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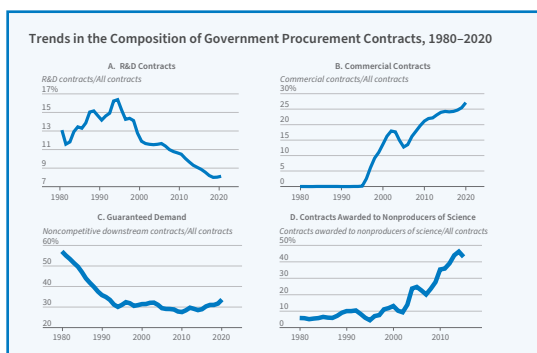
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Program Report

ALSO IN THIS ISSUE



The Changing Structure
of American Innovation 8

CEOs and Firm Performance 12

Life-Cycle Impacts of
Graduating in a Recession 17

Sin Taxes: Good, Better, Best 22

NBER News 27

Conferences and Program Meetings 30

Political Economy

Francesco Trebbi and Ebonya Washington*

The mission of the NBER's Political Economy Program is to provide a forum for the discussion and distribution of theoretical and empirical research that identifies and addresses political constraints on economic problems. The program flourished under the vision and leadership of founding director Alberto Alesina from its launch in 2006 until his untimely death in 2020. As codirectors, we are grateful to him for shaping it into the active research hub it is today. The program currently has 95 affiliates, who have produced more than 1,000 working papers since the last program report, in 2013.

Political Economy is a broad-tent program in terms of methodology, geography, time period, and topics covered. Members study not only what might be thought of as traditional political economy—the links between economics and politics, such as the study by Daron Acemoglu, Suresh Naidu, Pascual Restrepo, and James Robinson of how elections and institutions impact growth¹—but also investigate how forces like moral values and behavioral impulses impact politics and economics. Benjamin Enke's investigation of morality and voting² and Pietro Ortoleva and Erik Snowberg's exploration of the role of overconfidence in political behavior³ are but two examples of the latter.

We cannot cover the full breadth of program affiliates' output in the decade since the last report. We therefore will not revisit the four topics—institutions, diversity, US elections, and culture—that it highlighted, except to say that they are still highly researched. As one illustration, Alberto Bisin and Paola Giuliano convene a full-day meeting on cultural economics adjacent to the spring program meeting. We highlight instead three different topics on which program affiliates have focused their efforts: political polarization, state capacity, and conflict. All have large welfare significance.

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Polarization

Extreme populist parties have gained strength across democratic nations in the years following the 2008–09 financial crisis, and alongside this phenomenon has grown researchers' interest in polarization. In addition to studying diverging political views, Levi Boxell, Matthew Gentzkow, and Jesse Shapiro document a rise in affective polarization — negative attitudes toward nonmembers of one's political party — in six of 12 OECD countries investigated, with the greatest increase in the United States.⁴ [Figure 1] Party identification now seems to operate as a key dimension of individual identity, with research demonstrating a connection between partisanship and a range of nonpolitical behaviors, from Gordon Dahl, Runjing Lu, and William Mullins's study of fertility⁵ to Emanuele Collonnelli, Valdemar Pinho Neto, and Edoardo Teso's look at hiring in Brazil.⁶

The central concern of the research on polarization is understanding the causes of its rise and underlying drivers. The bulk of the empirical analysis supports a role for three major causes: trade and globalization, ethnocentrism, and the media. Regarding trade, Cevat Aksoy, Sergei Guriev, and Daniel Treisman demonstrate that, across 118 countries, opinions of the incumbent politician diminish as imports increase.⁷ Moderates are driven out of office in the face of rising Chinese trade exposure, Christian Dippel, Robert Gold, and Stephan Heblich show for Germany;⁸ and David Autor, David Dorn, Gordon Hanson, and Kaveh Majlesi document for the US.⁹

Evidence of a role for ethnocentrism in the rise of populism is provided by, among others, Simone Moriconi, Giovanni Peri, and Riccardo Turati, who show that low-skilled immigration has driven nationalistic preferences across 12 European nations since 2007.¹⁰ Immigration also decreases support for redistributive policies, according to Alesina, Elie Murad, and Hillel Rapoport,¹¹ contributing to a long literature that seeks to understand why inequality does not predict support for increased redistribution, a puzzle that has great relevance for our understanding of polarization. In fact, Alesina, Armando Miano, and Stefanie Stantcheva find that just having survey respondents think about immigration lowers support for redistribution.¹² Jesper Akesson, Robert Hahn, Robert Metcalfe, and Itzhak Rasooly find similar effects for race.¹³

Outside of the connection with polarization, program affiliates remain interested in how racial, ethnic, religious, and gender identity impact political preferences, behavior, and, most of all, treatment received in the political sphere. Elizabeth Cascio and Na'ama Shenhav analyze 100 years of women's voting in the

political beliefs.¹⁹ Nor are they the only two explanations explored for increased polarization. Political economists have for quite some time been asking questions around how our biases impact how we take in media and how media further our biases. Ester Faia, Andreas Fuster, Vincenzo Pezone, and Basit Zafar study the former²⁰ and Gregory J. Martin and Ali Yurukoglu the latter.²¹

Increasingly, the field of political economy, like the public's attention, has also turned to social media and its role in furthering discord. Gene Grossman and Elhanan Helpman model how parties' ability to push fake news to their supporters increases both policy divergence and sub-optimal outcomes.²² Acemoglu, Asuman Ozdaglar, and James Siderius demonstrate platforms' role in this process, showing that they are incentivized to create algorithms that amplify low-reliability content.²³ But even outside of fake news, Renee Bowen, Danil Dmitriev, and Simone Galperti show that our sharing behavior furthers polarization.²⁴ Rafael Di Tella, Ramiro Gálvez, and Ernesto Schargrodsky find that following a political event, in this case the 2019 Argentina presidential debate, only those inside the echo chamber became more polarized.²⁵ On the other hand, intriguingly, Boxell, Gentzkow, and Shapiro describe how polarization has increased most in recent years among demographic groups least likely

to use social media.²⁶ Nonetheless, Thomas Fujiwara, Karsten Müller, and Carlo Schwarz find that social media affects vote shares in US elections.²⁷

While there is no consensus on the role of social media in politics, and certainly not on whether social media enhance or diminish welfare more broadly, what is clear is that the role of new media in campaigns, information acquisition, and political movements will be exciting areas of future inquiry, both in relation to and outside of the impact on political polarization. The same is true of other potential drivers of polarization, such as income and wealth inequality.

State (In)Capacity

Over the past decade, program affiliates have sought to understand the emergence of weak versus capable states. Studies by Timothy Besley, Robin Burgess, Adnan Khan, and Guo Xu,²⁸ who examine the cross-national relationship between per capita income and the level of government bureaucracy [Figure 2], and Acemoglu, Camilo Garcia-Jimeno, and Robinson who look at the networks of Colombian municipalities are recent examples.²⁹ The field has reached something of a consensus on the importance of strong states in long-run development, as Melissa Dell, Nathaniel Lane, and Pablo Querubin show for northern Vietnam³⁰ and Charles Angelucci, Simone Meraglia, and Nico Voigtländer demonstrate for England.³¹

A strong state, however, is not necessarily a driver of welfare gains, particularly if the state is in the hands of powerful elites. State capture is therefore another interest, with empirical investigations ranging from Claudio Ferraz, Frederico Finan, and Monica Martinez-Bravo's work on traditional elites in Brazil³² to Patrick Francois, Ilia Rainer, and Trebbi's study of autocratic cabinet allocations to ethnic groups in sub-

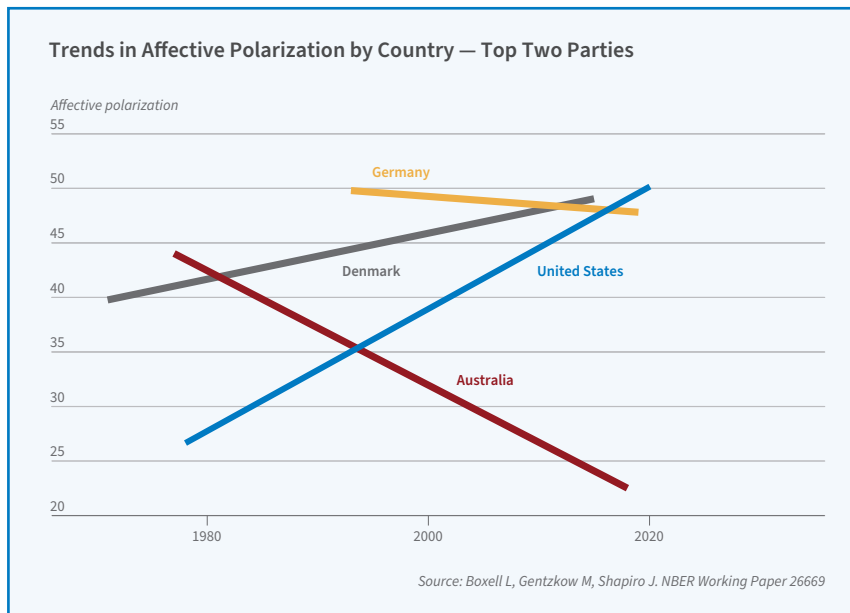


Figure 1

United States.¹⁴ Across contexts, contributors are exploring how ethnic and religious concordance between representatives and voters impacts receipt of public goods. See, for example, Kaivan Munshi and Mark Rosenzweig on India¹⁵ and Brian Beach, Daniel B. Jones, Tate Twinam, and Randall Walsh on California.¹⁶ Researchers are also continuing to explore how voters' voices are suppressed by race, as in Federico Ricca and Francesco Trebbi's work on how endogenous political institutions keep minorities from voting in the present-day US¹⁷ and Enrico Cantoni and Vincent Pons' analysis of voter ID laws.¹⁸

Returning to polarization, ethnocentrism and economic causes are not necessarily at odds: Jiwon Choi, Ilyana Kuziemko, Ebonya Washington, and Gavin Wright provide evidence for an interactive role for the two forces in

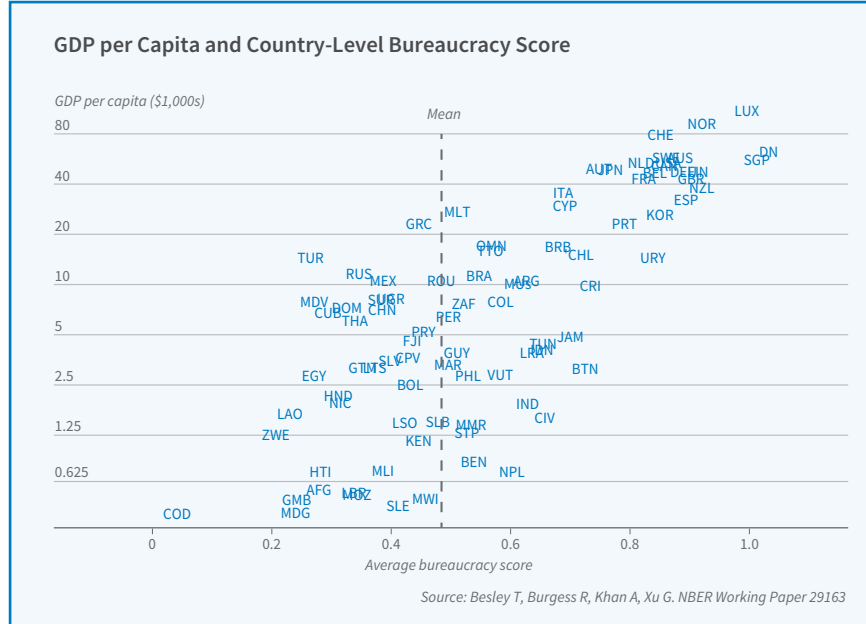


Figure 2

Saharan Africa.³³

Another factor that can weaken state capacity is the misalignment of incentives of government officials. Raymond Fisman and Yongxiang Wang find heavy manipulation of accidental death data in China due precisely to this cause.³⁴ Acemoglu, Leopoldo Fergusson, Robinson, Dario Romero, and Juan F. Vargas point to the perils of the lack of state capacity along critical dimensions when the incentives for representatives of the state are highpowered.³⁵

In addition to moral hazard, asymmetric information within the government can be a cause of weakness. Ernesto Dal Bó, Finan, Nicholas Li, and Laura Schechter provide experimental evidence of this issue for agricultural inspectors in Paraguay.³⁶ Oriana Bandiera, Michael Carlos Best, Adnan Qadir Khan, and Andrea Prat show how improvements in efficiency arise from the delegation of authority to procurement officers in Pakistan.³⁷

A final factor that can hobble state capacity is corruption, a huge topic of investigation. To provide two examples of its documentation, Fisman and Wang show that politically connected firms in China are allowed to get away with two to three times higher workplace fatality rates than unconnected firms.³⁸ In the US, Filipe R. Campante and Quoc-Anh Do demonstrate that corruption tends to be higher in systems where the centers of political power are more geographically isolated from principals/voters, a finding that suggests that corruption matters to voters.³⁹ Finan and Maurizio Mazzocco demonstrate this explicitly, showing that Brazil's anti-corruption audits are highly valued by voters notwithstand-

ing their costs.⁴⁰ In Mexico, Eric Arias, Horacio Larreguy, John Marshall, and Pablo Querubin find that the frequency of malfeasance is important for electoral accountability.⁴¹

The most difficult questions about corruption revolve around how to stamp it out and what might be the unintended consequences of eliminating it. Raúl Sanchez de la Sierra, Kristof Titeca, Haoyang Xie, Albert Malukisa Nkuku, and Aimable Amani Lameke present a case study of the internal organization of the traffic police in the Democratic Republic of the Congo, where the effects of anti-corruption efforts are ambiguous and depend on the transfer schemes and

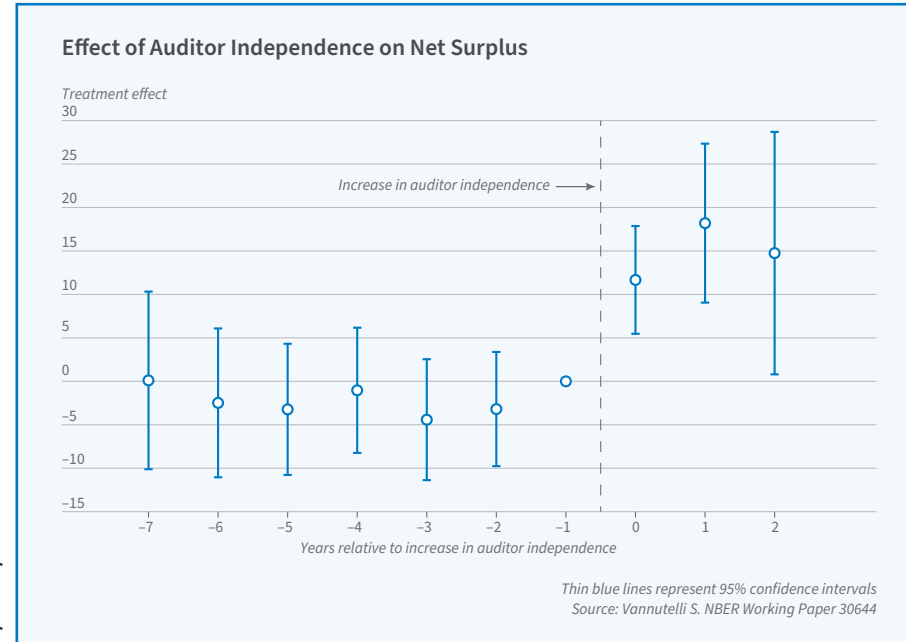


Figure 3

quotas allocated between lower-ranked and higher-ranked police officers.⁴² In El Salvador, Zach Y. Brown, Eduardo Montero, Carlos Schmidt-Padilla, and Sviatschi find that policies aimed at pacifying and reducing nonaggression among criminal gangs increased extortion.⁴³ Lauren Cohen and Bo Li provide evidence that in the US the Foreign Corrupt Practices Act, a statute aimed at curtailing foreign bribery, is misused strategically against foreign firms located in a senator's state when the senator is up for reelection.⁴⁴

Political capture of public officials,

a phenomenon often associated with corruption, has also received growing attention. Xu, Marianne Bertrand, and Burgess demonstrate that social proximity facilitates political capture of bureaucrats in India,⁴⁵ while Silvia Vannutelli shows that removing the ability of Italian mayors to hire their own financial auditors yields municipal fiscal improvements.⁴⁶ [Figure 3]

Increasing Conflict and Violence

Since 2013 the world has seen the rise and fall of the Islamic State in the Middle East, heightened conflict in Syria in the aftermath of the Arab Spring, insurgencies in Yemen, Afghanistan, and Nigeria, and Russian invasions of Ukraine, first in 2014 and then on a larger scale in 2022. All these conflicts have far-flung economic, social, and political consequences. Program affiliates have increasingly turned their attention to conflict, beginning with its origins. Acemoglu, Fergusson, and Simon Johnson⁴⁷ and Cemal Eren Arbatli, Quamrul Ashraf, Oded Galor, and

Marc Klemp⁴⁸ investigate anthropological and economic origins from a broad historical perspective. Other researchers consider cultural origins, including Eoin McGuirk and Marshall Burke in the context of Africa,⁴⁹ or institutional constraints, like Oendrilla Dube and Naidu⁵⁰ and Antonella Bandiera, Lelys Dinarte Diaz, Juan Miguel Jimenez, Sandra Rozo, and Maria Micaela Sviatschi in Latin America.⁵¹

Researchers also seek to understand the incentives and strategies of the actors. Studies by Efraim Benmelech and Esteban Klor⁵² and Trebbi, Eric

Weese, Austin L. Wright, and Andrew Shaver⁵³ focus on the role of insurgent groups in Asia. Veli Andirin, Yusuf Neggers, Mehdi Shadmehr, and Shapiro estimate various regimes' tolerance for citizen action by studying the frequency of political protests.⁵⁴ [Figure 4]

Burke, Solomon Hsiang, and Edward Miguel outline the role of climate in conflict.⁵⁵ Murat Iyigun, Nathan Nunn, and Nancy Qian take the long view, investigating the question empirically over five centuries of conflicts in Europe, North Africa, and the Near East, from 1400 to 1900.⁵⁶

Increasing attention to the topic of violence has generated closer interactions between political economy and other subfields of economics, particularly development and economic history. Several of the studies cited above focus on developing countries. Similarly, Ying Bai, Ruixue Jia, and Jiaojiao Yang's work on the role of Zeng Guofan in the Taiping Rebellion in nineteenth century China connects to both subfields.⁵⁷ Leander Heldring, Robinson, and Parker Whitfill's study of the political consequences of World War II bombings makes clear the link between political economy and economic history.⁵⁸

Political economy connects economics to international relations. Nation building, nationalism, and war are at the core of work by Alesina, Bryony Reich, and Alessandro Riboni.⁵⁹ Conflict studies also bridge the boundary to cultural anthropology. The long-run impact of conflict on cooperation is explored by Michal Bauer, Christopher Blattman, Julie Chytlová, Joseph Henrich, Miguel,

and Tamar Mitts⁶⁰ and Sarah Lowes and Montero⁶¹ among others. Dal Bó, Pablo Hernández, and Sebastián Mazzuca explore the trade-off between predation and production in proto-states.⁶² These linkages are evidence of the sort of interdisciplinary and cross-field conversations that the Political Economy Program has fostered since its launch.

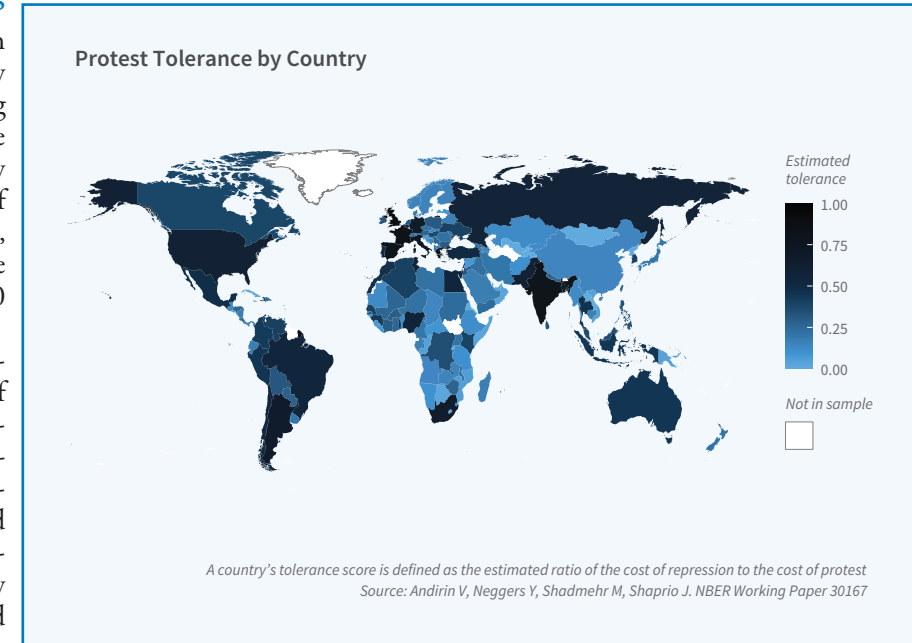


Figure 4

Conclusion

In the words of Alesina and Roberto Perotti: "Political-economy models begin with the assertion that economic policy choices are not made by social planners, who live only in academic papers."⁶³ From state polarization to state capacity to war to many of the other topics that we did not cover in this brief report, researchers in political economy have met complex big-picture questions of the last decade with analytical rigor. We anticipate that they will bring this same approach to the high-impact questions of the decades to come, reinforcing the real-world relevance of this field.

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[Return to Text](#)

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[Return to Text](#)

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[Return to Text](#)

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[Return to Text](#)

Research Summaries

The Changing Structure of American Innovation

Ashish Arora and Sharon Belenzon

The COVID-19 mRNA vaccine was a result of the joint efforts of three types of organization. University of Pennsylvania researchers, notably Katalin Karikó and Drew Weissman, performed some of the foundational research. Startups, including BioNTech, Moderna, and Arbutus, among others, developed key elements of the technology required to safely deliver the vaccine. Established pharmaceutical firms, notably Pfizer, were responsible for testing, production, and distribution. Pfizer and its partner BioNTech developed the vaccine internally, whereas Moderna, the other major supplier of COVID vaccines in the United States, benefited from significant government research funding. This division of labor in innovation, which allowed multiple firms to contribute, is a notable component of the US innovation ecosystem.

Together with our collaborators, we have studied the evolving specialization of US innovation and the rise and fall of industrial research. Though it still flourishes in fields such as artificial intelligence, the corporate lab's heyday was from the 1930s until the 1980s. Many leading US firms have withdrawn from scientific research, closing their labs or reorienting them toward applications rather than basic science.¹ [Figures 1 and 2]

In the 1960s, DuPont scientists published more articles in the *Journal of the American Chemical Society* than MIT and Caltech researchers combined. But by the 1990s, the company had reduced its research focus. The number of scientific articles published by DuPont scientists fell from 749 in 1994 to 245 in 2015, while its US patents more than doubled, from around 1,600 in 1994 to nearly 3,500 in 2012. In 2016, DuPont's Central

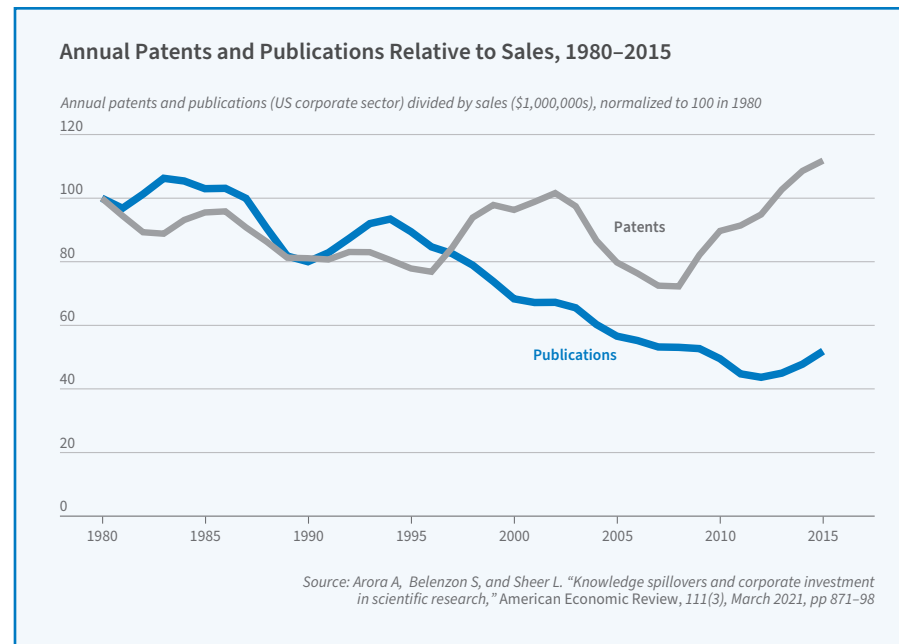


Figure 1

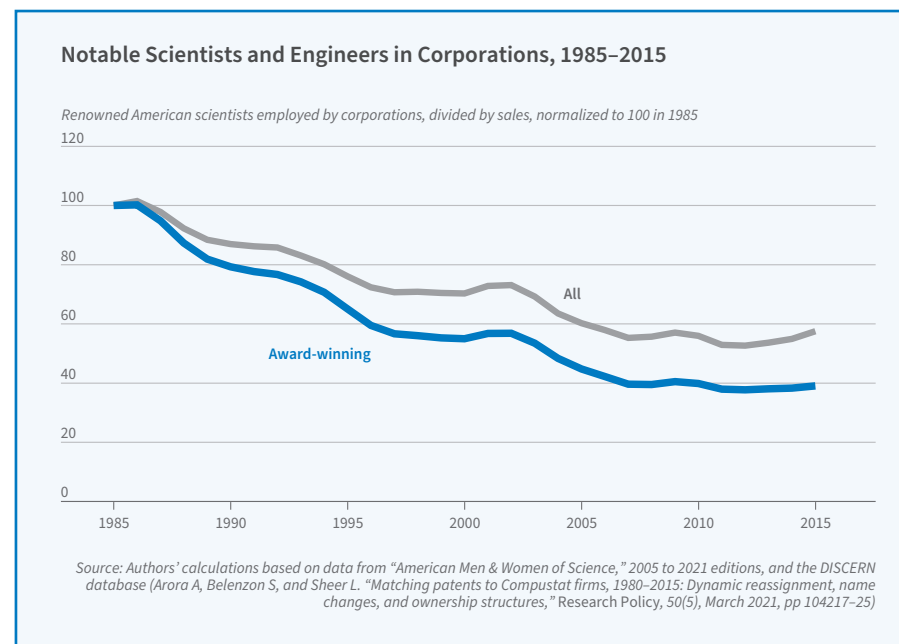


Figure 2

Research & Development organization was merged with the company's engineering division. Consistent with this, National Science Foundation data show that the share of basic and applied research in total business R&D expenditures in the United States fell from about 30 percent in 1985 to less than 20 percent in 2015. Simply put, corporate R&D became less "R" and more "D."²

The Rise of Industrial Research

The leading US companies of the 1870s and 1880s largely relied on external inventions. They acquired inventions in an active market for technology.³ Large companies established labs to evaluate the quality of external inventions and other inputs, test materials, control quality, and troubleshoot production-related issues.⁴ By World War I, some leading firms recognized they could no longer rely on borrowed technologies or individual inventors. Invention was reliant on scientific knowledge, but university research was limited. General Electric, AT&T,

DuPont, and Eastman Kodak led the way by investing in scientific research to fill the gap, and the US corporate lab emerged.

Using newly developed firm-level data from the 1920s and 1930s, we show that the companies most inclined to invest were those using frontier technology in fields where US university research lagged, such as electronics, physics, and polymer chemistry.⁵ In ongoing work, we are examining the different ways the expansion of university research affects private research, including through production of new scientific knowledge, new human capital, and university inventions available through licensing and university spinoffs.⁶

Corporate scientific research paid off in breakthrough innovations and high market valuations. DuPont, initially a producer of explosives, lacquers, and rayon, invested in development of polymer chemistry, which became the basis for new products, most notably nylon and polyester. It helped that DuPont had ample resources to develop and commercialize these products and

faced little competition. Many labs belonged to large companies operating in concentrated industries, which helped insulate them against spillovers.

Research is typically disclosed in scientific publications, and hence upstream research is more likely than downstream development to result in knowledge spillovers. In work with Lia Sheer, we show that corporate investment in research trades off the cost of spillovers to rivals against the benefits to the discovering firm of the use of science in its own inventions.⁷ From 1985 through 2015, spillovers to rivals appear to have increased faster than internal benefits, pointing to one possible reason for the decline of industrial research. [Figure 3, next page] If firms invest in scientific research not only as a perk for talented inventors with a taste for science or as a signal to investors, regulators, or customers, but also as an input to their own inventions, then protection for inventions would encourage investment in research. We find that, consistent with this, weakening patent protection for inventions tied to corporate research reduces follow-on invest-



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Arora received his BA in economics from Delhi University and his PhD from Stanford University, also in economics.

Sharon Belenzon is a professor in the strategy area of Duke University's Fuqua School of Business and an NBER research associate affiliated with the Productivity, Innovation, and Entrepreneurship Program. His research investigates the role of business in advancing science. Through various lenses and perspectives, this research aims to deepen understanding of why American corporations participate in scientific research and why they have been cutting back on this activity over the past four decades. The work develops large-scale empirical measures of research and development and the application of science to technology.

Belenzon earned MA and BA degrees in economics from Tel Aviv University, Israel. He received his PhD from the London School of Economics and Political Science and completed postdoctorate work Nuffield College, University of Oxford. He was the 2007 recipient of the Ewing Marion Kauffman Foundation postdoctoral fellowship at the NBER.



ment in that research stream.⁸

Knowledge spillovers have tended to focus discussions of innovation policy on government support for research, neglecting the potential role of procurement policies. Though the COVID-19 mRNA vaccine was based on years of federally funded research, federal procurement contracts were vital to the final stages of vaccine development. Belenzon and Larisa Cioaca document changes in government procurement policies that may have contributed to the decline in corporate science.⁹

In addition to funding R&D activities directly, government procurement provides incentives to businesses to invest in R&D by rewarding firms that demonstrate technological superiority in R&D races with downstream procurement contracts. Such “guaranteed demand” was particularly popular during the Cold War (1948–89) but has since diminished. R&D contracts are increasingly decoupled from downstream procurement. [Figure 4] Beginning in the 1980s, the rise of Japan and the end of the Cold War shifted attention away from national security and toward innovations with commercial applications. The growing use of full and open competition in procurement contracting reduced

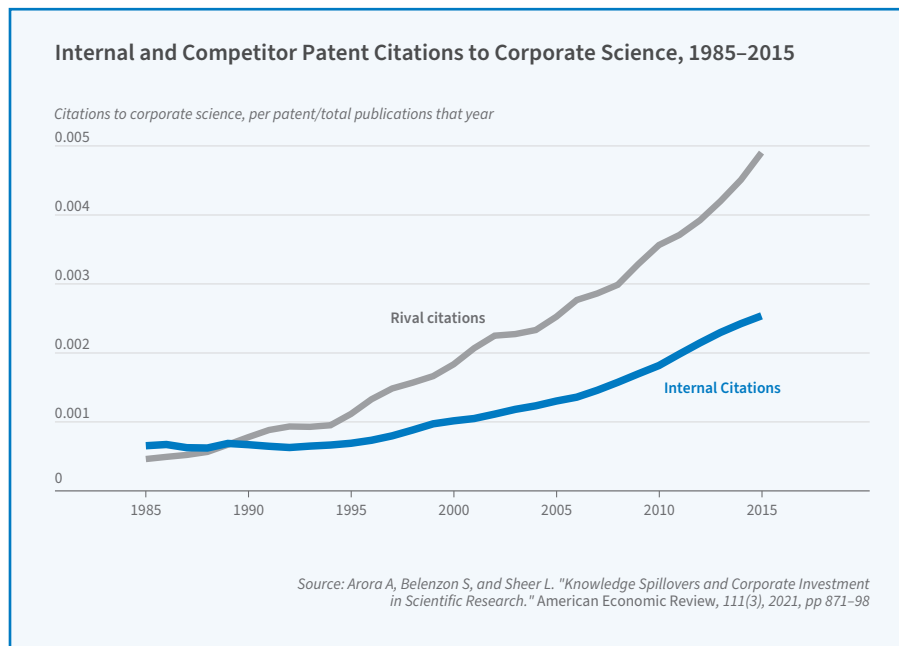


Figure 3

the government’s ability to take the risk out of upstream corporate R&D investments.

American Innovation and the Loss of Corporate Research

Corporate research projects are difficult to replicate in universities and startups: they are larger in scale, combine

scientific and engineering disciplines, and are mission oriented. The synergy between science and its application finds its natural expression in industrial research. Significant discoveries are often made while solving specific problems. Louis Pasteur, in studying how to prevent wine from spoiling, developed the germ theory of fermentation as well as the technique of pasteurization. His discovery, in addition to being an extremely valuable industrial innovation, led to the modern sciences of bacteriology, immunology, and microbiology, and to the development of vaccines.

Close collaboration between science and engineering is much easier inside an industrial lab. The Google Translate project is a case in point. Google’s software engineers converted the code created by its computer scientists into the company’s TensorFlow language, hardware engineers modified semiconductor chips originally custom built by Google for neural networks, and database engineers dealt with the copious amounts of data required by the algorithms.

The machine translation example also highlights the multidisciplinary nature of mission-oriented research. The transistor, for instance, would not have been possible without the interdisciplinary efforts of physicists, metallurgists, and chemists at Bell Labs. Metallurgists at the

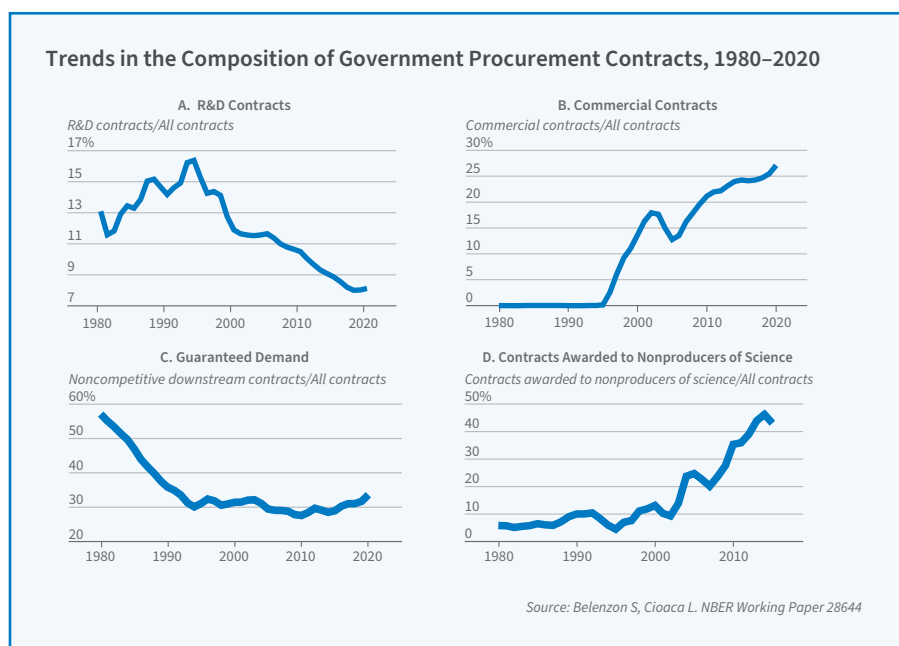


Figure 4

firm had become experienced in purifying and doping semiconductors while manufacturing back-voltage rectifiers for radars during World War II. Bell metallurgist Henry Theurer later developed methods for processing germanium crystals to impurity levels as low as one part per 10 billion. It was also at Bell Labs that Gordon Teal and Ernest Buehler’s crystal “pulling” method for fabricating the positive-negative junctions in silicon rods was developed, as was W. G. Pfann’s “zone refining.”¹⁰ William Shockley’s transistor would not have been commercially successful without both of these in-house achievements in material sciences.

An innovation system relying on venture-capital-funded startups may create other kinds of gaps as well. For instance, as Josh Lerner and Ramana Nanda argue, venture investment is narrowly focused on software, digital products, and biotech, neglecting “deep-tech” sectors such as semiconductors and hardware, materials, and clean energy.¹¹ It may well be that startups trying to develop science-based innovations in such sectors are unattractive investments—they can capture only a small share of the value they create because of their weak bargaining position vis-à-vis potential acquirers.¹² Their bargaining position is worse if the decline of corporate research results in fewer potential acquirers.

Corporate labs, which were once the hub of the innovation ecosystem in America, have given way to universities and startups. Though the new specialized system offers many benefits, it may also leave important gaps. Startups are less likely to succeed in pulling off large-

scale or multidisciplinary innovations. Sectors where both scientific research and technical and commercial development are intertwined are more likely to be neglected by venture capitalists. These gaps may lower the social return to investment in scientific research.

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Sadun's research focuses on managerial and organizational drivers of productivity and growth. She cofounded large-scale projects to measure management practices and managerial behavior in organizations, such as the World Management Survey, the Executive Time Use Survey, and the first large-scale management survey in hospitals, MOPS-H, conducted in partnership with the US Census Bureau. Her work has helped uncover the extent to which the diffusion of basic management and organizational practices varies across organizations within and across countries, and how this heterogeneity affects productivity. Sadun has examined the complementarity between technology adoption and management practices in production, and is currently studying the effectiveness of large-scale digital training investments in private and public sector organizations.

Sadun is codirector of the HBS Digital Reskilling Lab, and faculty cochair of the Harvard Project on the Workforce. She is the author of articles published in journals such as *The Quarterly Journal of Economics*, *American Economic Review*, and *Journal of Political Economy*. She served as an economic adviser to the Italian government in 2020 and 2022 and received the honor of *Grande Ufficiale dell'Ordine Al Merito della Repubblica Italiana* in 2021. Sadun received her PhD in economics from the London School of Economics and Political Science.

CEOs and Firm Performance

Raffaella Sadun

CEOs have become a topic of increasing scrutiny in economic research. Early studies on this topic inferred the presence of differentiation in CEOs' abilities and managerial styles *indirectly*, examining changes in firm performance after exogenous events such as deaths or movements of managers across different firms affected their ability to manage.¹ This summary describes recent empirical work that I have conducted to generate *direct* evidence on what top managers do, how they differ from one another, and whether these differences matter for firms' performance.

The research touches upon different aspects of what CEOs do—ranging from day-to-day behavior to strategy setting. Ultimately, it strives to build new measurements of CEOs' activities that are at the same time fine grained and scalable within and across countries. Given the intangible nature of leadership, this requires embracing an eclectic empirical approach, including developing new survey instruments, exploring previously untapped quantitative and textual data sources, and adopting machine learning methods to leverage rich and at times unstructured data.

This research has led to three broad findings. First, top managers vary considerably in what they do, both in terms of day-to-day behaviors (effort on the job, allocation of time across activities) and decision-making approaches (specifically, the formulation and execution of firm strategies). Second, CEOs also differ in terms of what they *do not* do, that is, the extent to which they allocate decision-making authority to other individuals in their organizations. Third, differences across CEOs in both activities and delegation are related to organizational

performance, primarily due to matching effects. There isn't one optimal way to be a CEO. What matters is the fit between what CEOs do (or do not do, in the case of delegation) and the specific needs of the firms that they run. This latter finding points to the importance of studying frictions in the market for CEOs, starting with imperfections in the selection of CEOs and in the way in which CEOs' activity is monitored and rewarded within firms.

What Do CEOs Do? Time Use

In a series of papers, Oriana Bandiera, Renata Lemos, Stephen Hansen, Andrea Prat, and I measured and studied differences in CEO behavior, looking at both hours spent working and time allocation across different activities.² The notion that actual behavior could be an important factor of differentiation across managers is well accepted in the management literature,³ but the empirical examination of managerial time use has been somewhat elusive. To provide direct evidence on managerial behavior, we developed a new methodology to measure with unprecedented detail the time use of 1,114 CEOs in six countries. We scaled up traditional shadowing approaches—detailed observations of CEOs in action—by measuring CEOs' diaries via daily calls with executives or their personal assistants during a random workweek. Overall, we collected data on 42,233 activities covering an average of 50 working hours per CEO. For each activity, we recorded the same five features: type (for example, meeting, plant/shop-floor visit, business lunch, or personal time), planning horizon, number of participants, number of different functions involved, and participants' function

(for example, finance, marketing, client, or supplier). The method allowed us to build a bottom-up measure of CEO effort by gauging the time spent on work-related activities during the week.

The data show wide variation in both CEO effort and time allocation. Figure 1 shows the distribution of hours worked across CEOs. Hours recorded vary from about 20 to nearly 100. Figure 2 provides a snapshot of differences in CEO activities. The work of CEOs mostly goes into meetings—more than 50 percent of working time at the median, involving both employees and outsiders. Even in this case, behaviors across CEOs vary markedly.

What explains these differences? Some of the variation in CEO labor supply is accounted for by differences in firm governance: family-business CEOs work 9 percent fewer hours than other firms' CEOs, even conditional on formal qualifications and firm characteristics such as size and industry. Additionally, family-firm CEOs appear to be more likely to take time off when popular sporting events are being broadcast, and are less likely to work their usual schedules when snowstorms or other weather shocks make it more difficult to reach the office. Since differences in effort are correlated with firm performance—18 percent of the performance

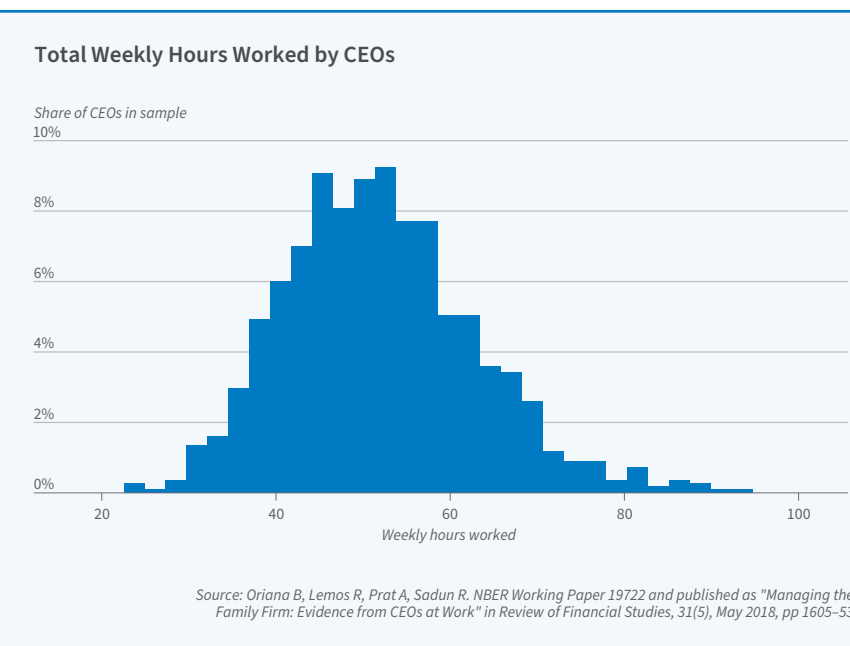


Figure 1

gap between family and nonfamily firms is accounted for by differences in effort—the results suggest that potential profit opportunities may be lost in the pursuit of private benefits of control.

Examining differences in time allocation turns out to be a more complex challenge than analyzing CEO effort, since the wealth of information contained in the time diaries is too extensive to be easily compared across CEOs or

correlated with other outcomes of interest, such as CEO and firm characteristics. To address this challenge, we use a machine learning algorithm (Latent Dirichlet Allocation) that projects the many dimensions of observed CEO behavior onto two "pure" behaviors—groups of related activities that together reflect a coherent, underlying behavioral profile. The algorithm finds the combination of features that best differentiates the sample

CEOs. The first of the two pure behaviors is associated with more time spent with employees involved in production activities and in one-on-one meetings with firm employees or suppliers. The second pure behavior is associated with more time spent with C-suite executives and in interactions involving several participants and multiple functions inside and outside the firm. To fix ideas, we label the first type of pure behavior "manager" and the second "leader," following a popular distinction described by John Kotter.⁴

Armed with a one-dimensional behavior index that represents each CEO as a convex combination of the two pure behaviors, we then study the correlation between CEO behavior, firm characteristics, and firm performance. We find that leader behavior is more common in large firms, multinationals, listed firms, and in sectors with high R&D intensity

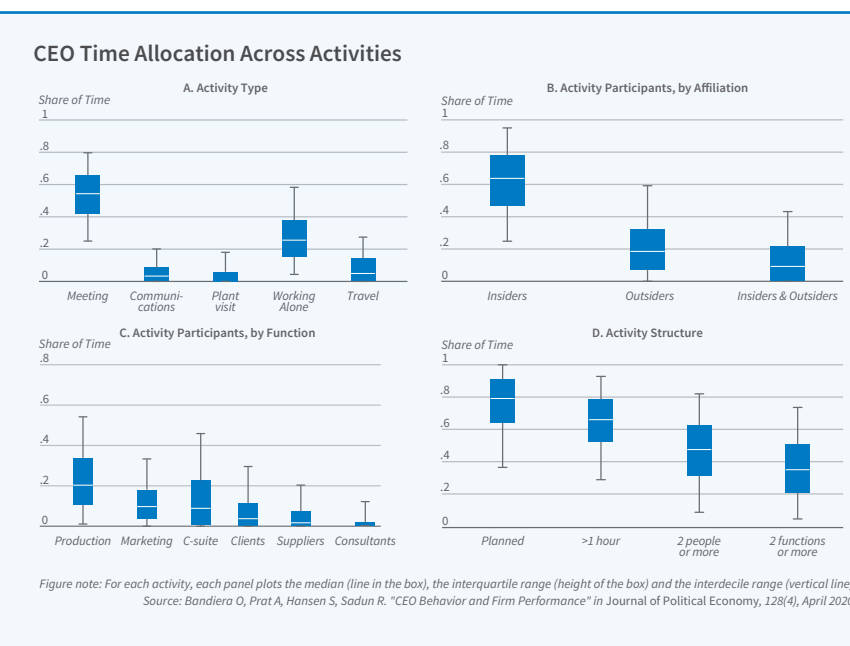


Figure 2

and production processes denoted by a higher incidence of abstract, rather than routine, tasks. We also find that leader behavior is more likely to be found in more productive and profitable firms. The correlation is economically and statistically significant: a one standard deviation in the CEO behavior index is associated with an increase of 7 percent

in sales, controlling for labor, capital, and other standard firm-level covariates. In the absence of exogenous variation in CEOs' assignment to firms, we cannot assume this relationship is causal—for example, CEOs may simply adapt their behavior to firms' needs, and more productive firms may hire more leaders. However, two pieces of evidence go against this interpretation. First, pre-appointment trends in performance do not predict the appointment of a leader CEO; second, firms that hire a leader CEO experience a significant increase in productivity only after the CEO appointment, and this effect emerges gradually over time. That is, CEO behavior does not seem to be merely a reflection of differential pre-appointment trends or firm-level, time-invariant differences in performance.

The association between the CEO behavioral index and firm performance does not necessarily imply that all firms would benefit from hiring a leader CEO. In fact, the performance correlations emerging from the data are consistent with both vertical differentiation among CEOs—that is, that all firms would be better off with a leader CEO—and horizontal differentiation with matching frictions—that is, that some firms would be better off with leaders and others with managers, but not all firms needing a leader CEO are able to appoint one.

We develop and estimate a simple model of CEO firm assignment that encompasses both vertical and horizontal differentiation to test which is a better fit for the data. The model estimation is consistent with horizontal differentiation of CEOs with matching frictions: while most firms with managers are as productive as those with leaders, the sup-

extent to which CEOs delegate decision-making authority to middle managers in a large cross-country survey of manufacturing firms.⁶ Our survey instrument, administered over the phone by a large team of trained interviewers, asked middle managers the maximum amount they could spend without asking permission from the central headquarters (CHQ) and their autonomy on four key domains of activity: spending, hiring, marketing, and product introduction. We find wide heterogeneity in delegation both across and within countries, as shown in Figure 3.

While some of this variation is related to firm characteristics—for example, delegation was much higher in larger plants—the data also suggest an important role for contextual factors external to the firm, and in particular the level of generalized

trust in the area in which the firm CHQ is located. Firms in higher-trust regions are more decentralized and larger, and CHQ trust also predicts the level of delegation in subsidiaries, even when they are located in other regions or countries. We find that multinational subsidiaries located in a country that their parent country tends to trust, like the subsidiary of a French multinational in Belgium, are typically more decentralized than subsidiaries located in a country that the multinational's parent country does not trust, like a French subsidiary located in Britain. Overall, these results suggest that external forces, and in this case some specific aspects of culture, may have powerful effects on CEOs' willingness to delegate and, ultimately, on firm structure.

Even in the case of delegation, the data suggest the importance of matching CEO decisions to the specific needs of the firm. Philippe Aghion, Bloom,

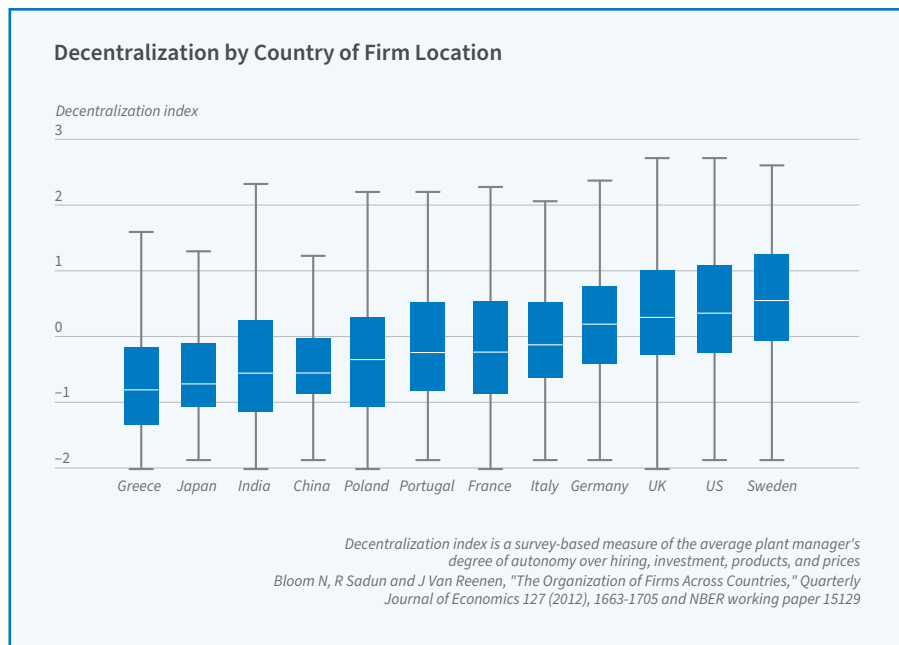


Figure 3

ply of managers outstrips demand such that 17 percent of firms end up with the "wrong" type of CEO. These inefficient assignments are more frequent in lower-income countries (36 percent versus 5 percent of firms). The productivity loss generated by the misallocation of CEOs to firms accounts for 13 percent of the labor productivity gap between high- and low-income countries.

What CEOs Do Not Do: Delegation

Given the multitude and complexity of the activities performed inside organizations, it is essential for CEOs to be able to effectively delegate work. Effective delegation allows for more effective matching of problems with expertise and may increase empowerment and motivation of subordinates.⁵ Nicholas Bloom, John Van Reenen, and I explored the

Brian Lucking, Van Reenen, and I study the performance effects of decentralization during the Great Recession, a time that coincided with a sudden increase in uncertainty in demand.⁷ Using two large microdatasets on decentralization in firms in the US and 10 OECD countries, we find that firms that delegated more power from the central headquarters to local plant managers prior to the Great Recession outperformed their centralized counterparts in sectors that were hardest hit by the subsequent crisis, as measured by the exogenous component of export growth and product durability. We interpret these results through the lens of a simple model of delegation, which provides support to the idea that decentralization provides firms with the necessary flexibility and local perceptiveness needed to respond to turbulent business conditions.

Strategy

A key prerogative of CEOs is setting firm strategy. Direct evidence on whether CEOs vary in their strategy "practices," however, is scant. To make progress on this topic, Bloom, Michael J. Christensen, Jan Rivkin, M. J. Yang, and I examine how chief executives formalize, develop, and implement strategy in a sample of 262 Harvard Business School-educated CEOs.⁸ In spite of their common graduate education, there is tremendous variation in how strategy is approached—specifically how structured versus extemporaneous strategy practices are used by CEOs, both between and within industries. CEOs who use more-structured processes tend to lead larger and faster-growing firms. The data suggest that management education matters, as CEOs exposed to a curriculum that emphasized systematic analysis of the external environment—namely, the Harvard Business School first-year curriculum after the introduction of Michael Porter's systematic analysis of competition—were significantly more likely than CEOs who were trained just before the change in curriculum to formalize their position-

ing against competitors. We also find that the more intense focus on strategy formalization may have crowded out attention to organizational practices related to strategy implementation.

Skills

In a separate line of research, Hansen, Tejas Ramdas, Joe Fuller, and I investigate the skill requirements needed to succeed in these top managerial positions using a large corpus of detailed and previously unexplored job descriptions for C-suite positions spanning 17 years.⁹ We classify the information contained in these documents using methods borrowed from machine learning, which allows us to map unstructured, free-text data into distinct clusters of skill requirements. We use the data to examine the variation in the demand for different managerial skills, which provides, to the best of our knowledge, the first direct evidence of C-suite skill requirements. Finally, we match the job description data with firm accounts and job postings for other occupations within the same firm and analyze the extent to which demand for social skills—a cluster that experienced sustained growth over time in CEO job descriptions—varies across firms. The results suggest that social skills are in especially high demand in larger, more complex, more IT-intensive organizations, consistent with the idea that social skills may facilitate the trading of expertise in the firm.¹⁰

Conclusions

CEOs play an increasingly important role in modern organizations, yet the nature of their activity and the mechanisms through which they may be able to affect firm performance often escape rigorous empirical investigation. The data that I helped build over the past few years show tremendous heterogeneity in CEO activities, delegation, decision-making approaches, and skill requirements. While the evidence supports the notion that CEOs matter for firm performance, it also suggests that this effect

runs through the appropriate matching of CEOs to firms—that is, differentiation among CEOs is largely horizontal rather than vertical. This points to the crucial importance of understanding the mechanism through which CEOs are selected, and the governance of the CEO-firm relationship, which is essential to monitor fit and, if needed, to break bad matches.

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[Return to Text](#)

Life-Cycle Impacts of Graduating in a Recession

Hannes Schwandt and Till von Wachter

Young adults who enter the labor market during recessions can experience negative impacts to their economic, family, and health outcomes that endure into middle age and beyond. Those who join the workforce in a downturn have lower long-term earnings, higher rates of disability, fewer marriages, less successful spouses, and fewer children. In middle age they also have higher mortality due to lung, liver, and heart disease. The long-lasting effects of labor market shocks to young adults have important implications for assessing the costs of recessions and government interventions.

Young adulthood — the period from age 18 to 25 — is a time of profound changes that affect the entire life cycle. During this time, the vast majority of people transition from adolescent dependence to adult independence. They complete their education or training, enter the labor market, and start families. Economic theory and casual observation suggest that their early life-cycle decisions are highly interdependent and vulnerable to economic shocks. An increasing number of studies in medicine and psychology also show that early adulthood is a critical phase for neurological, social, and psychological development.

Large and recurring shocks like recessions can affect a significant share of young adults who are in this critical phase. A staggering 30 percent — 46 million — of prime-age workers in the US labor force in 2019 entered the market for the first time during a recession year. Business cycles are known to have strong contemporaneous impacts on young adults and their household decisions, including marriage, fertility, and homeownership.¹

A growing body of research has shown that entering the labor market in

a recession leads to losses in earnings, wages, and employment that persist for about 10 years, and that these losses are larger for less advantaged labor market entrants.² Yet, recent analysis suggests that an unlucky start could have longer-term consequences. For example, Anna Aizer and coauthors suggests that the effect of economic interventions may last into middle age.³ A small number of studies indicate that some impacts on earnings and health can persist until age 40, and that economic conditions in youth and early adulthood may even affect mortality in middle age.⁴ Hence, it is important to extend the follow-up period of studying the effect of adverse labor market entry into middle age, and to analyze the effect on noneconomic outcomes.

Studying life-cycle and midlife effects comes with some challenges, however. It requires long follow-up periods and data on a broad range of economic, family, and health outcomes, as well as knowing where and when an individual entered the labor market. To be able to study a range of outcomes over the life cycle with sufficient precision, we develop a new method for harnessing large, repeated cross-sectional survey and vital statistics data. To analyze effects in middle age, we focus on cohorts entering the labor market in US states before, during, and after the 1982 recession — the largest postwar downturn before the Great Recession — from labor market entry until age 50.

Evidence from Recession Graduates

Economic models of career progression, family formation, and health predict that even short-term economic shocks can affect the entire life cycle into middle age. The theory also high-



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Till von Wachter is a professor of economics, faculty director of the California Policy Lab, and director of the Federal Statistical Research Data Center at the University of California, Los Angeles. He is a research associate in NBER's Aging and Labor Studies Programs. He is also Research Professor at the German Social Security Agency.

Von Wachter's publications span numerous topics in labor economics and the economics of aging. He has written extensively about how labor market conditions, institutions, and firms affect the careers and well-being of workers throughout the life cycle. This includes analyses of how unemployment and job loss affect career and health outcomes, and the role of unemployment insurance and disability insurance in buffering such shocks. Von Wachter also has studied the role of firms in explaining increasing earnings inequality, how lack of competition in the labor market affects the impact of minimum wages, and how firms are impacted by policies increasing retirement ages.

Von Wachter's research has been published in leading journals, such as the *American Economic Review*, the *Quarterly Journal of Economics*, and the *Journal of the American Medical Association*. He has been an advisor to the US Department of Labor, the International Monetary Fund, the Organization for Economic Cooperation and Development, the World Bank, the Government of Canada, the California Labor and Workforce Development Agency, and the City of Los Angeles, among others.

lights how family, economic, and health outcomes can influence one another over the life cycle, and helps us understand why some groups may respond differently than others to an initial shock. While standard models of career progression suggest that entering the labor market in a recession has only temporary effects, models in which job search and human capital accumulation occur in sequence can imply long-lasting effects, especially if workers' ability to adjust declines with age.

Models of marriage and fertility suggest that having fewer labor market opportunities may lead some individuals to start families earlier, especially if income losses are moderate. Marriages induced by unfavorable labor market conditions may be less stable, and persistently lower earnings are predicted to lead to an increase in divorces, lower marriage rates, and reduced fertility. In parallel, economic stress, family instability, and lasting reductions in earnings likely imply lower health investments throughout people's lives. The cumulative effect on health will result in increasingly greater mortality during middle age, when death rates naturally increase. Poorer health and unstable families will, in turn, tend to depress productivity and are associated with a rise in the incidence of work-related disability.

To measure a broad set of outcomes in a comparable fashion over a long period of time, we use National Vital Statistics System data from 1979 to 2016 and population estimates from the US Decennial Census and the American Community Survey (ACS) to compute mortality rates. Information on socioeconomic outcomes, including earnings, labor supply, marital status, divorce, and cohabitation, is derived from the Census, the ACS, and the Current Population Survey. Our mortality analysis is based on more than 900 million person-year observations and over 1.7 million deaths. The analysis

of socioeconomic outcomes is based on 7.8 million survey observations.

Our analysis focuses on the impact of fluctuations in the state-level unemployment rate. This provides us with exogenous variation in local labor market conditions and allows us to net out ongoing trends for all cohorts at the national level. To further ensure that we only measure the effect of temporary initial conditions and not the ensuing evolution in regional economies, in an extensive robustness analysis we control for potentially confounding concurrent trends at the state and cohort levels.

One complication is that our cross-sectional data do not contain information on the state or the year in which an individual entered the labor market. Furthermore, people might migrate to a different state before graduating, or time their graduation in response to local economic conditions. These responses could bias the analysis even if we knew the location and time of graduation. To address these measurement and selection issues, we reweight unemployment rates to reflect the economic conditions a cohort would face at graduation if it had migration and education rates similar to those of surrounding cohorts.⁵ A key advantage of this approach is that it only requires information at the birth-state and birth-year levels and hence can be applied to Vital Statistics, Decennial Census, and ACS data, which otherwise could not be used to study the long-term effects of state-level labor market entry shocks.

Long-Term Impacts on Mortality, Earnings, and Family Lives

Our modeling approach allows us to display the effect of entering the labor market in a recession graphically. Our figures show the estimated changes in the life-cycle profile of several of our core out-

comes due to a 1 percentage point higher unemployment rate at labor market entry. Our first main finding is that a temporarily higher state unemployment rate when young people enter the labor market leads to precisely estimated increases in their mortality in middle age. [Figure 1] The magnitude of these effects is meaningful — if sustained until the end of the cohorts' lives, a 3.9 percentage point higher unemployment rate, as experienced by the 1982 graduation cohort, would lead to a decrease in life expectancy of six to nine months. Consistent with our findings of increased mortality, we also see a rise in morbidity as measured by a rise in the incidence of self-reported disability and receipt of federal disability insurance in middle age.

Our second main finding [Figure 2] is that these midlife mortality increases are driven to an important extent by increases in mortality from diseases related to lifestyle and health behaviors, such as lung cancer, liver disease, and drug overdoses. In contrast, we find no long-term effects on other causes of death, such as accidents or cancers other than lung cancer. Interestingly, we find that a recession at the time of labor market entry lowers the mortality of young workers immediately after graduation through a reduction in accidents.

Our third main finding is that entering the

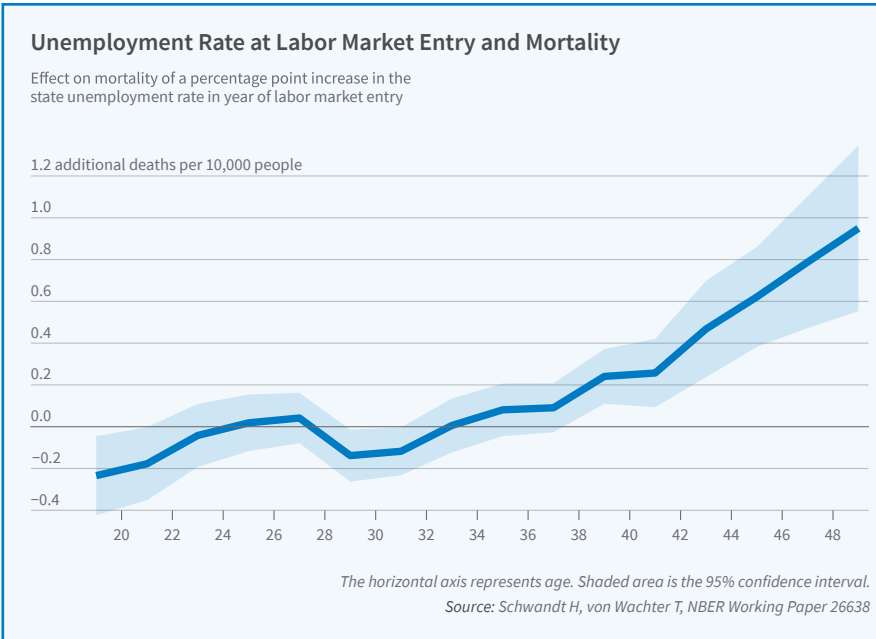


Figure 1

labor market during a recession has substantial dynamic effects on key economic outcomes over the life cycle, including annual earnings [Figure 3, next page], but also wages, employment, poverty, and receipt of income from government programs. We find that despite initial earnings recovery in their mid-30s, adversely affected entry cohorts suffer a reduction in annual earnings and hourly wages as

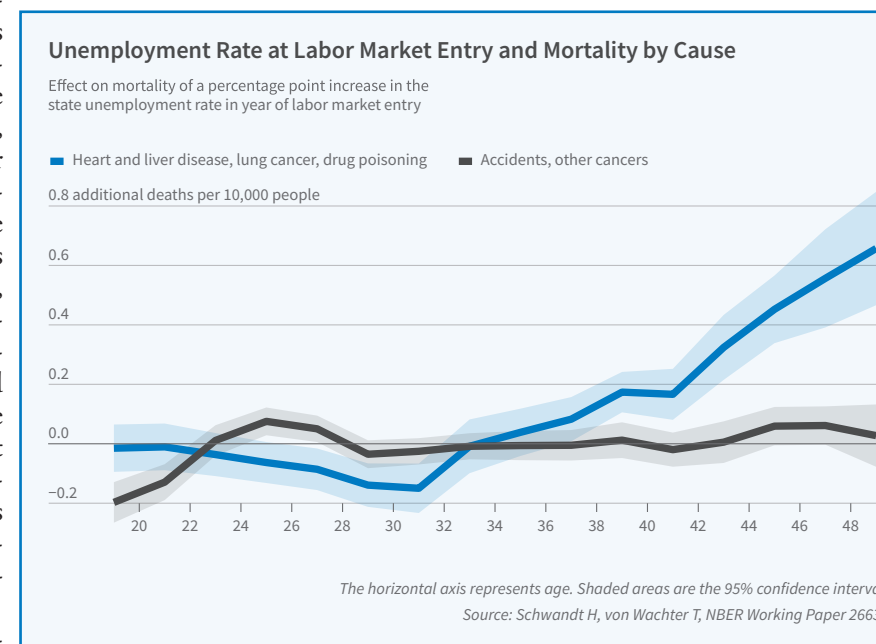


Figure 2

they reach their mid-40s. Our fourth main finding [Figure 4, next page] is that recession-entry cohorts tend to marry and have children earlier, then experience a rise in divorce, and in the long run see lower marriage rates, higher divorce rates, and smaller family sizes.

Our fifth main finding is that those who enter the labor market during a downturn tend to be married to spouses with slightly less education, and who have similar long-run income losses

[Figure 3, next page] and increased disability risk from adverse entry.

Our sixth main finding is that compared to White recession graduates, non-White individuals experience larger initial economic losses and mortality increases that appear earlier — during the first decade after joining the labor market. Non-White individuals also do not experience a short-term increase in family

formation, suggesting that the stronger negative income may offset lowered opportunity costs. Across genders, on the other hand, effect patterns are similar in the short and medium run. But in the long run, both female and non-White recession graduates increase their labor force participation while experiencing smaller income losses. At the same time, they suffer greater mortality increases due to heart, liver, and lung

disease in the long term.

Life-Cycle Impacts of Recessions Occur in Three Phases

Our results imply that the life-cycle impacts of adverse labor market entry occur in three phases. Shortly after the end of the recession, when the economy and employment have returned to normal for most workers, we see persistent but declining earnings reductions as predicted by most career models.

In this phase, a rise in family formation and fertility occurs, suggesting that fewer labor market opportunities may lead some young individuals to invest time in marriage and child-rearing. Mortality is not significantly affected, as most young people's health is far from the threshold leading to mortality.

In the medium run, roughly when workers are in their 30s, careers have settled at a better level: two-thirds of the earnings gap has faded. However, a rise in divorces occurs, likely due to lower-quality initial matches and possible chronic marital stress from lower wages, and fertility is depressed. During this phase, lower health investments and other stressors likely increase the latent health gap between lucky and unlucky cohorts, but with only small impacts on mortality.

In a third phase, when individuals reach midlife, ages

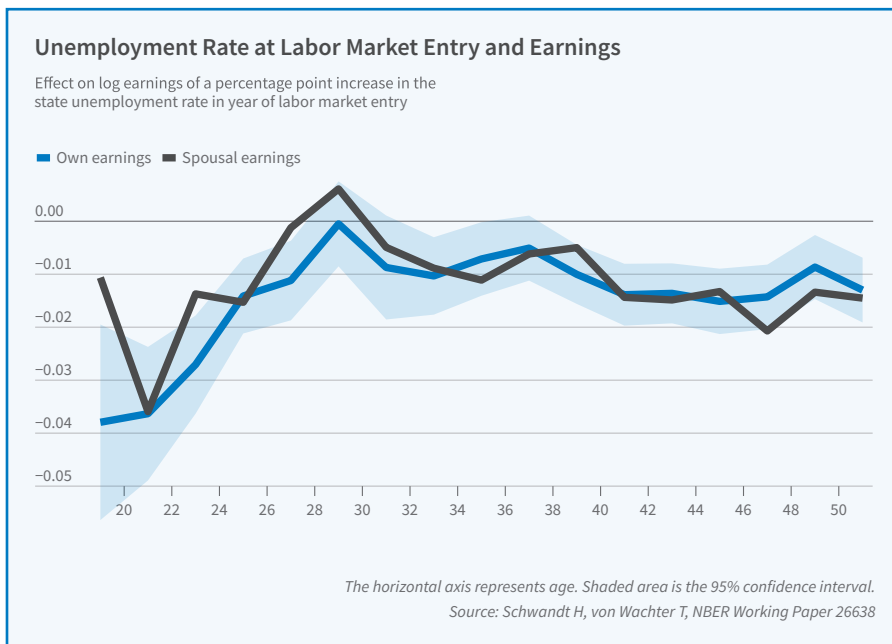


Figure 3

40 to 50, average health has declined enough that the health gap of unlucky graduates triggers increased mortality. At the same time, poorer health tends to further depress remarriage rates and earnings. Wages may start declining because their slow start may have put them on the lower rungs of job or skill ladders. At the same time, these lower

careers, as well as the role of public social insurance programs. Our results suggest that unlucky labor market entrants have some ability to recover their earnings losses through higher labor supply, but that this ability is limited by several factors. On average, only those not already working full time—notably women or non-White individuals who have lower mean employment rates in the cohort we study—can substantially offset losses through increased work. Yet even then the earnings gap is only closed temporarily, and initial and late-life earnings losses are never recovered. Furthermore, we find that this increased labor supply may come at a cost in terms of health.

wages lead women and non-White individuals to increase their labor supply to make up for lost earnings. This chronic labor market stress might further depress marriage rates and harm health.

Implications for Social Insurance and Young Workers

Our findings cast new light on the ability of individuals to self-insure against temporary macroeconomic shocks early in their careers, as well as the role of public social insurance programs. Our results suggest that unlucky labor market entrants have some ability to recover their earnings losses through higher labor supply, but that this ability is limited by several factors. On average, only those not already working full time—notably women or non-White individuals who have lower mean employment rates in the cohort we study—can substantially offset losses through increased work. Yet even then the earnings gap is only closed temporarily, and initial and late-life earnings losses are never recovered. Furthermore, we find that this increased labor supply may come at a cost in terms of health.

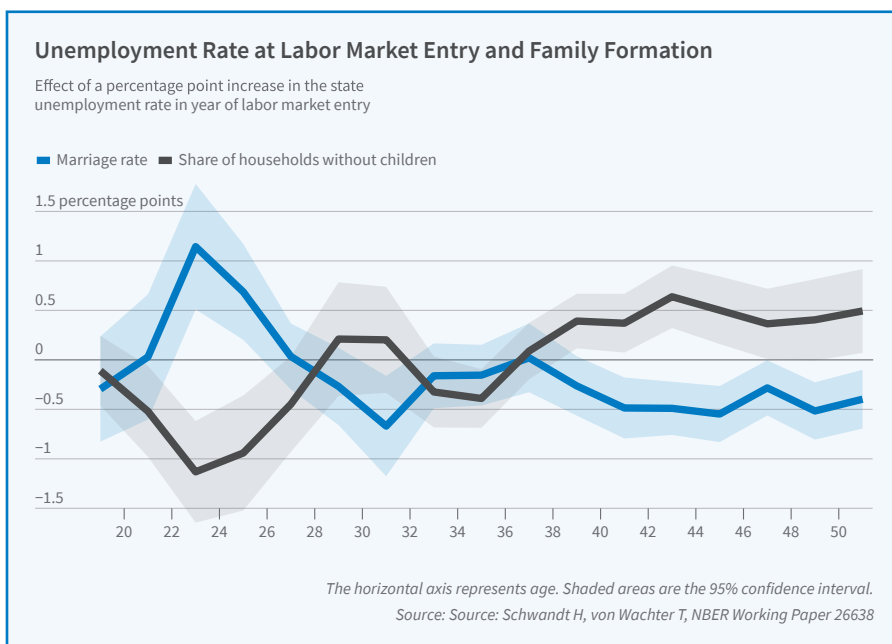


Figure 4

out affecting some other dimension of lifetime outcomes. Our finding that unlucky individuals marry unlucky spouses within their cohort implies that within-family insurance may not be as effective in offsetting the effect of a weak labor market as it may be for buffering the effect of an individual job loss.

These findings put a spotlight on public social insurance mechanisms and the role of government interventions during recessions. Government programs targeted at lower-income people play some role in buffering these losses, mostly initially, but are unable to prevent long-lasting losses.⁶ Currently, only Social Security benefits and the progressive nature of income taxation are likely to help buffer some of the cross-cohort earnings variation due to recessions. New government programs keeping young people in education or employed could help to improve career outcomes and to prevent the potentially destabilizing impacts of anticipated family formation. Similarly, workers are only indirectly and imperfectly insured against adverse life-cycle effects on health. The increase in take-up of Social Security Disability Insurance benefits we find reflects one mechanism providing partial insurance. General health insurance such as Medicare or public funding of unpaid emergency room care could be another.

Our results imply that despite some available social insurance mechanisms, recessions lead to longer lasting and broader impacts on young workers than previously thought. This implies that mon-

etary and fiscal policies aimed at avoiding or dampening downturns can play an important role in averting the long-term effects of adverse labor market entry.

¹ “Who Suffers during Recessions?” Hoynes H, Miller D, Schaller J. *Journal of Economic Perspectives* 26(3), Summer 2012, pp. 27–48.

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⁴ “The Health Effects of Leaving School in a Bad Economy,” Maclean J. *Journal of Health Economics* 32(5), September 2013, pp. 951–964; “Economic Conditions and Mortality: Evidence from 200 Years of Data,” Cutler D, Huang W, Lleras-Muney A. NBER Working Paper 22690, September 2016.

⁵ “Unlucky Cohorts: Estimating the Long-Term Effects of Entering the Labor Market in a Recession in Large Cross-Sectional Data Sets,” Schwandt H, von Wachter T. *Journal of Labor Economics* 37(S1), January 2019, pp. S161–S198.

⁶ We find that SNAP and family welfare benefits (Aid to Families with Dependent Children and then Temporary Assistance for Needy Families) are initially elevated for non-White and lower-educated categories. However, these increases are not sufficient to offset a substantial decline in family income and a rise in poverty, or to prevent longer-term economic losses. The fact that the receipt of SNAP benefits among unlucky cohorts starts to increase again in middle age is a sign of social insurance at work.

Sin Taxes: Good, Better, Best

Hunt Allcott, Benjamin Lockwood, and Dmitry Taubinsky

Economists have long recognized that when consuming a good produces externalities, welfare can be raised by imposing corrective taxes. More recently, there has been a growing belief that some goods should be taxed because of *internalities*—harms that people might impose on themselves due to limited attention, misunderstanding of financial instruments, systematically biased beliefs about themselves such as overconfidence, or lapses of self-control. One of the agendas that we have pursued at the intersection of public economics and behavioral economics

is the optimal design of corrective taxes and subsidies to mitigate both externalities and internalities. Relative to externalities, internalities have received much less attention from economists, but they have been a key focus of our work—and, quantitatively, we have found that they are as significant as externalities. Taxes addressing externalities and internalities are sometimes referred to colloquially as “sin taxes.”

There are several domains where economists and policymakers worry about both externalities and internalities.

One concerns goods that are ostensibly harmful to health, such as cigarettes, alcohol, and sugary drinks. The externalities include burdens on the health system, and the internalities may range from incorrect beliefs about harmful health effects to lapses of self-control. Another domain concerns appliances or automobiles that vary in energy or fuel efficiency. Purchasing less-efficient goods increases environmental externalities and may also harm consumers themselves if they misperceive or are inattentive to the energy or fuel costs.

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reducing inequality and changing behavior. He received his BA in philosophy and economics from Amherst College in 2008 and his PhD in economics from Harvard University in 2016.

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Harvard University.

Using a combination of theory, field experiments, surveys, and quasi-experiments, Taubinsky studies topics such as inattention to and misunderstanding of complex tax incentives, “sin taxes” on goods such as sugary drinks, consumer-facing energy policy, and regulation welfare effects of non-standard policy levers such as information labels, social recognition and financial decision-making by low-income populations such as payday-loan borrowers.

Taubinsky grew up in California, where he currently lives with his wife and two children.

An additional consideration in these domains is that “sin goods” are more heavily consumed by low-income people. Thus, if the sin tax is not combined with some form of progressive redistribution of its revenues, the tax will increase financial inequality.

This summary draws together our research, involving both theory and measurement, which provides a reasonably holistic framework for designing and evaluating sin taxes. This research program takes into account both the difficult task of incorporating externalities and the additional question of optimal redistribution of tax revenue.

A Framework for Optimal Sin Taxes

As laid out by Arthur Pigou in the case of externalities, if consuming a good harms others, then people will consume too much in an unregulated market.¹ Thus, taxing a good with negative externalities can raise welfare by reducing consumption toward the efficient level at which marginal social cost equals marginal social benefit.

A similar logic applies to markets with internalities. If behavioral biases cause an individual to ignore some harms from consuming a good, then their demand for that good is higher, at every price, than it would be if they were unbiased. The key to quantifying the welfare-maximizing sin tax is not measuring the overall harms from consumption but rather measuring the extent to which consumers underestimate those harms due to behavioral biases.

When consumers' surplus and government revenues are weighted equally, the optimal tax equals the sum of the average marginal internalities and the average marginal externalities.² This is a slight generalization of the principle of Pigouvian taxation, special cases of which have been previously studied by behavioral economists for parametric models of consumer mistakes like quasi-hyperbolic discounting.³

In our work, we relax the assump-

tion that surplus is equally valuable for all consumers.⁴ We study a more general framework that can address concerns about regressive taxes that increase financial inequality. In this framework, the surplus of lower-income consumers receives more weight, which means that both their transfer to the government and, more subtly, their welfare gain from externality reduction receive more weight. The second point is sometimes omitted from public debates but it's an important one: even if the financial incidence from a tax is regressive—lower-income people consume more of the good—the impact on costs from internalities may be progressive. The externality cost change will be most progressive when lower-income consumers are the ones making the larger mistakes and responding most to the tax. This is a key distinction from conventional analyses that only consider externalities: when externalities are borne by all of society, there is no notion of progressive behavior change in such frameworks.

The size of the optimal sin tax depends on the extent to which it is regressive or progressive, and on the extent to which any financial inequality in its incidence can be mitigated by progressive redistribution of its revenue. To what extent does it make sense to distribute the tax revenues progressively? A corollary of a classic result from public finance—the Atkinson-Stiglitz theorem—is that optimal progressive redistribution of the sin tax revenue must fully offset the regressive incidence of the sin tax when the only reason that lower-income people consume more of the sin good is that they have less money. However, if some of the across-income consumption patterns can be explained by differences in internalities or preferences, then optimal redistribution of tax revenue will be less progressive because it will be more distortionary of labor supply. Thus, the optimal sin tax will be lower because on net it will increase financial inequality. Our analysis provides a quantitative result about the

optimal degree of redistribution, which we show can be computed by comparing the *correlation* of income and sin good consumption to the *causal effect* of income on sin good consumption.

While the above analysis focuses on linear sin taxes, some taxes/subsidies—such as those on energy use or savings—are nonlinear, means-tested, or both. We have extended our analysis to consider more-flexible tax policies, including nonlinear taxes on sin goods.⁵ In this setting, the extent to which it makes sense to offset the regressivity of the commodity tax through other policy channels is again determined by the difference between the correlational and causal associations of income and the taxed good.

We have applied these conceptual insights in three areas.

Application: Taxes on Sugary Drinks

Taxes on sweetened beverages are motivated by reducing both externalities (in this case, health care costs not paid by the individual) and internalities (such as self-control problems or lack of information about health harms). We have collected the necessary empirical parameters to quantify the welfare-maximizing tax level on sugary drinks.⁶

Figure 1 shows a key fact: lower-income people drink more sugary drinks. This might suggest that sugary drink taxes are financially regressive: lower-income households will pay more of these taxes. However, Figure 2 demonstrates an offsetting fact: lower-income people have less nutrition knowledge and Figure 3 shows that they report having less self-control over sugary drink consumption. They are more likely to say that they drink more sugary drinks than they should.

Quantitatively, we find that the lowest-income households overestimate total utility from sugary drinks by about 1.1 cents per ounce, while the highest-income households overestimate utility by about 0.8 cents per

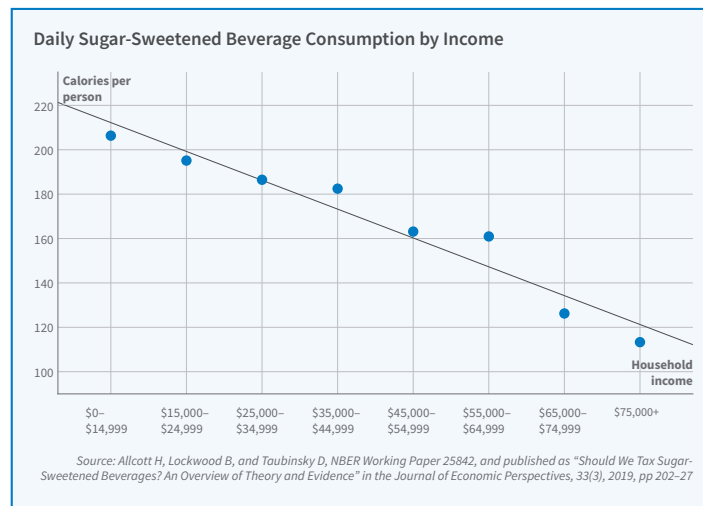


Figure 1

ounce. Figure 4 presents our estimates of bias across the income distribution. We also estimate that consumer demand is relatively elastic to sugary drink prices (and thus taxes) but that this elasticity does not vary significantly by income. The fact that lower-income households are more biased but not less elastic implies that the corrective benefits from sugary drinks taxes are progressive.

Finally, we estimate that sugary drinks are a normal good: the causal effect of income on their consumption is positive. This implies that the negative correlation between sugary drink consumption and income is due to differences in preferences and biases. Thus, it is not optimal to fully offset

the regressivity of the sugary drinks tax, which lowers its optimal size because of its impact on financial inequality.

We use our theoretical model to take into account all of the empirical facts to determine the optimal sugary drink tax. In our model, the welfare-maximizing tax on sugary drinks in the US is 1 to 2 cents per ounce, which is similar to current tax rates in the seven US cities that have such taxes.⁷ If, however, taxes were optimized at a more local level and thus were to lead to some cross-border shopping, their optimal size would be somewhat smaller. We find that the average household at all income levels benefits from a sugary drink tax, although higher-income households may benefit more depend-

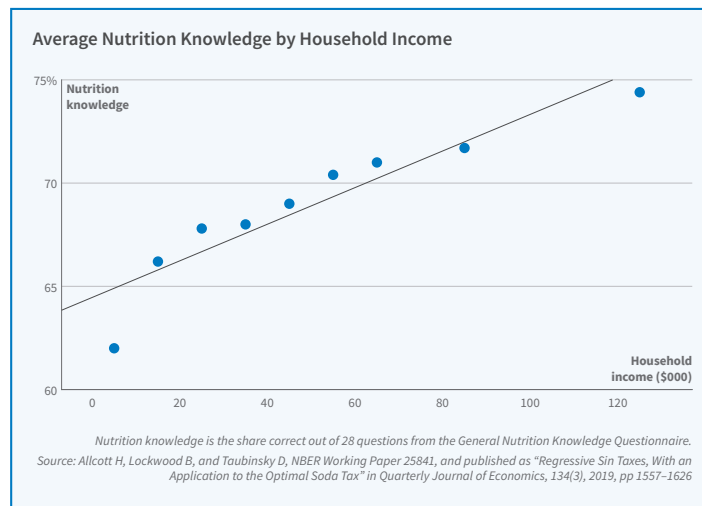


Figure 2

ing on how we quantify behavioral bias.

Application: Energy Efficiency

A second application is to energy efficiency policies such as subsidies for energy-saving appliances and corporate average fuel economy standards. One justification for these policies is that they are second-best substitutes when there are political constraints on pollution taxes. Another is that they act like sin taxes—or their opposite-signed counterparts, “virtue subsidies”—that counteract alleged information asymmetries and behavioral biases.

It has been argued that consumers are poorly informed about or inattentive to electricity costs when buy-

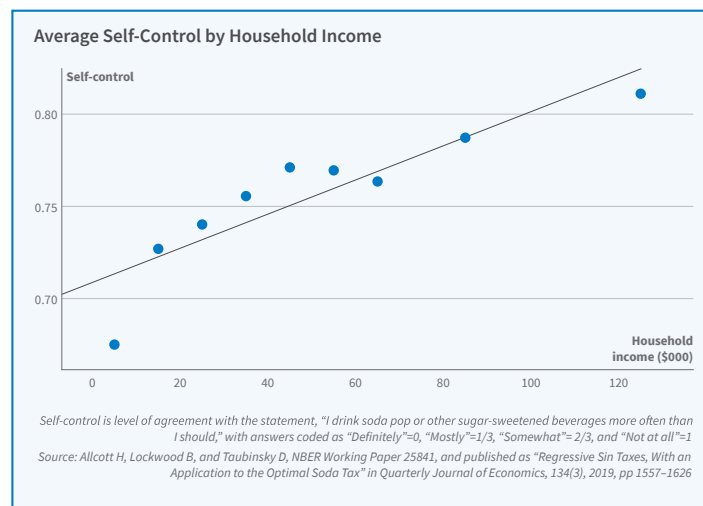


Figure 3

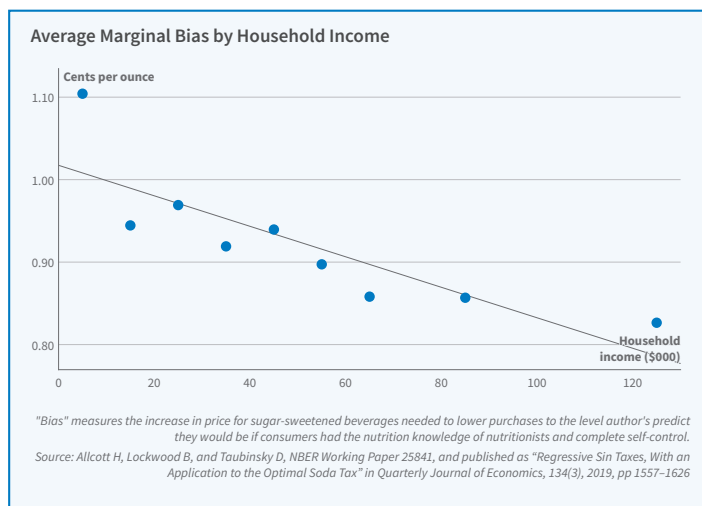


Figure 4

ing lightbulbs, causing them to buy too many energy-wasting incandescents rather than more efficient options like compact fluorescents and LEDs. To offset these biases, many governments subsidize energy-saving lightbulbs or ban incandescents. As another example, it is sometimes argued that people buying cars don't pay sufficient attention to fuel costs, causing them to buy too many gas guzzlers. Fuel economy standards can offset this by forcing automakers to sell more high-fuel-economy vehicles.

We have tested these arguments. In one study, we recruited people shopping for lightbulbs and randomized them into two groups: a treatment group that was given clear information on the electricity costs of different lightbulb technologies and a control group that was not. If lack of information or attention reduces demand for energy-efficient lightbulbs, then the experimental treatment should offset this and increase demand. Across two different experiments, we found some support for this hypothesis, but the effect sizes were not large enough to generate an increase in social surplus from banning incandescent lightbulbs.⁸

We found qualitatively analogous results in our work on fuel economy. Consumers do not appear to pay full attention to gasoline costs, and in our field experiment we found that providing fuel economy information had no effect on vehicle purchases.⁹ A large body of excellent work by other scholars finds similarly mixed results. In one model we developed, the estimated impacts of fuel economy standards are not large enough to increase social surplus.¹⁰

Application: State-Run Lotteries

A final application is to state-run lotteries.¹¹ Such lotteries are subject to an implicit tax because a portion of each ticket's purchase price is retained by the government rather than being distributed to consumers through prizes. The economic principles are

thus similar to those of other sin tax applications but they are applied to the general case where the government can differentially tax various characteristics of the sin good.

Do these revenue-generating lotteries raise total welfare? As with the other applications, there are two sides to the debate. On the one hand, state-run lotteries might be a “win-win” that increases both state budgets and consumer surplus if consumers' decisions to buy lottery tickets are not affected by behavioral biases. Although these lotteries typically have negative expected monetary value, consumers might still rationally buy them either for entertainment value or because they generate anticipatory utility from the possibility of winning. On the other hand, if consumer demand is primarily driven by behavioral biases such as overconfidence, self-control problems, or innumeracy, then these lotteries may be welfare reducing, particularly if both lottery demand and biases are disproportionately concentrated among lower-income people.

Empirically, we find that purchasing lottery tickets is associated with survey measures of innumeracy, poor statistical reasoning, and other proxies for behavioral bias. Collectively, these proxies explain 43 percent of lottery purchases. As with sugary drinks, these biases seem to be concentrated among lower-income people. However, since lottery tickets are cheap—the administrative costs are modest and about 30 percent of proceeds go to states for education and other programs—there is a trade-off between overconsumption due to bias, normatively respectable consumer surplus, and government revenues. In our model, the current designs of the large multistate lotto games increase welfare overall although they may harm heavy spenders.

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[Return to Text](#)

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Annual Report of Awards to NBER Affiliates

Alberto Abadie, Sherry Glied, and Jón Steinsson were elected to the American Academy of Arts and Sciences.

John M. Abowd received the inaugural Edward Lazear Prize from the Society of Labor Economists for excellence in research, service to the field, and contributions to civil society, as well as a 2022 Champions of Freedom Award from the Electronic Privacy Information Center for his role in modernizing the US Census Bureau’s confidentiality protection systems.

Katharine Abraham and **Matthew Gentzkow** were elected to the National Academy of Sciences.

Viral Acharya was awarded a 2022 Jack Treynor Prize by the Institute for Quantitative Research in Finance for “Is Physical Climate Risk Priced? Evidence from Regional Variation in Exposure to Heat Stress,” coauthored with Tim Johnson, Tuomas Tomunen, and Suresh Sundaresan.

Elizabeth Ananat and Anna Gassman-Pines won the Rosabeth Moss Kanter Award for Excellence in Work-Family Research from the Purdue University Center for Families and the Boston College Center for Work & Family.

Adrien Auclert, David Baqaee, Natalie Bau, Peter Ganong, Simon Jäger, and David Yang were named Sloan Research Fellows.

Martha J. Bailey won the Carolyn Shaw Bell Award, given annually by the American Economic Association to an individual who has furthered the status of women in the economics profession.

Robert Barro received an honorary degree from the University of Athens.

Andrew B. Bernard presented the Ohlin Lecture at the Stockholm School of Economics.

Eric Bettinger was awarded an honorary doctorate from the University of Zurich.

Christopher Blattman, Leah Platt Boustan, Seema Jayachandran, and Ahmed Mushfiq Mobarak were named to *Vox*’s inaugural Future Perfect 50 list, which honors “scientists, thinkers, scholars, writers, and activists building a more perfect future.”

Nicholas A. Bloom was awarded a Guggenheim Fellowship and elected to the Bloomberg 50 for research on working from home.

Judson Boomhower and **Matteo Maggiori** received Andrew Carnegie Fellowships.

Severin Borenstein and **Catherine Wolfram** received Adelman-Frankel Awards from the United States Association for Energy Economics for unique and innovative contributions to the field of energy economics.

Leah Platt Boustan, Fatih Guvenen, Chang-Tai Hsieh, Oleg Itskhoki, Dean Karlan, Ilyana Kuziemko, Ricardo Lagos, Thomas Lemieux, Guido Menzio, Giuseppe Moscarini, Benjamin Olken, Giorgio Primiceri, Nancy Qian, Jón Steinsson, Amir Sufi, Laura Veldkamp, and Alessandra Voena were named Fellows of the Econometric Society.

Giulia Brancaccio, Myrto Kalouptsi and Theodore Papageorgiou were awarded the Econometric Society’s Frisch Medal for their paper “Geography, Transportation, and Endogenous Trade Costs.”

Judith Chevalier won the 2022 Industrial Organization Society Distinguished Fellow Award for excellence in research, education, and leadership.

Norma Coe and Rachel Werner’s paper “Informal Caregivers Provide Considerable Front-Line Support in Residential Care Facilities and Nursing Homes” was selected as a top 10 editor’s pick for 2022 by *Health Affairs*.

William J. Collins was elected a Fellow of the Cliometric Society.

Lin William Cong was named a Fellow of the Asian Bureau of Finance and Economic Research. His work with Zhiheng He, Andrew Karolyi, Ke Tang, and Weiyi Zhao received best paper awards at the EFMA-WRDS Conference and the 19th Chinese Finance Annual Meeting.

Janet Currie was elected president-elect of the American Economic Association.

Donald R. Davis and **Jonathan I. Dingel** received the 2022 Bhagwati Award from the *Journal of International Economics* for “The Comparative Advantage of Cities.”

David Deming was awarded the 2022 Sherwin Rosen Prize by the Society of Labor Economists for outstanding contributions to labor economics.

Ian Dew-Becker received the SCOR-PSE Chair on Macroeconomic Risk Junior Research Prize from the Paris School of Economics for the paper “Tail Risk in Production Networks.”

Douglas W. Diamond shared the 2022 Nobel Memorial Prize in Economic Sciences for research on banks and financial crises with Ben Bernanke and Philip Dybvig.

Francis X. Diebold won the Isaac Kerstenetzky Scholarly Achievement Award of the Centre for International Research on Economic Tendency Surveys.

Jonathan I. Dingel received the 2022 August Lösch Prize from the Institute for Environmental, Resource, and Spatial Economics of Kiel University for outstanding research in regional science.

Florian Ederer, Song Ma, and Colleen Cunningham won the Best Paper on Competition Economics Prize from the Association of Competition

Economics and the Jerry S. Cohen Award for Antitrust Scholarship from the American Antitrust Institute for “Killer Acquisitions.” Ederer and Bruno Pellegrino received a Best Paper Award at the Econometric Society European Meeting for “A Tale of Two Networks: Common Ownership and Product Market Rivalry.”

David Card, Barry Eichengreen, James Poterba, and Carmen Reinhart were named Distinguished Fellows of the American Economic Association. Eichengreen also received the Nessim Habif Prize for Contributions to Science and Industry from the University of Geneva and was made a Corresponding Fellow of the British Academy.

Andrea Eisfeldt and Andrew Demers received the American Real Estate and Urban Economics Association’s award for best paper in *Real Estate Economics* for “Total Returns to Single-Family Rentals.”

Hülya Eraslan was named an Economic Theory Fellow by the Society for the Advancement of Economic Theory.

Robert Fairlie, David Robinson, and Alicia Robb won the Bradford-Osborne Research Award for their paper “Black and White: Access to Capital among Minority-Owned Startups.”

Hanming Fang and Edward Kung won the American Risk and Insurance Association’s Robert C. Witt Award for best article published in the *Journal of Risk and Insurance* for “Why Do Life Insurance Policyholders Lapse? The Roles of Income, Health and Bequest Motive Shocks.”

Maryam Farboodi, Laura Veldkamp, Venky Venkateswaran, and Dhruv Singal won the Swiss Finance Institute’s Outstanding Paper Award of 2022 for “Valuing Financial Data.”

Robert C. Feenstra and **Charles Hulten** were corecipients of the Julius Shiskin Memorial Award for Economic Statistics, which is awarded by the Business and Economic Statistics Section of the American Statistical Association.

Claudia Goldin was named a Distinguished Fellow of the Center

for Economic Studies at Ludwig-Maximilians-Universität München, received the Richard A. Lester Book Award from the Industrial Relations Section at Princeton University, and was honored with a Visionary Award from the Council for Economic Education.

Paul Goldsmith-Pinkham, Andreas Fuster, Tarun Ramadorai, and Ansgar Walther won the Brattle Group Prize in Corporate Finance for their *Journal of Finance* paper “Predictably Unequal? The Effects of Machine Learning on Credit Markets.”

Andrew Goodman-Bacon shared the Dennis J. Aigner Award for best empirical paper in the *Journal of Econometrics* for “Difference-in-Differences with Variation in Treatment Timing” and won the 2022 Arrow Award for best paper in health economics from the International Health Economics Association for “The Long-Run Effects of Childhood Insurance Coverage: Medicaid Implementation, Adult Health, and Labor Market Outcomes.”

Daniel Haanwinckel and Rodrigo R. Soares jointly received the Haralambos Simeonides Prize for best papers written by economists with ties to Brazilian research institutions.

Samuel Hartzmark and David Solomon won the FESE De la Vega Prize, given to young scholars for an outstanding research paper on financial markets, for “Predictable Price Pressure.”

Jennifer Hunt was named a Fellow of the Society of Labor Economists.

Douglas Irwin was elected president of the Economic History Association.

Zhengyang Jiang and coauthors Robert Richmond and Tony Zhang won the NASDAQ Award for Best Paper on Asset Pricing at the annual Western Finance Association conference for “A Portfolio Approach to Global Imbalances.”

Ginger Zhe Jin, Michael Luca, and Daniel Martin won the *American Economic Journal: Microeconomics* Best

Paper Award for “Is No News (Perceived As) Bad News? An Experimental Investigation of Information Disclosure.”

B. Zorina Khan’s book *Inventing Ideas: Patents, Prizes, and the Knowledge Economy* received the 2022 Alice Hanson Jones Biennial Prize from the Economic History Association.

Mervyn King won the inaugural Bancor Prize for international leadership in economic thought and practice.

Matthew Kraft received the Outstanding Public Communication of Education Research Award from the American Educational Research Association.

Kevin Lang and **Lisa Lynch** were elected to the American Economic Association Executive Committee.

Josh Lerner, Antoinette Schoar and coauthors Jason Mao and Nan Zhang received the 2022 Doriot Award for Best Private Equity Research Paper from the HHL Leipzig Graduate School of Management for “Investing Outside the Box: Evidence from Alternative Vehicles in Private Equity.”

Christian Leuz received the ACA Prize in Financial Governance from the Institute of Accounting, Control and Auditing at the University of St. Gallen for contributions on the economic consequences and evaluation of capital market and transparency regulation.

Juhani Linnainmaa and Sina Ehsani won a Dimensional Fund Advisors Prize from the American Finance Association for their paper “Factor Momentum and the Momentum Factor.”

Bridget T. Long won the Peter H. Rossi Award for Contributions to the Theory or Practice of Program Evaluation from the Association for Public Policy Analysis & Management.

Lisa Lynch received the Labor and Employment Relations Association Lifetime Achievement Award for contributions to the fields of industrial relations and human resources.

Matteo Maggiori received the Germán Bernácer Prize for outstanding contributions in macroeconomics

and finance by a European economist under age 40.

Costas Meghir was the Fisher-Schultz lecturer at the Econometric Society European Meeting.

Olivia S. Mitchell won the American Risk and Insurance Association Kulp-Wright Book Award for *Remaking Retirement: Debt in an Aging Economy*.

Fiona Murray was named Dame Commander of the Order of St. Michael and St. George by King Charles for her service to science, technology, and diversity.

Kevin O’Rourke was awarded an honorary doctorate by the University of Southern Denmark.

Ariel Pakes received the Erwin Plein Nemmers Prize in Economics, awarded by Northwestern University.

Lubos Pastor, Robert Stambaugh, and Lucian Taylor received the Fama-DFA Prize from the *Journal of Financial Economics* for “Sustainable Investing in Equilibrium” and the Moskowitz Prize on sustainable finance for “Dissecting Green Returns.”

Petra Persson received a National Science Foundation CAREER Award to study the consequences for families of prenatal screening technologies and assisted reproductive technologies.

Robert Pindyck won the John Kenneth Galbraith Award for breakthrough discoveries in economics

from the Agricultural and Applied Economics Association.

Elena Prager and Matt Schmitt won the American Antitrust Institute’s Jerry S. Cohen Award for Antitrust Scholarship Best Antitrust Article on Labor Monopsony for “Employer Consolidation and Wages: Evidence from Hospitals.”

Assaf Razin and Efraim Sadka received the Best Paper Award of the *Journal of Government and Economics* for “Migration and Redistribution: Why the Federal Governance of an Economic Union Does Matter.”

Joshua L. Rosenbloom was named a Fellow of the American Association for the Advancement of Science.

Raffaella Sadun won the Fondazione De Sanctis prize in economics.

Jeffrey A. Smith received an honorary doctorate from Aarhus University in Denmark.

Christopher M. Snyder received the Distinguished Service Award of the Industrial Organization Society for leadership in scholarship and practice.

Stefanie Stantcheva was awarded a Guggenheim Fellowship.

Nancy Stokey won the CME Group-Mathematical Sciences Research Institute Prize in Innovative Quantitative Applications recognizing originality and innovation in the use

of mathematical, statistical, or computational methods to study the behavior of markets and economics.

Johannes Stroebel won the 2023 Fischer Black Prize, given biannually by the American Finance Association to the top financial economics scholar under the age of 40.

Eric T. Swanson received the Best Paper Award from the *Journal of Monetary Economics* for “Measuring the Effects of Federal Reserve Forward Guidance and Asset Purchases on Financial Markets.”

Alan M. Taylor received the Economic History Association’s Engerman-Goldin Prize for his work with Òscar Jordà and Moritz Schularick in developing the Macrohistory Database.

Francesco Trebbi and Federico Ricca won the MinE Best Paper Award from the European Economic Association for “Minority Underrepresentation in US Cities.”

John Van Reenen was named a Foreign Honorary Member of the American Economic Association.

Stijn Van Nieuwerburgh served as president of the American Real Estate and Urban Economics Association.

Angelino C. G. Viceisza was elected president of the National Economic Association and served as second vice president of the Midwest Economics Association.

Conferences and Meetings, Spring 2023

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

Big Data and Securities Markets

Organizers: Itay Goldstein, Chester S. Spatt, and Mao Ye
January 13

Cohort Studies Meeting

Organizers: Dora Costa and Martha J. Bailey
January 20–21

Mentorship Program to Support NSF Grant Proposal Development for MSI Faculty Workshop

Organizers: Danielle Dickens, James M. Poterba, and Angelino Viceisza
January 27

Industrial Organization Program Meeting

Organizers: Adam Dearing, Kei Kawai, and Chad Syverson
February 3–4

Financing Higher Education

Organizers: John Y. Campbell and Kaye Husbands Fealing
February 3

Economic Analysis of Regulation

Organizers: Steve Cicala and James M. Poterba
February 9

Health Care Program Meeting

Organizers: Marcella Alsan, Marika Cabral, Amy Finkelstein, and Martin Gaynor
February 23–24

Economic Fluctuations and Growth Program Meeting

Organizers: Andrea L. Eisfeldt and Charles I. Jones
February 24

Chinese Economy Working Group Meeting

Organizers: Nancy Qian, Shang-Jin Wei, and Daniel Xu
February 24–25

International Fragmentation, Supply Chains, and Financial Frictions

Organizers: Pol Antràs, Sofia Bauducco, Linda S. Goldberg, and Şebnem Kalemli-Özcan
March 1–2

Digitization Tutorial

Organizers: Martin Beraja, Avi Goldfarb, and Catherine Tucker
March 1–2

Program on Children Meeting

Organizers: Anna Aizer and Janet Currie
March 2–3

Workshop of Digital Economics

Organizers: Avi Goldfarb, Catherine Tucker, and Pinar Yildirim
March 3

Monetary Economics Program Meeting

Organizers: Christina Patterson and Johannes Wieland
March 3

TRIO Conference on Digital Economy and Finance

Organizers: Shin-ichi Fukuda, Joshua K. Hausman, and Kenichi Ueda
March 4–5

Immigrants and the US Economy

Organizers: Aimee Chin and Kalena Cortes
March 9–10

Law and Economics Program Meeting

Organizer: Christine Jolls
March 10

Productivity, Innovation, and Entrepreneurship Program Meeting

Organizers: Nicholas Bloom, Serguey Braguinsky, Sabrina T. Howell, and Josh Lerner
March 10

Policy Responses to Tax Competition

Organizers: David R. Agrawal, James M. Poterba, and Owen M. Zidar
March 16–17

CRIW Measuring and Accounting for Environmental Public Goods: A National Accounts Perspective

Organizers: Mary Bohman, Eli Fenichel, and Nicholas Z. Muller
March 16–17

NBER *Reporter*

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