **Gabriel Zucman**, University of California, Berkeley and NBER, “Tax Evasion by the Wealthy: Measurement and Implications”
- **Richard P. Tonkin**, **Sean White**, **Sofiya Stoyanova**, **Aly Youssef**, **Sunny Sidhu**, and **Chris S. Payne**, UK Office for National Statistics, “Developing Indicators of Inequality and Poverty Consistent with National Accounts”
- **Dominic Webber**, **Richard P. Tonkin**, and **Martin Shine**, UK Office for National Statistics, “Using Tax Data to Better Capture Top Incomes in Official UK Inequality Statistics”
- **Stefan Bach** and **Charlotte Bartels**, DIW Berlin (the German Institute for Economic Research), and **Theresa Neef**, Freie Universität Berlin, “Distributional National Accounts: A Macro-Micro Approach to Inequality in Germany”
- **Marie Connolly** and **Catherine Haeck**, Université du Québec à Montréal, and **Jean-William P. Laliberté**, University of Calgary, “Parental Education Mitigates the Rising Transmission of Income between Generations”
- **Victoria L. Bryant**, Internal Revenue Service; **Anne-Line Koch Helso**, University of Copenhagen; and **Pablo Mitnik**, Stanford University, “Inequality of Opportunity for Income in Denmark and the United States: A Comparison Based on Administrative Data”
- **Janet C. Gornick**, **Branko Milanovic**, and **Nathaniel Johnson**, City University of New York, “American Exceptionalism in Market Income Inequality: Inequality across Household Types”
- **Isabel Z. Martinez**, Universität St. Gallen, “In It Together? Inequality and the Joint Distribution of Income and Wealth in Switzerland”
- **Jonathan D. Fisher**, Stanford University, and **David Johnson**, University of Michigan, “Inequality and Mobility over the Past Half Century Using Income, Consumption and Wealth”
- **William Gale**, Brookings Institution, and **Benjamin Harris**, Northwestern University, “Changing Wealth Accumulation Patterns: Evidence and Determinants”
- **Sarah K. Bruch**, University of Delaware, and **Janet C. Gornick** and **Joseph van der Naald**, City University of New York, “Geographic Inequality in Social Provision and Redistribution in the US States 1994–2018”

- **Paolo Acciari**, Italian Ministry of Economy and Finance; **Facundo Alvaredo**, Paris School of Economics; and **Salvatore Morelli**, City University of New York, “The Concentration of Personal Wealth in Italy: 1995–2016”
- **Jeff Larrimore**, Federal Reserve Board, and **Jake Mortenson** and **David Splinter**, Joint Committee on Taxation, “Presence and Persistence of Poverty in US Tax Data”
- **Bertrand Garbinti**, Banque de France and CREST (Center for Research in Economics and Statistics), and **Frédérique Savignac**, Banque de France, “Intergenerational Wealth Mobility in France over the 20th Century”
- **Randall Akee**, University of California, Los Angeles and NBER; **Maggie R. Jones**, US Census Bureau; and **Emilia Simeonova**, Johns Hopkins University and NBER, “The EITC and Intergenerational Income Mobility”
- **John Sabelhaus**, University of Maryland, and **Alice Henriques Volz**, Federal Reserve Board, “Social Security Wealth, Inequality, and Lifecycle Saving”
- **Pirmin Fessler** and **Martin Schürz**, Oesterreichische Nationalbank, “Structuring the Analysis of Wealth Inequality Using the Functions of Wealth: A Class-Based Approach”
- **Michael Batty**, **Jesse Bricker**, **Joseph S. Briggs**, **Sarah Friedman**, **Danielle Nemschoff**, **Eric Nielsen**, **Kamila Sommer**, and **Alice Henriques Volz**, Federal Reserve Board, “The Distributional Financial Accounts of the United States”
- **John M. Abowd** and **Kevin McKinney**, US Census Bureau, and **John Sabelhaus**, University of Maryland, “United States Earnings Dynamics: Inequality, Mobility, and Volatility”
- **John C. Haltiwanger**, University of Maryland and NBER, and **James Spletzer**, US Census Bureau, “Rising Between Firm Inequality and Declining Labor Market Fluidity: Evidence of a Changing Job Ladder”
- **Sam E. Asher**, Johns Hopkins University; **Paul Novosad**, Dartmouth College; and **Charlie Rafkin**, MIT, “Comparing Intergenerational Income and Educational Mobility for Racial Groups in the US”
- **Facundo Alvaredo**, Paris School of Economics; **Yonatan Berman**, London Mathematical Laboratory; and **Salvatore Morelli**, City University of New York, “On the Distribution of Estates and the Distribution of Wealth: Evidence from the Dead”
- **Merike Kukk**, Tallinn University of Technology and Bank of Estonia, and **Jaanika Meriküll** and **Tairi Rõõm**, Bank of Estonia, “What Explains the Gender Gap in Wealth? Evidence from Administrative Data”
- **James J. Feigenbaum**, Boston University and NBER; **Price V. Fishback**, University of Arizona and NBER; and **Keoka Grayson**, Hobart and William Smith College, “Inequality and the Safety Net Throughout the Income Distribution, 1929–40”

Summaries of these papers are at [www.nber.org/conferences/2020/CRIWs20/summary.html](http://www.nber.org/conferences/2020/CRIWs20/summary.html)

## Economics of Digitization

An NBER conference on the Economics of Digitization took place at Stanford University on March 6. Research Associate Joel Waldfogel of the University of Minnesota, Faculty Research Fellow Michael Luca of Harvard University, and Research Associate Shane Greenstein of Harvard University organized the meeting. These researchers' papers were presented and discussed:

- **Zach Y. Brown**, University of Michigan, and **Alexander MacKay**, Harvard University, “Competition in Pricing Algorithms”
- **Milan Miric** and **Pai-Ling Yin**, University of Southern California, “Population-Level Evidence of the Gender Gap in Technology Entrepreneurship”
- **Joerg Claussen**, University of Munich; **Christian W. Peukert**, UCP Católica-Lisbon; and **Ananya Sen**, Carnegie Mellon University, “The Editor vs. the Algorithm: Returns to Data and Externalities in Online News”
- **Leif Brandes**, University of Lucerne; **David Godes**, University of Maryland; and **Dina Mayzlin**, University of Southern California, “What Drives Extremity Bias in Online Reviews? Theory and Experimental Evidence”
- **Nicole Immorlica** and **Glen Weyl**, Microsoft Research, and **Matthew Jackson**, Stanford University, “Verifying Identity as a Social Intersection”
- **M. Keith Chen** and **Peter E. Rossi**, University of California, Los Angeles; **Judith A. Chevalier**, Yale University and NBER; and **Lindsey Currier**, University of Chicago, “Suppliers and Demanders of Flexibility: The Demographics of Gig Work”
- **Mohammed Alyakoob**, University of Southern California, and **Mohammad S. Rahman**, Purdue University, “Shared Prosperity (or Lack Thereof) in the Sharing Economy”

Summaries of these papers are at [www.nber.org/conferences/2020/EoDs20/summary.html](http://www.nber.org/conferences/2020/EoDs20/summary.html)

---

## Program and Working Group Meetings

---

### Industrial Organization

Members of the NBER's Industrial Organization Program met February 7–8 at Stanford University. Research Associate Julie H. Mortimer of Boston College and Faculty Research Fellows Christopher Neilson of Princeton University and Michael Sinkinson of Yale University organized the meeting. These researchers' papers were presented and discussed:

- **Mo Xiao**, University of Arizona, and **Zhe Yuan**, Alibaba Group, “License Complementarity and Package Bidder: The US Spectrum Auctions”
- **Thomas R. Covert**, University of Chicago and NBER, and **Richard Sweeney**, Boston College, “Relinquishing Riches: Auctions vs Informal Negotiations in Texas Oil and Gas Leasing” (NBER Working Paper [25712](#))
- **Yeon-Koo Che** and **Dong Woo Hahn**, Columbia University, and **Yinghua He** of Rice University, “Leveraging Uncertainties to Infer Preferences: Robust Analysis of School Choice”
- **Itai Ater**, Tel Aviv University, and **Oren Rigbi**, Ben-Gurion University, “Price Transparency, Media and Informative Advertising”
- **Amil Petrin**, University of Minnesota and NBER; **Emmanuel Dhyne**, National Bank of Belgium; and **Valerie Smeets** and **Frederic Warzynski**, Aarhus University, “Theory for Extending Single-Product Production Function Estimation to Multi-Product Settings”
- **Zach Y. Brown**, University of Michigan, and **Jihye Jeon**, Boston University, “Endogenous Information and Simplifying Insurance Choice”
- **Xing Li** and **Wesley Hartmann**, Stanford University, and **Tomomichi Amano**, Harvard University, “Preference Externality Estimators: A Comparison of Border Approaches and IVs”
- **Sylvia Hristakeva**, University of California, Los Angeles, “Vertical Contracts with Endogenous Product Selection: An Empirical Analysis of Vendor-Allowance Contracts”
- **David C. Chan Jr** and **Matthew Gentzkow**, Stanford University and NBER, and **Chuan Yu**, Stanford University, “Selection with Variation in Diagnostic Skill: Evidence from Radiologists” (NBER Working Paper [26467](#))
- **Pedro Gardete**, Nova School of Business and Economics, and **Megan Hunter**, Stanford University, “Guiding Consumers through Lemons and Peaches: Analyzing of the Effects of Search Design Activities”
- **Cailin R. Slattery**, Columbia University, “Bidding for Firms: Subsidy Competition in the United States”

Summaries of these papers are at [www.nber.org/conferences/2020/IOs20/summary.html](http://www.nber.org/conferences/2020/IOs20/summary.html)

## Labor Studies

Members of the NBER's Labor Studies Program met February 20–21 at the Federal Reserve Bank of San Francisco. Program Directors David Autor of MIT and Alexandre Mas of Princeton University organized the meeting, which was sponsored by the bank. The following researchers' papers were presented and discussed:

- **Chiara Farronato**, Harvard University and NBER; **Andrey Fradkin**, Boston University; **Bradley Larsen**, Stanford University and NBER; and **Erik Brynjolfsson**, MIT and NBER, “Consumer Protection in an Online World: An Analysis of Occupational Licensing”
- **Sabrina L. Di Addario**, Bank of Italy; **Patrick M. Kline**, University of California, Berkeley and NBER; **Raffaele D. Saggio**, University of British Columbia; and **Mikkel Sølvsten**, University of Wisconsin-Madison, “It Ain't Where You're from It's Where You're At: Firm Effects, State Dependence, and the Gender Wage Gap”
- **Christina L. Brown**, University of California, Berkeley; **Supreet Kaur**, University of California, Berkeley and NBER; and **Heather Schofield**, University of Pennsylvania, “Attention as Human Capital”
- **Sandra E. Black**, Columbia University and NBER; **Jeffrey T. Denning**, Brigham Young University; and **Jesse Rothstein**, University of California, Berkeley and NBER, “Winners and Losers: The Effect of Gaining and Losing Access to Selective Colleges on Labor Market Outcomes”
- **Bruce D. Meyer**, University of Chicago and NBER; **Angela Wyse**, **Alexa Grunwaldt** and **Derek Wu**, University of Chicago; and **Carla Medalia**, US Census Bureau, “Learning about Homelessness in the US Using Linked Administrative and Survey Data”
- **Bradley Setzler**, University of Chicago, and **Felix Tintelnot**, University of Chicago and NBER, “The Effects of Foreign Multinationals on Workers and Firms in the United States” (NBER Working Paper 26149)
- **Tito Boeri**, Bocconi University; **Andrea Ichino**, European University Institute; **Enrico Moretti**, University of California, Berkeley and NBER; and **Johanna Posch**, European University Institute, “Wage Equalization and Regional Misallocation: Evidence from Italian and German Provinces” (NBER Working Paper 25612)
- **Marika Cabral**, University of Texas at Austin and NBER, and **Marcus Dillender**, University of Illinois at Chicago, “The Impact of Benefit Generosity on Workers' Compensation Claims: Evidence and Implications”
- **Daniel R. Arnold**, University of California, Berkeley, and **Christopher M. Whaley**, RAND, “Who Pays for Health Care Costs? The Effects of Health Care Prices on Wages”

Summaries of these papers are at [www.nber.org/conferences/2020/Ls20/summary.html](http://www.nber.org/conferences/2020/Ls20/summary.html)

## Economic Fluctuations and Growth

Members of the NBER's Economic Fluctuations and Growth Program met February 28 at the Federal Reserve Bank of New York. Research Associates Ufuk Akcigit of the University of Chicago and Sydney C. Ludvigson of New York University organized the meeting. These researchers' papers were presented and discussed:

- **Konrad B. Burchardi**, IIES, Stockholm University; **Thomas Chaney**, Sciences Po; **Tarek Alexander Hassan**, Boston University and NBER; and **Lisa Tarquinio** and **Stephen J. Terry**, Boston University, “Immigration, Innovation, and Growth”

- **Leena Rudanko**, Federal Reserve Bank of Philadelphia, “Firm Wages in a Frictional Labor Market”
- **Fatih Karahan**, Federal Reserve Bank of New York; **Serdar Ozkan**, University of Toronto; and **Jaе Song**, Social Security Administration, “Anatomy of Lifetime Earnings Inequality: Heterogeneity in Job Ladder Risk vs. Human Capital”
- **Rohan Kekre**, University of Chicago, and **Moritz Lenel**, Princeton University, “Monetary Policy, Redistribution, and Risk Premia”
- **Matthew Smith**, Department of the Treasury; **Owen M. Zidar**, Princeton University and NBER; and **Eric Zwick**, University of Chicago and NBER, “Top Wealth in the United States: New Estimates and Implications for Taxing the Rich”
- **Germán Gutiérrez**, New York University, and **Thomas Philippon**, New York University and NBER, “How EU Markets Became More Competitive than US Markets: A Study of Institutional Drift” (NBER Working Paper 24700)

Summaries of these papers are at [www.nber.org/conferences/2020/EFGw20/summary.html](http://www.nber.org/conferences/2020/EFGw20/summary.html)

## Law and Economics

Members of the NBER’s Law and Economics Program met February 28 in Cambridge. Program Director Christine Jolls of Yale University organized the meeting. These researchers’ papers were presented and discussed:

- **Allen Ferrell**, Harvard University and NBER; **Alberto Manconi**, Bocconi University; **Ekaterina V. Neretina**, University of Southern California; **Luc Renneboog**, Tilburg University; and **William Powley**, MIT, “Are Star Lawyers Also Better Lawyers?”
- **Alberto Galasso**, University of Toronto and NBER, and **Hong Luo**, Harvard University, “Risk-Mitigating Technologies: The Case of Radiation Diagnostic Devices” (NBER Working Paper 26305)
- **Ofer Eldar** and **Jill Grennan**, Duke University, and **Kate Waldo**, Georgetown University, “Common Ownership and Startup Growth”
- **Li Liao**, **Zhengwei Wang**, and **Jia Xiang**, Tsinghua University, and **Hongjun Yan**, DePaul University; and **Jun Yang**, Indiana University, “Investing with Fast Thinking”
- **Giri Parameswaran**, Haverford College; **Charles Cameron**, Princeton University; and **Lewis A. Kornhauser**, New York University School of Law, “Bargaining and Strategic Voting on Appellate Courts”
- **David Frydlinger**, Cirio Law Firm, and **Oliver D. Hart**, Harvard University and NBER, “Overcoming Contractual Incompleteness: The Role of Guiding Principles” (NBER Working Paper 26245)

Summaries of these papers are at [www.nber.org/conferences/2020/LEs20/summary.html](http://www.nber.org/conferences/2020/LEs20/summary.html)

## Environment and Energy Economics

Members of the NBER’s Environment and Energy Economics Program met February 27–28 in Cambridge. Research Associate H. Spencer Banzhaf of Georgia State University and Program Director Catherine Wolfram of the University of California, Berkeley organized the meeting. These researchers’ papers were presented and discussed:

- **Jacquelyn Pless**, MIT, “Are ‘Complementary Policies’ Substitutes? Evidence from R&D Subsidies in the UK”

- **Christopher R. Knittel**, MIT and NBER, and **Shinsuke Tanaka**, Tufts University, “Driving Behavior and the Price of Gasoline: Evidence from Fueling-Level Micro Data” (NBER Working Paper [26488](#))
- **Joseph S. Shapiro**, University of California, Berkeley and NBER, “The Environmental Bias of Trade Policy”
- **Andres Gonzalez Lira**, University of California, Berkeley, and **Ahmed Mushfiq Mobarak**, Yale University and NBER, “Slippery Fish: Enforcing Regulation under Subversive Adaptation”
- **Lutz Sager**, Georgetown University, “The Global Consumer Incidence of Carbon Pricing: Evidence from Trade”
- **Janet Currie**, Princeton University and NBER; **John L. Voorheis**, US Census Bureau; and **Reed Walker**, University of California, Berkeley and NBER, “What Caused Racial Disparities in Particulate Exposure to Fall? New Evidence from the Clean Air Act and Satellite-Based Measures of Air Quality” (NBER Working Paper [26659](#))
- **Avraham Ebenstein**, Hebrew University of Jerusalem, and **Michael Greenstone**, University of Chicago and NBER, “Childhood Exposure to Particulate Air Pollution, Human Capital Accumulation, and Income: Evidence from China”
- **Alex Hollingsworth**, Indiana University, and **Ivan J. Rudik**, Cornell University, “The Social Cost of Leaded Gasoline: Evidence from Regulatory Exemptions”
- **Justin Marion** and **Jeremy D. West**, University of California, Santa Cruz, “Dirty Business: Principal-Agent Problems in Hazardous Waste Remediation”
- **Geoffrey Heal** and **Wolfram Schlenker**, Columbia University and NBER, “Coase, Hotelling and Pigou: The Incidence of a Carbon Tax and CO<sub>2</sub> Emissions” (NBER Working Paper [26086](#))

Summaries of these papers are at [www.nber.org/conferences/2020/EEEs20/summary.html](http://www.nber.org/conferences/2020/EEEs20/summary.html)

## Children

Members of the NBER’s Program on Children met March 5–6 in Cambridge. Program Directors Anna Aizer of Brown University and Janet Currie of Princeton University organized the meeting. These researchers’ papers were presented and discussed:

- **Michael Gilraine**, New York University, “Air Filters, Pollution and Student Achievement”
- **Peter Bergman**, Columbia University; **Raj Chetty**, **Lawrence F. Katz**, and **Nathaniel Hendren**, Harvard University and NBER; **Stefanie DeLuca**, Johns Hopkins University; and **Christopher Palmer**, MIT and NBER, “Creating Moves to Opportunity: Experimental Evidence on Barriers to Neighborhood Choice” (NBER Working Paper [26164](#))
- **Imran Rasul**, **Pedro Carneiro**, and **Giacomo Mason**, University College London; **Lucy Kraftman**, Institute for Fiscal Studies; and **Lucie Moore** and **Molly Scott**, Office of Personnel Management, “The Impacts of a Multifaceted Pre-natal Intervention on Human Capital Accumulation in Early Life”
- **Katherine Meckel**, University of California, San Diego and NBER; **Maya Rossin-Slater**, Stanford University and NBER; and **Lindsey M. Uniat**, Yale University, “Efficiency versus Equity in the Provision of In-Kind Benefits: Evidence from Cost Containment in the California WIC Program” (NBER Working Paper [26718](#))
- **Olivier Marie**, Erasmus University Rotterdam, and **Esmée Zwiars**, Princeton University, “The Power of the Dutch Pill: The Short and Long Term Effects of Access to Birth Control”
- **John Anders** and **Andrew C. Barr**, Texas A&M University, and **Alexander A. Smith**, United States Military Academy, West Point, “The Effect of Early Childhood Education on Adult Criminality: Evidence from the 1960s through 1990s”
- **Elira Kuka**, George Washington University and NBER, and **Na’ama Shenhav**, Dartmouth College, “Long-Run Effects of Incentivizing Work Post-Birth”



- **Christina Brown**, University of California, Berkeley; **Supreet Kaur**, University of California, Berkeley and NBER; and **Heather Schofield**, University of Pennsylvania, “Attention as Human Capital”
- **Herdís Steingrimsdóttir**, Copenhagen Business School, and **Snaebjörn Gunnsteinsson**, University of Maryland, “The Long-Term Impact of Children’s Disabilities on Families”
- **Alicia S. Modestino** and **Richard J. Paulsen**, Northeastern University, “School’s Out: How Summer Youth Employment Programs Impact Academic Outcomes”
- **Bhashkar Mazumder**, Federal Reserve Bank of Chicago; **Maria Rosales-Rueda**, Rutgers University; and **Margaret Triyana**, Wake Forest University, “Social Interventions, Health and Well-being: The Long-term and Intergenerational Effects of a School Construction Program”
- **Timothy N. Bond** and **Jillian B. Carr**, Purdue University; **Analisa Packham**, Vanderbilt University and NBER; and **Jonathan Smith**, Georgia State University, “Hungry for Success? SNAP Timing, High-Stakes Exam Performance, and College Attendance”

Summaries of these papers are at [www.nber.org/conferences/2020/CHs20/summary.html](http://www.nber.org/conferences/2020/CHs20/summary.html)

## International Finance and Macroeconomics

Members of the NBER’s International Finance and Macroeconomics Program met March 6 in San Francisco. Faculty Research Fellow Cristina Arellano of the Federal Reserve Bank of Minneapolis and Research Associate Oleg Itskhoki of Princeton University organized the meeting. These researchers’ papers were presented and discussed:

- **Marcus Biermann**, Université Catholique de Louvain, and **Kilian Huber**, University of Chicago, “Tracing the International Transmission of a Crisis through Multinational Firms”
- **Gianluca Benigno**, London School of Economics; **Andrew Foerster**, Federal Reserve Bank of San Francisco; **Christopher Otrok**, University of Missouri; and **Alessandro Rebucci**, Johns Hopkins University and NBER, “The Anatomy of Crises and Cycles in Mexico: An Endogenous Regime Switching Approach”
- **Gastón Chaumont**, University of Rochester, “Sovereign Debt, Default Risk, and the Liquidity of Government Bonds”
- **Sofonias Korsaye** and **Fabio Trojani**, University of Geneva, and **Andrea Vedolin**, Boston University and NBER, “The Global Factor Structure of Exchange Rates”
- **Vania Stavrakeva**, London Business School, and **Jenny Tang**, Federal Reserve Bank of Boston, “Deviations from FIRE and Exchange Rates: A GE Theory of Supply and Demand”
- **Konstantin Egorov**, New Economic School, and **Dmitry Mukhin**, University of Wisconsin-Madison, “Optimal Monetary Policy under Dollar Pricing”
- **Alyssa G. Anderson** and **Bernd Schulusche**, Federal Reserve Board, and **Wenxin Du**, University of Chicago and NBER, “Arbitrage Capital of Global Banks”

Summaries of these papers are at [www.nber.org/conferences/2020/IFMs20/summary.html](http://www.nber.org/conferences/2020/IFMs20/summary.html)

# Capital in the Nineteenth Century

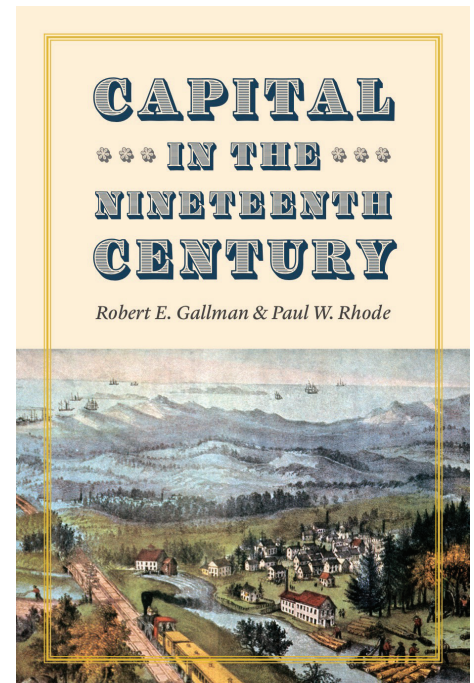
Robert E. Gallman and Paul W. Rhode

A nation's capital stock is widely recognized as a crucial determinant of the productivity of its workers and the standard of living of its citizens. Tracking the evolution of capital is therefore a critical input to economic history. Economist Robert E. Gallman (1926–98) gathered extensive data on US capital stock and created a legacy that has, until now, been difficult for researchers to access and appraise in its entirety.

Gallman measured American capital stock from a range of perspectives, viewing it as the accumulation of income saved and invested, and as an input into the production process. He used the level and change in the capital stock as proxy measures for long-run

economic performance. Analyzing data in this way from the end of the colonial period to the turn of the 20th century, Gallman provided a firm empirical foundation for our knowledge of the 19th century—the period during which the United States began to experience per capita income growth and became a global economic leader. Gallman's research was painstaking and his analysis meticulous, but he did not publish the material supporting his findings during his lifetime. Here Paul W. Rhode completes this project, giving permanence to a great economist's insights and craftsmanship.

[Ordering Information](#)



# Environmental and Energy Policy and the Economy, volume 1

Matthew J. Kotchen, James H. Stock, and Catherine D. Wolfram, editors

This volume presents six new papers on environmental and energy economics and policy. Robert Stavins evaluates carbon taxes versus a cap-and-trade mechanism for reducing greenhouse-gas emissions, arguing that specific design features of either instrument can be more consequential than the choice of instrument itself. Lucas Davis and James Saltee show that the exemption of electric vehicles from the gasoline tax is likely to be efficient as long as gasoline prices remain below social marginal costs, even though it results in lower tax revenue. Caroline Flammer analyzes the rapidly growing market for green bonds and highlights the importance of third-party certification to the financial and environmental performance of publicly traded companies.

Antonio Bento, Mark Jacobsen, Christopher Knittel, and Arthur van Benthem develop a general framework for evaluating the costs and benefits of fuel economy standards and use it to account for the differences between several recent studies of changes in these standards. Nicholas Muller estimates a measure of output in the US economy over the last 60 years that accounts for air pollution damages, and shows that pollution effects are sizable, affect growth rates, and have diminished appreciably over time. Finally, Marc Hafstead and Robertson Williams illustrate methods of accounting for employment effects when evaluating the costs and benefits of environmental regulations.

[Ordering Information](#)



# The Roles of Immigrants and Foreign Students in US Science, Innovation, and Entrepreneurship

Ina Ganguli, Shulamit Kahn, and Megan MacGarvie, editors

The number of immigrants in the US science, technology, engineering, and mathematics (STEM) workforce and among recipients of advanced STEM degrees at US universities has increased in recent decades. Given the contribution of STEM workers to economic growth and the current public debate about immigration, there is a need for evidence on the economic impacts of immigration on the STEM workforce and on innovation. Using new data and rigorous empirical analysis, this volume examines various aspects of the relationship between immigration, innovation, and entrepreneurship, including the effects of changes in

the number of immigrants and their skill composition on the rate of innovation; the relationship between high-skilled immigration and entrepreneurship; the differences between immigrant and native entrepreneurs; and the post-graduation migration patterns of STEM doctoral recipients, in particular their likelihood of returning to their home country. The volume also examines the roles of the US higher education system and US visa policy in attracting foreign students for graduate study and retaining them after graduation.

[Ordering Information](#)



National  
Bureau of  
Economic  
Research

THE ROLES OF IMMIGRANTS  
AND FOREIGN STUDENTS IN  
US SCIENCE, INNOVATION,  
AND ENTREPRENEURSHIP

Edited by Ina Ganguli, Shulamit Kahn,  
and Megan MacGarvie



# NBER *Reporter*

NATIONAL BUREAU OF ECONOMIC RESEARCH

1050 Massachusetts Avenue  
Cambridge, Massachusetts 02138-5398  
(617) 868-3900

Change Service Requested

Nonprofit Org.  
U.S. Postage  
PAID  
National Bureau of  
Economic Research