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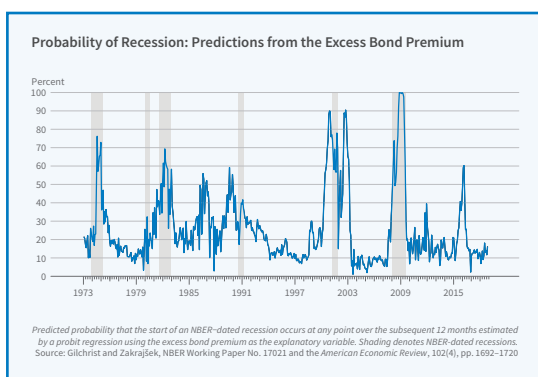
NATIONAL BUREAU OF ECONOMIC RESEARCH

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Working Group Report

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Household Finance

Brigitte C. Madrian and Stephen P. Zeldes*

Amid calls for greater attention to the policies and market institutions that affect household financial choices, the NBER Household Finance Working Group was established in 2009 with support from the Alfred P. Sloan Foundation. It provides a forum for disseminating research and fostering collaboration among those working on household financial decision-making, the structure and operation of markets offering financial products targeted to consumers, and the regulatory policy issues that arise in these markets.

The activities of the working group have helped to define the field of household finance. This report, which summarizes research studies presented at group meetings over the last several years, illustrates several of the field's core areas of research. These papers represent only a small subset of the research that has been discussed at working group meetings.

Financial Education

A large and growing literature has documented widespread consumer behaviors, often labeled financial mistakes, which involve households paying more than they need to for some services, or purchasing services that do not appear to serve their needs. An oft-cited antidote to these "mistakes" is financial education. But initial research on financial education largely documented correlations rather than

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causal effects. More recent research takes seriously the problems of identification.

William L. Skimmyhorn uses administrative data matched with credit bureau records to evaluate the effects of a large natural experiment, a mandatory personal financial management course adopted by the U.S. Army in 2007–08 for all newly enlisted personnel.¹ The paper exploits the staggered rollout of the program across military bases to rule out time effects as a factor that might confound the results. Soldiers who joined the Army subsequent to the course's introduction have retirement savings plan participation and contribution rates roughly double those of soldiers who enlisted just prior to introduction of the course. They also have lower credit card balances, auto loan balances, and unpaid debts.

Miriam Bruhn, Luciana de Souza Leão, Arianna Legovini, Rogelio Marchetti, and Bilal Zia evaluate a randomized controlled trial designed to provide evidence on the impact of a newly designed, comprehensive financial education program in Brazilian high schools.² The 17-month program integrates financial education into the math, science, history, and language curriculum of almost 900 high schools and includes new textbooks and extensive teacher training. The program leads to improved levels of student financial proficiency, increased saving, and better budgeting behavior, but also results in higher use of expensive credit for consumer purchases. The program also has some positive spillover effects in the financial behaviors of students' parents.

Together, these two papers suggest that appropriately designed financial education programs can substantially affect household financial outcomes.

Financial Advice

Another antidote to consumer financial mistakes is the provision of financial advice. Understanding whether such advice improves outcomes is a recent, active area of ongoing research. One potential problem is that some advisers may have conflicts of interest due to the incentives built into their compensation. Two recent audit studies, employing actors posing as consumers seeking financial advice, shed light on the nature of these conflicts.

The first, by Santosh Anagol, Shawn

Cole, and Shayak Sarkar, examines the quality of advice provided by life insurance agents in India.³ They find that agents maximize their own welfare by recommending products with high commissions, instead of less-expensive products that can deliver the same, or very similar, benefits. They also find that agents cater to the beliefs of uninformed consumers even when those beliefs are wrong, presumably because doing so increases the likelihood of retaining those customers. The second, by Sendhil Mullainathan, Markus Noeth, and Antoinette Schoar, examines the investment advice provided by financial advisers who interact with the broad population of retail investors — as distinguished from high net-worth households — in the United States.⁴ They examine a set of advisers who are paid based on the fees they generate, and they too find that advisers often reinforce the biases of potential clients when doing so is in the advisers' interests. For example, many advisers in their study recommended actively managed portfolios with higher fees and commissions for the adviser rather than lower-cost index funds with lower associated commissions.

Mark Egan, Gregor Matvos, and Amit Seru evaluate the prevalence of misconduct among financial advisers in the United States.⁵ Using data on customer filings and regulatory actions against U.S. broker-dealers over a 10-year period, they document that 7 percent of broker dealers have a record of misconduct, and that prior offenders are five times more likely to face new allegations of misconduct than the average adviser. They also evaluate the implications of misconduct. Half of the advisers accused of misconduct lose their jobs, although many are subsequently rehired by other firms. The firms that hire these previously dismissed advisers have higher firm-level rates of misconduct. Misconduct is also more likely in firms that primarily serve retail customers in counties with older, less-educated, higher-income populations. This leads to a segmented market

in which some firms cater to unsophisticated consumers because they can get away with higher levels of misconduct, while others discipline misconduct to retain a reputation that will attract financially sophisticated consumers.

These findings raise the question of how investors assess the advice quality and trustworthiness of financial advisers. Julie R. Agnew, Hazel Bateman, Christine Eckert, Fedor Ishkhakov, Jordan Louviere, and Susan Thorp explore this question in a multi-round incentivized survey experiment in which subjects were given conflicting recommendations from two advisers regarding a financial choice.⁶ Subjects are more likely to follow advice that is not in their best interest in later rounds if they received advice that was in their interest in earlier rounds. They are more likely to follow advice if the adviser displays a credential, even though many cannot accurately assess whether a credential is legitimate or fake. They are also more likely to accept bad advice when the quality of the advice is more difficult to assess. These findings suggest that it may be relatively easy for ill-intentioned financial advisers to dupe unwitting clients.

Retirement Saving

One approach to increasing retirement savings that does not rely on either financial literacy or financial advice is automatic enrollment, which could be mandatory or allow an option to opt out of savings plan participation. There is compelling evidence that such an approach increases both savings plan participation and asset accumulation in the accounts into which individuals are automatically enrolled.⁷ One important question not answered in the early research on this topic is whether the savings generated are new savings, or whether they are offset by changes elsewhere on the household balance sheet. More recent research has tried to address this important question.

Using data from Denmark, Raj Chetty, John N. Friedman, Soren Leth-

Petersen, Torben Nielsen, and Tore Olsen examine the impact of changes in compulsory pension plan contributions on total household savings.⁸ When individuals change jobs in Denmark, their new employer may have a compulsory pension plan contribution rate that is higher or lower than their previous employer. The researchers find that individuals offset only 20 percent of these compulsory saving changes by adjusting their savings elsewhere, both in the short- and longer term.

John Beshears, James J. Choi, David Laibson, Madrian, and Skimmyhorn examine another potential margin of adjustment: household debt.⁹ They study the impact of the adoption of automatic enrollment into the Thrift Savings Plan for U.S. Army civilian employees, and find that automatic enrollment increases savings while generating no statistically significant changes in credit card or other forms of non-collateralized debt at any time horizon studied. They do, however, find modest increases in auto loan and first-mortgage debt at horizons of two to four years. Because auto and mortgage debt originations coincide with asset purchases, it is unclear whether increases in these liabilities imply decreases in net worth.

Borrowing

Linkages between different pieces of the household balance sheet have also been examined in the context of the large and plausibly unanticipated changes in consumers' monthly mortgage payments resulting from the large reduction in interest rates that occurred in the years following the global financial crisis. Using matched mortgage and credit bureau data, Marco Di Maggio, Amir Kermani, Benjamin J. Keys, Tomasz Piskorski, Rodney Ramcharan, Seru, and Vincent Yao show that, on average, consumers with nonconforming adjustable rate mortgages saw their monthly payments fall by \$940, a decline of 53 percent. Those with conforming adjustable rate mortgages experienced a

\$280 average monthly reduction — 23 percent — when interest rates were reset.¹⁰ They then evaluate how consumers respond to these reductions.

Their findings, which are summarized in Figure 1, suggest that consumers increase automobile purchases when the mortgage load lightens. They measure this by the assumption of new auto debt, and find that this single source of additional consumption accounts for 8 to 18

percent of the liquidity generated by consumers' lower mortgage payments. This consumption response is larger for households that are likely more constrained, namely, those with higher loan-to-value ratios and lower incomes. Consumers also increase their voluntary prepayments of mortgage debt, which accounts for 6 to 8 percent of the additional liquidity. This deleveraging response is smaller for households that are more constrained. The reduction in mortgage payments also leads to a substantial decline in the mortgage default rate, consistent with the results of another study by Andreas Fuster and Paul S. Willen.¹¹

What all this points to is that reductions in required mortgage payments affected aggregate economic outcomes. Areas with a higher concentration of adjustable rate mortgages saw a relative decrease in default rates for consumer debt, lower rates of house price

decline, increases in auto sales, and relative improvements in employment in the non-tradable sector. These results highlight the importance of mortgage debt contract rigidity in the transmission of monetary policy to the real economy.

Credit cards are another important form of household debt, and the subject of several recent regulatory reforms in the United States. Sumit Agarwal, Souphala Chomsisengphet, Neale Mahoney, and Johannes Stroebel assess the impact of

the 2009 Credit Card Accountability Responsibility and Disclosure (CARD) Act, which limited interest rate increases for credit cards and placed restrictions on non-interest fees for such things as exceeding the card's limit, paying late, and being inactive.¹² Using data on 160 million credit card accounts from several of the country's largest credit card lenders, they compare outcomes for consumer cards, which were subject to the regulations,

Social Insurance

Social insurance is an important source of financial protection for households in a variety of financial circumstances. Two recent studies examine the impact of a particularly important source of insurance — Medicaid — on the financial position of low-income households.

Tal Gross and Matthew Notowidigdo examine the effects of state Medicaid expan-

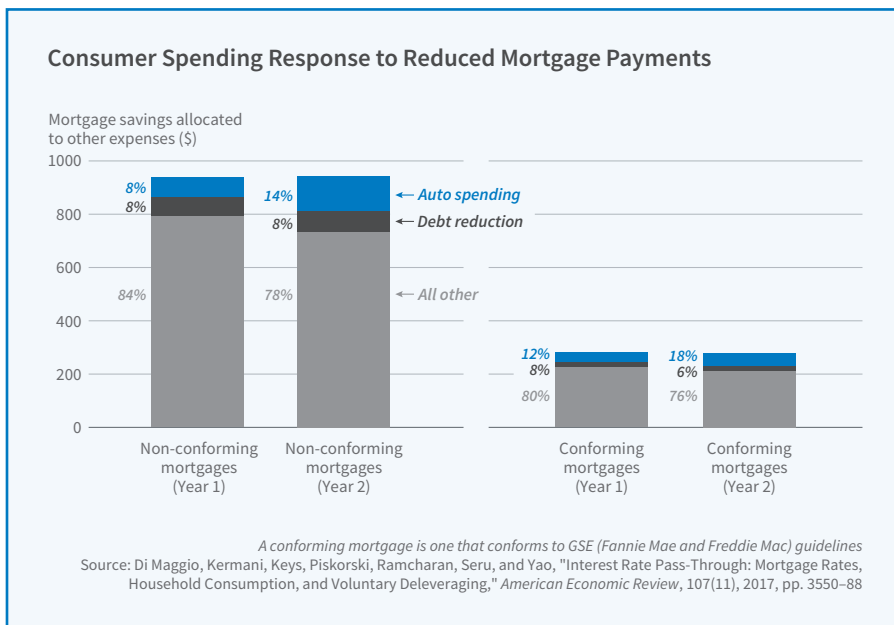


Figure 1

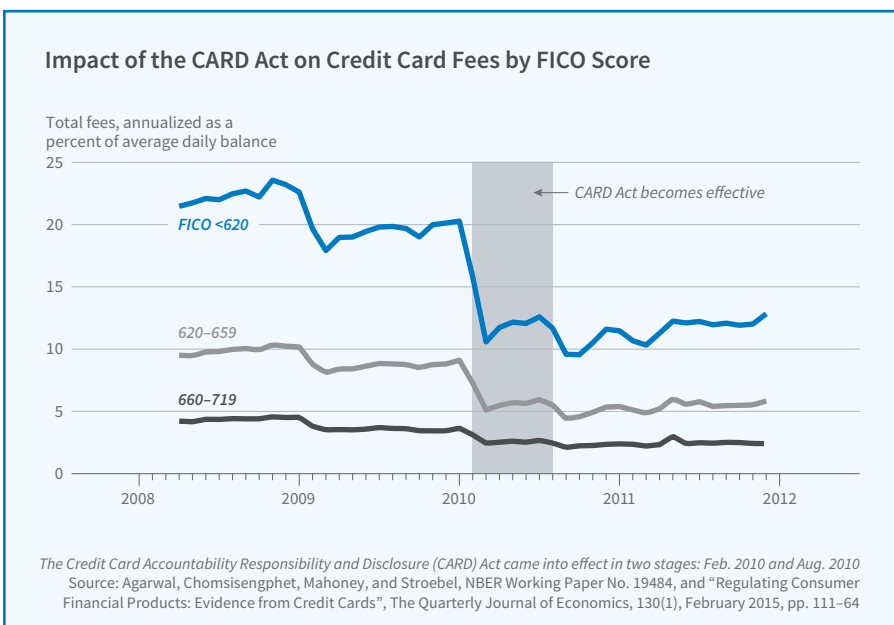


Figure 2

sions between 1992 and 2004.¹³ They find that out-of-pocket medical costs are an important factor in roughly one-quarter of the personal bankruptcy filings of low-income households. As a result, a 10 percentage point increase in Medicaid eligibility, which by design reduces out-of-pocket medical costs, also reduces personal bankruptcy filings by 8 percent.

Kenneth Brevoort, Daniel Grodzicki, and Martin B. Hackmann examine the effects of the Medicaid expansion provision of the Affordable Care Act (ACA).¹⁴ They estimate that increased health insurance coverage has a number of beneficial effects on eligible households: a \$3.4 billion reduction in unpaid medical bills sent to collection over a two-year period, higher credit scores, and better terms on the credit offered to households. Overall, they calculate that the indirect financial benefits of Medicaid in terms of better credit market outcomes are of a roughly similar magnitude to the direct reduction in out-of-pocket medical expenditures.

Joanna Hsu, David Matsa, and Brian Melzer examine the financial effects of another important form of social protection — unemployment insurance (UI).¹⁵ They exploit variation in the generosity of UI across states and over time to examine its impact on housing market outcomes

for households that did and did not experience a layoff. They find that a \$3,600 increase in the maximum annual benefit amount, equal to the cross-state standard deviation of benefits in 2010, reduces both mortgage delinquency and foreclosure rates by about 13 percent among those who experienced a layoff (see Figure 3). Using these estimates, they calculate that the UI expansions that took effect during the global financial crisis prevented 1.3 million foreclosures between 2008 and 2013, over 60 percent more than the number of foreclosures prevented by the Home Affordable Modification Program and the Home Affordable Refinance Program combined. UI also moderated the decline in house prices experienced in areas with rising unemployment. They conclude that UI acts as an automatic stabilizer for both aggregate consumption and for the housing market.

Bankruptcy is another important form of social protection. Felipe Severino and Meta Brown exploit variation in the personal bankruptcy exemption level across states and over time to examine how bankruptcy protection impacts credit market outcomes.¹⁶ They focus on a period before the passage of the federal Bankruptcy Abuse Prevention and Consumer Protection

Act of 2005, which significantly changed the rules around filing for bankruptcy. From a theoretical standpoint, increasing the generosity of bankruptcy protection should increase borrowers' demand for credit but reduce lenders' willingness to supply it. The net impact is ambiguous. Analyzing a panel of credit bureau records, Severino and Brown find that more-generous bankruptcy protection laws don't affect the aggregate level of household debt, but do impact its composition. In particular, borrowers increase their holdings of unsecured debt, which is more easily discharged through bankruptcy, and pay more for this debt through higher interest rates.

Will Dobbie and Jae Song examine the impact of bankruptcy protection on a range of other important household financial outcomes.¹⁷ They examine households that filed for bankruptcy under Chapter 13 between 1992 and 2005 and exploit random assignment to judges who vary in their leniency in discharging debts through this form of bankruptcy. They find that being granted Chapter 13 bankruptcy protection increases annual earnings by approximately \$5,500 (a 25 percent increase), increases the employment rate by 7 percentage points (an 8 percent increase), decreases five-year mortal-

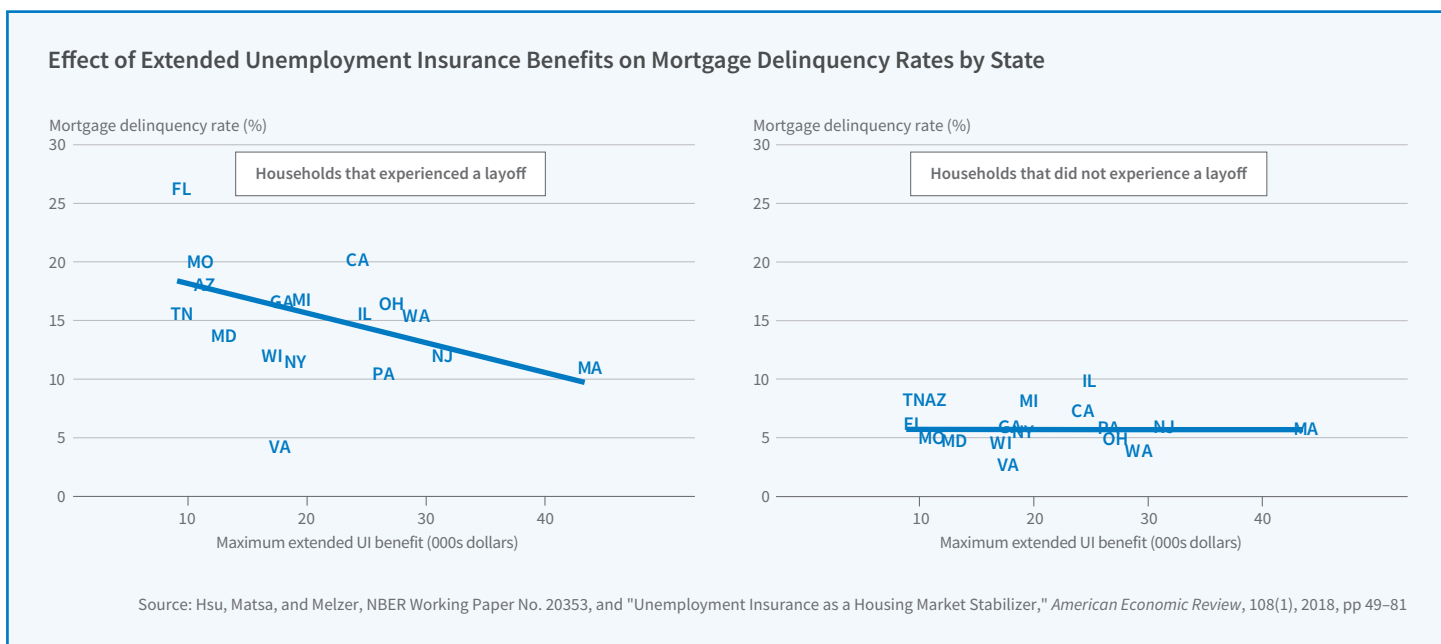


Figure 3

ity by 1.2 percentage points (a 30 percent decrease), and decreases the five-year foreclosure rate by 19 percentage points.

Further analysis points to two mechanisms behind these results. First, the impact of being granted bankruptcy protection is larger in states in which creditors can garnish wages, suggesting that bankruptcy protection preserves incentives to work by reducing the overall effective “tax” on working. Second, bankruptcy protection appears to reduce the financial disruption associated with strategic moves to avoid creditors: Those granted bankruptcy protection are 25 percent more likely to continue working at the same job, and 15 percentage points more likely to continue working in the same state.

Sources and Implications of Firm-level Market Power

In addition to examining the behavior of individuals and households, recent research has examined several dimensions of firm- and market-level outcomes in household finance markets. One active area of research has focused on identifying the sources of market power—including advertising, the ability to shroud fees, search costs, and consumer inattention—and their costs to consumers.

Umit Gurun, Matvos, and Seru find that borrowers in areas where mortgage lenders advertise more pay higher mortgage interest rates conditional on borrower and contract characteristics, and that this effect is more pronounced for those who are less financially sophisticated.¹⁸ An analysis of advertising content shows that initial/introductory rates are frequently advertised in a salient fashion, while reset rates are not, a type of shrouded attribute.

Agarwal, Song, and Yao explore the effects of increased competition in the mortgage market generated by bank entry in the market following banking deregulation in the U.S.¹⁹ They find that banks facing more competitive settings tend to offer lower initial rates on adjustable-rate mortgages, but that most of the financial benefit to consumers from these lower

rates is offset by higher reset rates.

On the investment side, Justine Hastings, Ali Hortacsu, and Chad Syverson use administrative data to analyze the pricing and sales force deployment decisions of firms that manage assets in Mexico’s privatized social security system.²⁰ They find that consumers exhibit less price sensitivity in areas where firms have a larger sales force, which then enables these firms to charge higher fees.

Anagol and Hugh Kim examine how the pricing structure of mutual funds in India enables firms to charge higher fees.²¹ They study a natural experiment, a 22-month period in which closed-end funds were allowed to charge a fee that was easily shrouded, while open-end funds were not. Fund entry during this period shifted dramatically from open- to closed-end funds, increasing overall fees paid by consumers.

Consumer search costs can also generate market power for financial services firms. Using data on millions of auto loans and loan applications from hundreds of financial institutions, Bronson Argyle, Taylor Nadauld, and Christopher Palmer document four empirical regularities that suggest that search costs impede market efficiency.²² First, there is significant dispersion in auto loan interest rates across institutions for the same type of loan, and most borrowers could access cheaper credit if they queried only two additional financial institutions. Second, search is costly, and borrowers are more likely to search in areas where search costs, as measured by the number of financial institutions within a 20-mile radius, are low. Third, there are large interest rate discontinuities at various FICO score thresholds, and significant variation across firms in the relationship between interest rates and FICO score; on average, borrowers with FICO scores just above an institution’s FICO score threshold are offered loans with an interest rate 1.5 percentage points lower than borrowers with scores just below the threshold, even though there are no differences in subsequent loan performance between borrowers on either side of these thresholds. Finally, consumer purchasing and financing deci-

sions are distorted by these discontinuities; buyers with FICO scores just below a threshold purchase older, less-expensive cars to offset the higher interest rate being paid, even though many could find a lower rate elsewhere if they shopped around.

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Prior to arriving at NYU, he was a staff economist with the Board of Governors of the Federal Reserve System and a professor of economics at Boston University.

Gilchrist's research interests are in monetary economics and applied macroeconomics. Much of his research focuses on financial market frictions and their consequences for real economic activity, with particular emphasis on the implications for investment behavior, business cycle dynamics, and the conduct of monetary policy.

Gilchrist grew up in England, France, and the American Midwest. He received a bachelor's degree in economics from Iowa State University and a PhD from the University of Wisconsin. He lives in New York with his wife and sons.

The Role of Financial Factors in Economic Fluctuations

Simon Gilchrist

The 2008–09 global financial crisis and ensuing worldwide recession have brought renewed attention to the importance of credit conditions for the macroeconomy. From a theoretical perspective, two broad mechanisms link credit conditions to macroeconomic outcomes.

First, financial frictions on the side of borrowers imply that their borrowing costs include an external finance premium—the cost of borrowing above and beyond the relevant risk-free interest rate. Theory tells us that this external finance premium should vary with the net worth of the borrower relative to the amount borrowed—in effect, higher borrower leverage implies greater borrowing costs. During an economic downturn, the external finance premium increases as asset prices fall and leverage rises; this increase in borrowing costs causes a reduction in spending by households and firms, which further exacerbates the downturn.

Second, conditional on the quality of borrowers' balance sheets, the supply of credit offered by financial intermediaries may also vary over the cycle, rising in booms and falling in recessions. Financial disruptions reduce credit supply and cause borrowing costs to rise, conditional on the default characteristics of the borrowers. Broadly speaking, my work in this area uses information on borrowers' costs obtained from corporate bond prices to understand the role of credit supply fluctuations in determining economic outcomes.

The Predictive Content of Credit Spreads

To identify disruptions in credit markets, research on the role of asset prices in economic fluctuations has focused on the

information content of various corporate credit spreads. This prior research, however, finds mixed results in the ability of credit spreads to forecast economic activity. A limitation of this literature is its reliance on aggregate credit spread indices that allow for a significant mismatch in the maturity composition of corporate bond yields and their risk-free Treasury counterparts. In effect, such series mix duration risk with credit risk.

In my first paper on this topic, Vladimir Yankov, Egon Zakrajšek, and I provide evidence that credit spreads are robust forecasters of economic activity, using a broad array of credit spreads constructed directly from the secondary bond prices on outstanding senior unsecured debt issued by a large panel of nonfinancial firms.¹ This allows us to construct a credit spread for each bond outstanding, based on comparing the bond price to that of a synthetic risk-free Treasury security with matched cash flows. This “ground-up” approach solves the problem of maturity mismatch when constructing credit-spread indices.

An additional advantage of this ground-up approach is that we are able to construct matched portfolios of equity returns, allowing us to examine the information content of bond spreads that is independent of the information contained in stock prices of the same set of firms, as well as in macroeconomic variables measuring economic activity, inflation, interest rates, and other financial indicators. We document that our portfolio-based bond spreads contain substantial predictive power for economic activity and outperform—especially at longer horizons—standard credit-risk indicators.

This analysis is conducted using standard in-sample forecasting methods. A follow-up paper written with Jon Faust, Jonathan Wright, and Zakrajšek employs a large number of real and financial indicators to forecast real-time measures of economic activity within a Bayesian Model Averaging (BMA) framework.² Our results indicate that BMA yields consistent improvements in the prediction of real activity measures, at horizons from the current quarter (“nowcasting”) out to four quarters hence. The gains in forecast accuracy owe exclusively to the inclusion of our portfolio credit spreads in the set of predictors. Put differently, BMA consistently assigns a high posterior weight to models that include these financial indicators.

The Excess Bond Premium

An important question is the extent to which the predictive content of credit spreads occurs because of credit demand, including the cyclical variation in borrowers’ credit risk, as opposed to variation in the willingness of bond holders to bear such risk, which we believe relates to credit-supply considerations.

To address this issue, Zakrajšek and I follow the same ground-up approach to construct a single index of credit spreads—the Gilchrist-Zakrajšek (GZ) spread—based on all available bond data outstanding dating back to 1973.³ Using a flexible empirical framework, we then decompose this credit spread into two parts: a component reflecting the available firm-specific information on default risk and the excess bond premium (EBP), a residual component that can be thought of as capturing inves-

tor attitudes toward corporate credit risk—that is, credit market sentiment. In effect, the EBP tries to capture the variation in the average price of bearing U.S. corporate credit risk, above and beyond the compensation that investors in the corporate bond market require for expected defaults.

Figure 1 shows these two credit-risk indicators from January 1973 through October 2018. Both the GZ credit spread and the EBP increase significantly prior to, or during, most of the cyclical downturns since the early 1970s. In addition, both indica-

stantially predate significant evidence of an impending slowdown in economic activity. In this sense, the EBP captures well the investor sentiment in the corporate bond market, as well as in other markets for risky assets, in the run-up to the financial crisis.

Using the GZ credit spread, we again document the ability of credit spreads to predict a wide range of real activity variables at both the one-quarter and one-year horizons. Focusing on data since the mid-1980s, a period that saw a substantial deepening of the U.S. corporate bond market, our

results indicate that the excess bond premium accounts for all of the forecasting power of credit spreads for macroeconomic outcomes.

Such forecasting exercises do not allow a causal interpretation. Using standard identification methods from the structural vector autoregression (VAR) literature, we further document that innovations in the EBP that are orthogonal to the current state of the economy lead to significant declines in

economic activity and equity prices. In quantitative terms, these estimates are on a par with the estimated effects of contractionary monetary policy shocks.

We also show that during the 2007–09 financial crisis, a deterioration in the creditworthiness of broker-dealers—who are key financial intermediaries in the corporate cash market—led to an increase in the excess bond premium. These findings support the notion that a rise in the EBP represents a reduction in the effective risk-bearing capacity of the financial sector and, as a result, a contraction in the supply of credit that has significant adverse consequences for the macroeconomy.

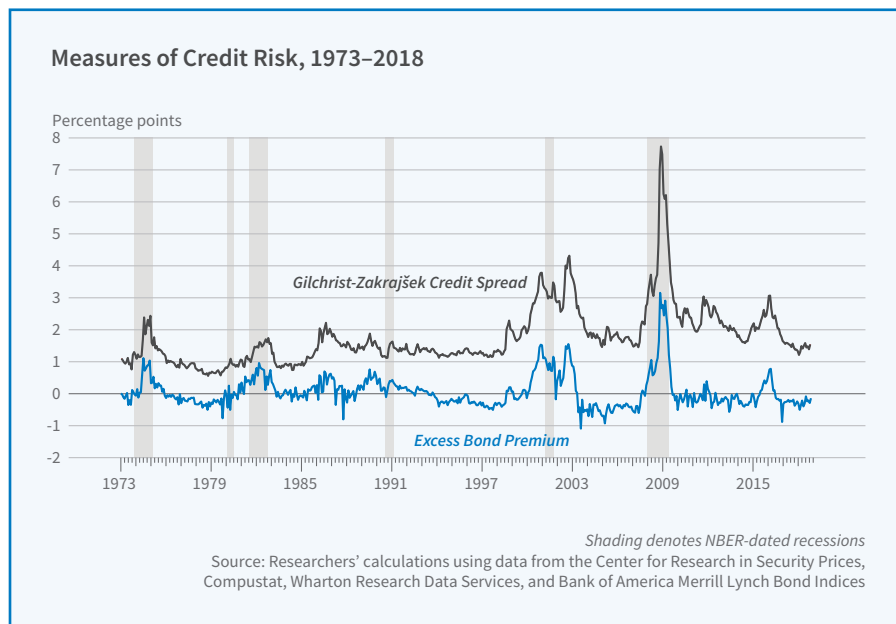


Figure 1

tors reach an all-time high at the peak of the financial turmoil associated with the collapse of Lehman Brothers in September 2008.

A closer look at the excess bond premium in the period prior to the Lehman collapse offers a significant insight. Notably, the EBP is at its lowest point during the 2003–06 period, which is often viewed as a period of excessive risk-taking in the financial sector. The EBP begins to increase in early 2007, concomitant with the slowdown in home prices and rising concerns regarding the quality of commercial paper backed by securitized mortgage assets. These concerns sub-

Recession Probabilities

More recent work with Giovanni Favara, Kurt Lewis, and Zakrajšek focuses on the ability of the excess bond premium to predict National Bureau of Economic Research-dated recessions, using a standard binary recession indicator approach.⁴ The leading statistical model in this area relies on a combination of the real federal funds rate and the term spread as the two primary recession predictors. Consistent with our prior results, we document that the GZ credit spread contains significant information—above and beyond these two variables—for recession risk over the 1973–2016 sample period. We further document that over the past four decades, the predictive power of credit spreads for economic downturns is due entirely to the EBP. Moreover, a model based solely on the EBP explains over half of the total variation captured by the broader model that includes the additional interest rate series.

To see the predictive content of the excess bond premium for recession outcomes, Figure 2 plots the implied recession probabilities from a statistical model that relies solely on the excess bond premium. In the post-1985 sample period, the EBP captures most of the variation in recession probabilities implied by such a framework. It also predicts the onset of the 2007–09 recession very well.

European Evidence

In other recent work, Benoit Mojon and I follow the same ground-up approach to construct credit risk indicators for euro-area banks and non-financial corporations.⁵

These indicators reveal that the financial crisis of 2008 dramatically increased the cost of market funding for both banks and nonfinancial firms in the euro area. The 2008 financial crisis also led to a systematic divergence in credit spreads for financial firms across national boundaries. Credit spreads for financial institutions in the periphery countries, Spain and Italy, widened considerably relative to their counterparts in the core countries such as France and Germany. This divergence in cross-country credit risk increased further as the European sovereign debt crisis intensified in 2010. This dramatic widening of such spreads in the periphery relative to the core of the euro zone

unemployment, and declines in inflation across the euro area.

Causes of the Great Recession

An important question is why the fall in home prices and the resulting financial turmoil had such severe economic consequences during the Great Recession. One answer is that falling home prices led to a sharp reduction in spending by households, owing both to wealth effects and to households' propensity to borrow against housing wealth. An alternative view is that declining home prices led to financial sector losses and a sharp, broad-based decline in credit available to both firms and households.

In a recent paper, Mark Gertler and I seek to assess the relative strength of these mechanisms within a panel data VAR framework.⁶ Household balance sheet effects during the crisis are identified through state-specific responses of employment to variation in home prices due to the differential degree to which households are indebted across geographic regions prior to the crisis.

Conditional on such response, we then exploit time-variation in the EBP for financial sector bonds to capture an aggregate component that may be attributed to the broad-based declines in credit supply that are not specific to the household sector.

Figure 3 [on the next page] shows the resulting historical decomposition of aggregate employment into the usual effect of housing prices over the cycle that primarily affects construction employment, the household balance sheet effect specific to

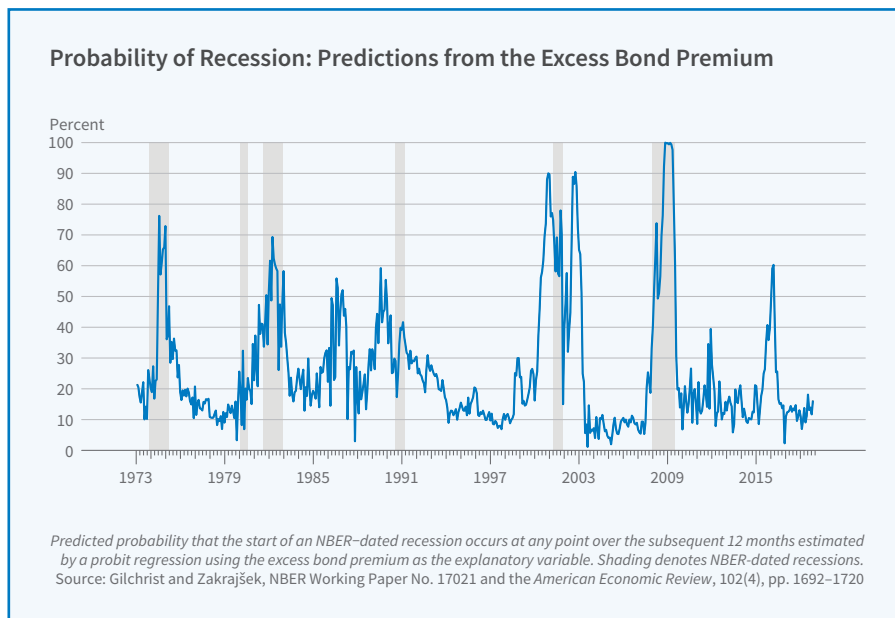


Figure 2

reflects the disruptions to credit supply experienced by the periphery, as rising concerns regarding sovereign default risk spilled over into the private sector.

Consistent with this view, we show that credit spreads provide substantial predictive content for a variety of real activity and lending measures for the euro area as a whole and for individual countries. Again, using structural VAR methods to determine causality, our analysis implies that disruptions in corporate credit markets lead to sizable contractions in output, increases in

the Great Recession, and the effect of an aggregate reduction in credit supply as captured by the excess bond premium. This decomposition implies that contractions in the aggregate supply of credit, as measured by increases in the EBP, account for over 50 percent of the overall decline in employment during the 2007–10 period.

While much work remains to be done studying the link between credit conditions and economic activity, my research suggests that credit spreads

forecast economic activity across a wide variety of settings. Moreover,

the evidence suggests that disruptions in credit supply, as measured by variation in the excess bond premium, are a primary factor contributing to adverse economic outcomes. The fact that the excess bond premium rises prior to recessions and helps predict recession outcomes suggests that credit supply plays an important role in shaping the business cycle, and accounts for a large fraction of the overall decline in economic activity during the Great Recession.

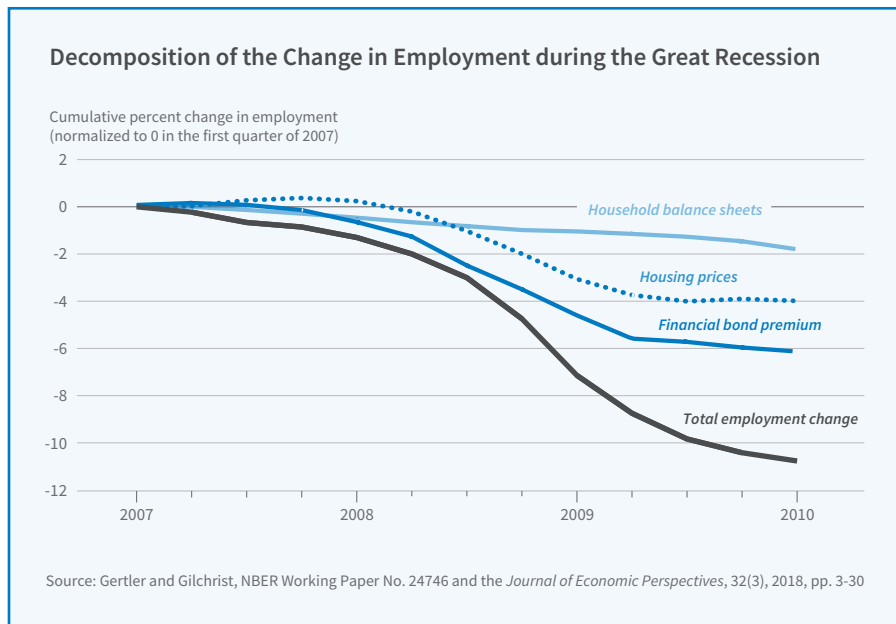


Figure 3

¹ S. Gilchrist, V. Yankov, and E. Zakrajšek, “Credit Market Shocks and Economic Fluctuations: Evidence from Corporate Bond and Stock Markets,” NBER Working Paper No. 14863, April 2009, and *Journal of Monetary Economics*, 56(4), 2009, pp. 471–93. [Return to Text](#)

² J. Faust, J. Wright, S. Gilchrist, and E. Zakrajšek, “Credit Spreads as Predictors of Real-Time Economic Activity: A Bayesian Model-Averaging Approach,” NBER Working Paper No. 16725, January 2011, and *The Review of Economics and Statistics*,

95(5), 2013, pp. 1501–19.

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³ S. Gilchrist and E. Zakrajšek, “Credit Spreads and Business Cycle Fluctuations,” NBER Working Paper No. 17021, May 2011, and the *American Economic Review*, 102(4), 2012, pp. 1692–1720.

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⁴ G. Favara, S. Gilchrist, K. Lewis, and E. Zakrajšek, “Recession Risk and the Excess Bond Premium,” FEDS Notes, Washington: Board of Governors of the Federal Reserve System, 2016, <http://dx.doi.org/10.17016/2380-7172.1739>.

<http://dx.doi.org/10.17016/2380-7172.1739>.

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⁵ S. Gilchrist and B. Mojon, “Credit Risk in the Euro Area,” NBER Working Paper No. 20041, April 2014, and *The Economic Journal*, 128(608), 2017, pp. 118–58.

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⁶ M. Gertler and S. Gilchrist, “What Happened? Financial Factors in the Great Recession,” NBER Working Paper No. 24746, June 2018, and *Journal of Economic Perspectives*, 32(3), 2018, pp. 3–30.

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Most of Jin’s research focuses on information asymmetry among economic agents and how to provide information to overcome this problem. She has studied restaurant food safety, health insurance, prescription drugs, e-commerce, online reviews, regulatory inspection, scientific innovation, air quality, blood donation, intrafamilial interaction, data security, and consumer protection. Her research has been published in economics, management, and marketing journals, and has been supported by the National Science Foundation, the Net Institute, and the Alfred P. Sloan Foundation. She is currently co-editor of the *Journal of Economics and Management Strategy*, associate editor of *RAND Journal of Economics*, and guest senior editor for a special issue of *Marketing Science* on consumer protection.

Price and Quality of Prescription Drugs

Ginger Zhe Jin

It is difficult for patients to perceive the quality of prescription drugs even after they consume them, because they lack medical knowledge and because symptom alleviation depends on comorbidities, diet, and other factors. Additionally, multiple factors, ranging from active pharmaceutical ingredients (API) and purity to transportation and storage conditions, affect drug quality. After a pharmaceutical product is approved for the market, ensuring quality in production and distribution is crucial.

This is why the U.S. Food and Drug Administration routinely inspects domestic drug manufacturing plants for compliance with good manufacturing practice. In theory, all drugs approved for use in the United States, whether made domestically or overseas, must comply with applicable federal regulations. But it is more difficult to conduct the good manufacturing practice inspection abroad, where roughly 80 percent of APIs and 40 percent of finished drugs are made. Because the FDA lacks legal jurisdiction outside the U.S., it can only send warning letters, issue import alerts, and deny market access for foreign plants that are found to be out of compliance.

In the early years of this century, several high-profile episodes of contaminated imports resulted in substantial numbers of deaths in the United States, leading the FDA to strengthen its quality control program in China, India, and many other countries. Even after these steps, however, the FDA mainly inspects wholesale imports. While the Federal Food, Drug, and Cosmetic Act (FFDCA) prohibits the importation of unapproved drugs into the U.S., including retail purchases by individuals who shop on the internet, the FDA does not vigilantly enforce the ban.¹ Thus it is possible that some low-quality pharmaceutical products are still reaching U.S. consumers as a result of online retail sales.

My collaborators and I have studied

the trade-offs that are associated with direct-to-consumer pharmaceutical sales by internet sellers, studying in particular the quality variation across drug providers and the evolving access that U.S. buyers have to offshore sellers.

Certification and Quality Variation

Four to six percent of U.S. residents order prescription drugs from online pharmacies.² Some are foreign pharmacies that may not meet FDA standards. The National Association of Boards of Pharmacy (NABP) reviewed 7,430 internet pharmacies in December 2010 and found that 96 percent were not in compliance with U.S. state and federal laws and/or NABP patient safety and pharmacy practice standards.³ Among non-compliers, 34 percent had server locations in a foreign country, 27 percent had a physical address outside the U.S., 56 percent did not provide any physical address, 84 percent did not require valid prescriptions, 62 percent issued prescriptions via online consultation, 50 percent offered foreign or non-FDA-approved drugs, and 83 percent did not offer medical consultation. These findings suggest that the rise of internet-marketed pharmaceuticals has introduced new concerns about drug quality.

The NABP, which emphasizes that consumer importation of drugs violates the FFDCA, certifies U.S. web-based pharmacies that comply with laws in both the state of their business operation and the states to which they ship. As of February 29, 2012, the NABP had certified 30 online pharmacies. Twelve of these were run by large pharmacy-benefits management companies open to members only; others are the online branches of national chain pharmacies such as CVS.com and Walgreens.com, and large online-only pharmacies such as drugstore.com.

Another certification agency,

LegitScript.com, has a similar focus on U.S. websites. It was endorsed by the NABP to screen pharmacy websites after 2011. As of November 2016, LegitScript was monitoring over 80,000 Internet pharmacies. It estimated that between 30,000 and 35,000 were actively selling prescription drugs at any one time. Among active websites, 96 percent did not satisfy LegitScript's certification criteria and therefore were not fully compliant with U.S. laws and regulations.⁴ NABP endorses the use of LegitScript by domain name registrars to assist in identifying illegally operating websites; I therefore consider websites certified by either agency as NABP-certified.

The other two private certifiers—PharmacyChecker.com and the Canadian International Pharmacy Association (CIPA)—are fundamentally different. CIPA is a trade association of Canadian pharmacies and only certifies Canadian websites that comply with Canadian laws, while PharmacyChecker covers the U.S., Canada, and many other countries. Similar to NABP, PharmacyChecker also charges fees for an approved website to be listed on PharmacyChecker.com beyond a short initial period.⁵ As of March 9, 2012, at about the time my collaborators and I were studying this issue, PharmacyChecker had approved 73 foreign websites and 51 U.S. websites. Because PharmacyChecker is unwilling to share its complete list of approvals, it is impossible to conduct a full comparison between approvals by PharmacyChecker and those by the NABP, LegitScript, or the CIPA. Among the four certification agencies, PharmacyChecker is the only one that provides head-to-head drug price comparisons across online pharmacies.

To investigate whether drug quality differs between certified and uncertified online sellers, Roger Bate, Aparna Mathur, and I obtained 365 samples of five popular brand-name prescription drugs from three tiers of online pharmacies: NABP-certified websites (tier A), PharmacyChecker/CIPA-certified websites (tier B), and websites that were not certified by any of the four certifiers (tier

C).⁶ We then compared all the testable samples (328) with authentic versions, using the Raman spectrometer.⁷ There was zero failure in tier A and tier B samples, but eight tier C samples of Viagra failed the authenticity test. All other testable drugs that were purchased from Tier C passed. This finding validates concerns that using uncertified online pharmacies may be risky, but the lack of failure among tier B pharmacies also suggests that not all foreign pharmacies are rogue.

It is important to note that there can be price differences in addition to quality differences. In our audit test, although tier A and tier B samples exhibited similar quality, tier B samples were 49.2 percent cheaper than tier A samples after controlling for other factors. Samples from tier C websites were 54.8 percent cheaper than those from tier A websites. Importantly, these differences were driven by non-Viagra drugs, all of which passed the authenticity test. In contrast, the failing samples of Viagra were cheaper than the passing samples, but there was no significant price difference across tiers once we conditioned on testability and authenticity.

The large price difference between tier A and the other two tiers highlights price variations in the international market of prescription drugs. Because many non-U.S. countries are willing to impose price regulations on prescription drugs, the same drug could be much cheaper outside the U.S., even if the drug was patented by a U.S. manufacturer. For example, a 2005 study estimated that Canadian prices for the 100 top-selling brand-name drugs were on average 43 percent below U.S. prices for the same drugs.⁸ As a result, saving money is one of the leading reasons to buy prescription drugs online, despite quality uncertainty.⁹

Access to Internet Pharmacies

It is easy for shoppers to find “cheap” pharmacies online. Internet shopping allows U.S. consumers to access low-priced drugs, while also allowing rogue pharmacies to take advantage of gullible consumers. This trade-off has been

recognized by the platforms that permit consumer search. As online pharmacies expanded, Google contracted with PharmacyChecker to filter websites listed in its sponsored search results. However, a Department of Justice investigation found that Google was allowing unapproved pharmacies to purchase sponsored links and target U.S. consumers. In February 2010, Google started to ban pharmacies not certified by the NABP from sponsored ads targeting U.S. consumers, and to block pharmacies not certified by the CIPA from sponsored ads targeting Canadian consumers. Other search engines followed suit. In August 2011, Google settled with DOJ and agreed to forfeit \$500 million in ad revenues.

How does the ban of sponsored ads affect consumer search and click behavior concerning online prescription drugs? Matthew Chesnes, Weijia (Daisy) Dai and I apply synthetic control and difference-in-differences (DID) to comScore click-through data from 1 million U.S. households.¹⁰ The monthly click-through data, ranging from September 2010 to September 2012, track the number of searches and searchers for a query and the number of organic and sponsored clicks on each website that result from the query. To be comprehensive, we started with more than 8,000 health-related queries and narrowed down to 528 queries that either accounted for the majority of click volume or were most likely leading to pharmacy websites. Searches using drug and pharmacy queries generated 97 percent of the traffic on pharmacy websites.

We sorted online pharmacies into the same tiers: tier A for NABP-certified websites, tier B for PharmacyChecker or CIPA-certified websites, and tier C for websites not certified by any of the four agencies. By definition, tier A pharmacies are not subject to the ban on sponsored listings and therefore not the subjects of the study. For each tier B or tier C pharmacy website, we constructed a control group sample using clicks on health-related non-pharmacy websites following drug and pharmacy queries.

The synthetic control sample is chosen such that organic clicks reflect the same underlying trend in consumer interests as the treated website, but are not directly affected by the search engine ban.

We found the ban to have heterogeneous effects on pharmacy websites. As shown in the left panel of the figure below, tier B websites experienced a large increase in organic clicks—clicks on the search results based on relevance to the search term rather than advertiser’s payment—making up for roughly two-thirds of their loss of sponsored clicks. These results suggest that the ban increased the search cost for tier B sites, but that some

The differential effects on tier B and tier C sites suggest that consumers may have become more cautious about which websites they buy from and more likely to use information from third-party certifiers. Furthermore, the increase in organic clicks on tier B pharmacies tends to come from queries that target discount pharmacies, and the most significant increase in organic links is for the drugs that treat chronic conditions.

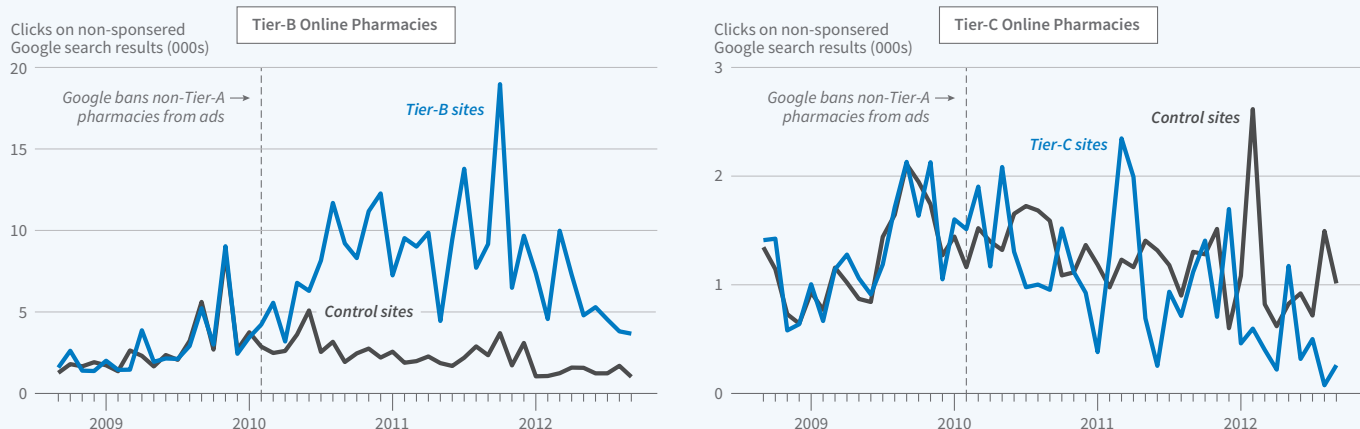
To summarize, while there is stringent regulation of drug quality in the U.S., personal imports still expose U.S. consumers to the potential risk of

visual appearance and disintegration, and analyzed their ingredients by chromatography and spectrometry. Fifteen percent of the samples failed at least one test and failing drugs were priced 13.6–18.7 percent lower than non-failing drugs after controlling for local factors, but the signaling effect of price is far from complete, especially for non-innovator brands.

In a subsequent study, we assessed basic quality of 1,437 samples of Ciprofloxacin, an antibiotic that is used to treat many bacterial infections, from 18 low- to middle-income countries.¹² Following the Global Pharma Health

Bans on Google Ads for Questionable Online Pharmacies and Organic Search Traffic

When Google banned Tier-B and C online pharmacies from buying Google search-result ads, Tier-B pharmacies saw traffic to their non-sponsored search results increase, where Tier-C pharmacies saw no such increase.



Tier-A online pharmacies are NABP/LegitScript-certified, Tier-B online pharmacies are PharmacyChecker or CIPA certified, and Tier-C online pharmacies are not certified
 Source: Chesnes, Dai, and Jin, NBER Working Paper No. 20469, and *Marketing Science*, 36(6), 2017, pp. 879–907

consumers overcome the search cost by switching from sponsored to organic links. Indirectly, these results also suggest that a sponsored search was likely effective for tier B sites before the ban, though we may not causally attribute all sponsored clicks before the ban to the effect of the advertising. In contrast, in the right panel of the figure, tier C pharmacies barely made up any of the loss in sponsored clicks, which can be explained by rising consumer concerns about the quality of drugs sold on uncertified websites after the ban, thanks to related media exposure and government advocacy.

unsafe and low-quality drugs. This risk has been addressed by private certification and enforcement action on a major search engine, but the cost of these actions is that U.S. consumers may face higher search costs and have less access to lower international prices.

A similar price-quality trade-off exists in developing countries and affects a much larger population. Bate, Mathur, and I focused on eight drug types on the WHO-approved medicine list and obtained 899 drug samples from seventeen low- and median-income countries.¹¹ We tested for

Fund e.V. Minilab® protocol, we found that 9.9 percent of the samples had less than 80 percent of the correct API, of which 41.5 percent were entirely falsified, containing zero API, and the rest were substandard, with measurable but insufficient API.¹³ Although substandard drugs are on average cheaper than passing generics in the same city, the average price of falsified drugs is not significantly different from that of passing drugs. These patterns suggest that careful consumers may suspect a drug is substandard before purchase, but it is more difficult to identify falsi-

fied drugs *ex ante*, since they mimic the price and packaging of high-quality, locally registered products.

¹ The FDA defines personal drug imports as those that represent a reasonable risk and are intended for personal use of no more than a three-month supply. An agency handbook on drug-product control states that when determining the legality of personal shipments, “FDA personnel may use their discretion to allow entry of shipments of violative FDA regulated products when the quantity and purpose are clearly for personal use, and the product does not present an unreasonable risk to the user.”

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² G. Orizio, A. Merla, P. Schulz, and U. Gelatti, “Quality of Online Pharmacies and Websites Selling Prescription Drugs: A Systematic Review,” *Journal of Medical Internet Research*, 13(3), 2011. <https://www.ncbi.nlm.nih.gov/pubmed/21965220>

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³ National Association of Boards of Pharmacy. “Internet Drug Outlet Identification Program Progress Report for State and Federal Regulators,” January 2011.

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⁴ LegitScript’s certification criteria include a valid license with local US jurisdictions, a valid registration with the US Drug Enforcement Administration (DEA) if dispensing controlled substances, valid contact information, a valid domain name registration, a valid prescription, dispensing only FDA-approved drugs, and protecting user privacy according to the HIPAA Privacy Rule (45 CFR 164). There are more LegitScript-certified websites than NABP-certified websites, probably because the NABP requires interested websites to apply and pay verification fees while LegitScript’s approval is free and does not require website application.

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⁵ Certification requirements on PharmacyChecker include the stipulation that any approved website must have a valid pharmacy license from its local pharmacy board, requires a prescription for US purchase if the FDA requires a prescription for the medication, protects consumer information, encrypts financial and personal information, and presents a valid mailing address and phone number for contact information.

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⁶ The prescriptions drugs were Lipitor (10 mg), Viagra (100 mg), Celebrex (200 mg), Nexium (40 mg), and Zoloft (100 mg).

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⁷ The samples were also cross-checked against a second lot from a separate national pharmacy chain store to verify consistency and determine method robustness. R. Bate, G. Jin, and A. Mathur, “In Whom We Trust: The Role of Certification Agencies in Online Drug Markets,” NBER Working Paper No. 17955, July 2013, and *Berkeley Express Journal of Economic Analysis & Policy*, Contribution Tier, 14(1), 2013, pp. 111–50.

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⁸ B. Skinner, “Canada’s Drug Price Paradox: The Unexpected Losses Caused by Government Interference in Pharmaceutical Markets,” Fraser Institute Digital Publication, 2005. <https://www.fraserinstitute.org/sites/default/files/CanadasDrugPriceParadox.pdf>.

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⁹ According to C. Gurau, “Pharmaceutical Marketing on the Internet: Marketing Techniques and Customer Profile,” *Journal of Consumer Marketing*, 22(7), 2005, pp. 421–8, the most frequent reasons quoted by interviewees for buying or intending to buy online were convenience and saving money, followed by information anonymity and choice. In our own survey (R. Bate, G. Jin, and A. Mathur, 2014) of

2,522 members of RxRights, 61.54 percent purchased drugs online, mostly from foreign websites, citing cost savings as the leading reason.

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¹⁰ M. Chesnes, W. Dai, and G. Jin, “Banning Foreign Pharmacies from Sponsored Search: The Online Consumer Response,” NBER Working Paper No. 20088, May 2014, and *Marketing Science*, 36(6), 2017, pp. 879–907.

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¹¹ R. Bate, G. Jin, and A. Mathur, “Does Price Reveal Poor-Quality Drugs? Evidence from 17 Countries,” NBER Working Paper No. 16854, March 2011, and *Journal of Health Economics*, 30(6), 2011, pp. 1150–63.

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¹² R. Bate, G. Jin, and A. Mathur, “Falsified or Substandard? Assessing Price and Non-Price Signals of Drug Quality,” NBER Working Paper No. 18073, October 2012, and *Journal of Economics & Management Strategy*, 24(4), 2015, pp. 687–711.

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¹³ Substandard and falsified drugs are not necessarily counterfeits. The World Health Organization in 2010 (<http://www.who.int/en/news-room/fact-sheets/detail/substandard-and-falsified-medical-products>) defined counterfeit drugs by the intent to deceive, but it is extremely difficult to prove intent in practice, especially if the focus is on the intent to infringe trademark rather than the intent to provide effective medicines. As a result, deliberating on trademark infringement often diverts attention from drug quality and its public health implications. By this definition, a counterfeit drug could have zero, some, or even full content of API, if it infringes the trademark; in the meantime, substandard or falsified drugs could be produced by manufacturers that have the legal trademark and other IP rights on the drug.

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Born and raised in India, Muralidharan earned an AB in economics from Harvard, an M.Phil. in economics from Cambridge, and a PhD in economics from Harvard. His research spans development, public, and labor economics with a focus on improving the effectiveness of public spending in the social sector — education, health, and social protection programs — in developing countries. His research program is characterized by large-scale randomized experiments conducted in partnership with governments to study the impact of programs and policies at scale. He is actively involved in policy advising and capacity building in India, and teaches a course on the Indian Economy at UCSD.

Public Sector Personnel Management in Developing Countries

Karthik Muralidharan

Government effectiveness in the provision of basic services like education and health directly affects the quality of life of poor people in developing countries. Yet, the quality of such service delivery is quite weak.¹ Understanding ways of improving service delivery in developing countries has been a focus of my research over the past 15 years. In this piece, I summarize the main insights from this body of work and discuss implications for both policy and research.

My work has focused on public-sector personnel management both because front-line workers are a critical link in service delivery, and because salaries are the largest component of public spending on service delivery. The best evidence comes from education for two reasons. First, it is a setting where public-sector employee productivity can be credibly measured using value-added estimates.^{2 3} Second, the sharp increase in the number of randomized experiments in education has allowed researchers to credibly study the causal effects of various policy options to improve education.⁴

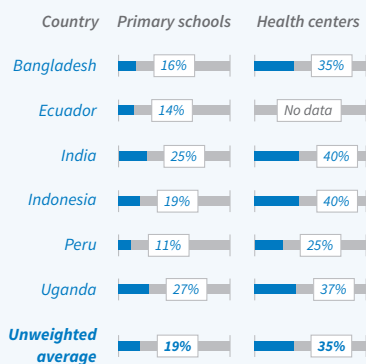
Further, the evidence summarized below typically comes from randomized experiments carried out in samples that are representative of tens of millions of people, and thus provide greater external validity than smaller-scale studies.⁵

Teacher and Health Worker Absence

A striking indicator of weak service delivery in developing countries is the high rate at which front-line service providers are simply absent from work. In a cross-country study using nationally-representative data collected during unannounced visits to schools and health clinics in 2002-03, Nazmul Chaudhury, Jeff Hammer, Michael Kremer, Halsey Rogers, and I found that around 19 percent of teachers and 35 percent of health workers were absent.⁶ In India, where we have the most detailed data, the absence rates were 25 percent and 40 percent respectively. The absence was not concentrated among a subset of “ghost” workers on the payroll, but was instead widely distributed among workers.

Unfortunately, the challenge of provider absence does not seem to have improved much over time. In a follow-up study in India conducted in 2010, Jishnu Das, Alaka Holla, Aakash Mohpal, and I visited the same villages that were visited in 2002-03 and found that teacher absence rates had only fallen modestly and were still nearly 24 percent.⁷ We estimate that the fiscal cost of teacher absence—measured as salaries paid for days of work that were not done—was \$1.5 billion each year. In the sections below, I consider the evidence on potential ways of improving teacher motivation and performance.

Employee Absenteeism in Schools and Health Centers



Source: Chaudhury, Hammer, Kremer, Muralidharan, and Rogers, “Missing in Action: Teacher and Health Worker Absence in Developing Countries”, *Journal of Economic Perspectives*, 20(1), 2006, pp. 91–116

Figure 1

Unconditional Salary Increases

Several global policy reports on education suggest that increasing teacher salaries may improve teacher motivation and student learning outcomes. For instance, UNESCO's Education for All Global Monitoring Report states that "low salaries reduce teacher morale and effort" and "teachers often need to take on additional work — sometimes including private tuition — which can reduce their commitment to their regular teaching jobs and lead to absenteeism."⁸ In Indonesia, a World Bank report stated that "low pay is likely to be one of the main reasons why teachers perform poorly, and have low morale," and another report said that "teachers often have a high rate of absenteeism because they take second jobs to make ends meet. This reality reduces their motivation and effectiveness in the classroom."⁹

Joppe de Ree, Menno Pradhan, Rogers, and I were able to test the impact of unconditional teacher salary increases on student learning outcomes using a large-scale randomized experiment in Indonesia. The study was conducted in the context of a policy change in Indonesia that permanently doubled the base pay of eligible civil-service teachers and was phased in over a period of time. Working in partnership with the government, we implemented an experimental design that accelerated the doubling of pay for *all* teachers in 120 randomly selected schools across the country.¹⁰ We evaluated the impact of this pay increase by comparing test scores in the 120 treated schools with those in 240 control schools.

We found that teachers in treated schools had higher income, were more likely to be satisfied with their income, and were less likely to report financial stress. They also were less likely to hold a second job and worked fewer hours on second jobs they did have. However, despite this improvement in teachers' pay, satisfaction, and time available to focus on their main job due to a reduction in second jobs, the large pay

increase did not improve either their effort or student learning. After two and three years of the pay increase, we find no difference in student test scores in language, mathematics, or science across treatment and control schools. The point estimates are close to zero and precisely estimated, allowing us to rule out even very small effects on student learning. Thus, the evidence suggests that higher pay improves the well-being of incumbent teachers but does not improve their effectiveness.

Of course, increasing teacher salaries can be expected to improve teacher quality over the long run by attracting stronger candidates to the profession. However, civil-service teachers in developing countries are typically paid much more than similarly qualified workers in the private sector,¹¹ and almost no one quits such a job. Thus, any positive effects on teacher quality will only be seen very gradually as incumbent teachers retire and new cohorts enter teaching. However, the costs of unconditional salary increases are borne immediately and are mostly incurred on incumbent teachers. Since there was no impact on performance, we calculate that at reasonable discount rates unconditional salary increases are a very inefficient way of improving service delivery in developing countries.

Performance-Linked Pay

In contrast to the disappointing results from unconditional salary increases, there is considerable evidence of positive impacts on student learning from interventions that link even a small component of teacher pay to objective measures of performance. Venkatesh Sundararaman and I studied the impacts of teacher performance pay using a large-scale randomized experiment across 300 public schools in the Indian state of Andhra Pradesh.¹² We studied two types of teacher performance pay — group bonuses based on school performance and individual bonuses based on teacher performance — with the average bonus cal-

ibrated to be around 3 percent of a typical teacher's annual salary.

After two years, students in incentive schools performed significantly better than those in comparison schools by 0.27 and 0.17 standard deviations in math and language tests respectively. The gains were broadly distributed with students at all levels of the initial test-score distribution benefiting equally from the program. School-level group incentives and teacher-level individual incentives performed equally well in the first year, but individual incentive schools outperformed the group incentive schools after two years of the program.

We found no evidence of any adverse consequences as a result of the incentive programs. Students in incentive schools did significantly better not only in math and language, for which there were incentives, but also in science and social studies, for which there were no incentives), suggesting positive spillover effects. There was no difference in student attrition between incentive and control schools, and no evidence of any adverse gaming of the incentive program by teachers. Our data also suggest that the main mechanism for the impact of the incentive program was not increased teacher attendance, but greater and more effective teaching effort conditional on being present.

Finally, we found that performance-based bonus payments to teachers were a significantly more cost effective way of increasing student test scores compared to spending a similar amount of money unconditionally on additional schooling inputs.

In a follow-up study that tracked the impact of teacher performance pay over a five-year period, I continue to find robust positive effects of teacher performance pay on student learning outcomes.¹³ The cohort of students entering in grade one who experienced the entire five years of primary school in a setting where their teachers were paid bonuses based on improvements in student learning scored 0.54 and 0.35 standard deviation higher in

math and language tests than their peers in the control group. These are large effects and among the largest effect sizes seen in experimental studies of education in developing countries in the past 15 years.

Further evidence on the positive effects of performance linked pay for teachers comes from a study by Esther Duflo, Rema Hanna, and Stephen Ryan, who use a randomized evaluation to study the impact of a program that recorded teacher attendance using cameras and paid teacher salaries on the basis of number of days attended.¹⁴ They find that the program reduced teacher absence in the treatment group by 21 percentage points, and increase student test scores by .17 standard deviations.

Selection Effects

The two main margins of improving teacher quality are improving the effectiveness of incumbent teachers and hiring and retaining more effective teachers. As shown above, performance-pay is likely to be much more cost-effective than across-the-board salary increases for improving the performance of incumbent teachers

Performance-pay may also be a more effective way of improving the quality of new entrants into the profession. This is because increasing the spread of worker pay to more closely reflect productivity is also likely to attract higher-ability candidates, compared with an across-the-board increase in salaries on a compressed schedule with no links to performance.¹⁵ In the context of education, Sundararaman and I find that teachers in India who are *ex ante* more willing to accept a

mean-preserving spread in pay linked to their performance are the ones who are more effective *ex post*.¹⁶ This suggests that effective teachers know who they are, and are likely to be more attracted to a compensation schedule that rewards performance than to one that does not differentiate across high and low performing teachers.

Complementarities between School Inputs and Teacher Incentives

Finally, there is suggestive evidence in the studies above that providing teachers with incentives based on improvements in student learning can also help improve the productivity of existing resources in the school. For instance, we find that teachers with formal teacher-training credentials do not appear to be any more effective than those without these credentials in the control schools. However, these teachers are significantly more effective in the incentive schools. In other words, if teaching quality depends on both teacher knowledge and effort, then an intervention that improves effort will be more effective among teachers with greater knowledge. However,

this evidence is only suggestive because we only have randomized variation in the incentives and not in the inputs.

In a recent study, Isaac Mbiti, Mauricio Romero, Youdi Schipper, Constantine Manda, Rakesh Rajani and I found robust evidence that teacher incentives can increase effectiveness of school inputs. The study, in Tanzania, featured a randomized evaluation conducted across 350 schools, and over

120,000 students.¹⁷ We randomly allocated schools to four groups: 70 received unconditional school grants, 70 received a teacher performance pay program, 70 received *both* programs, and 140 were assigned to a control group.

We report four sets of results. First, the school grant had no impact on student test-scores in math, Swahili, or English after two years. Second, there was some evidence that teacher performance pay improved student learning. Third, students in schools that received both inputs and incentives had significantly higher test scores in all subjects.

Fourth, and most important, we found strong evidence of complementarities between inputs and incentives. At the end of two years, test score gains in the schools that received both programs were significantly greater in all subjects than the sum of the gains in schools that received grants and incentives. In short, school inputs appear to be effective when teachers have incentives to use them effectively, but not otherwise. Conversely, better-motivated teachers can be much more effective with additional educational inputs.

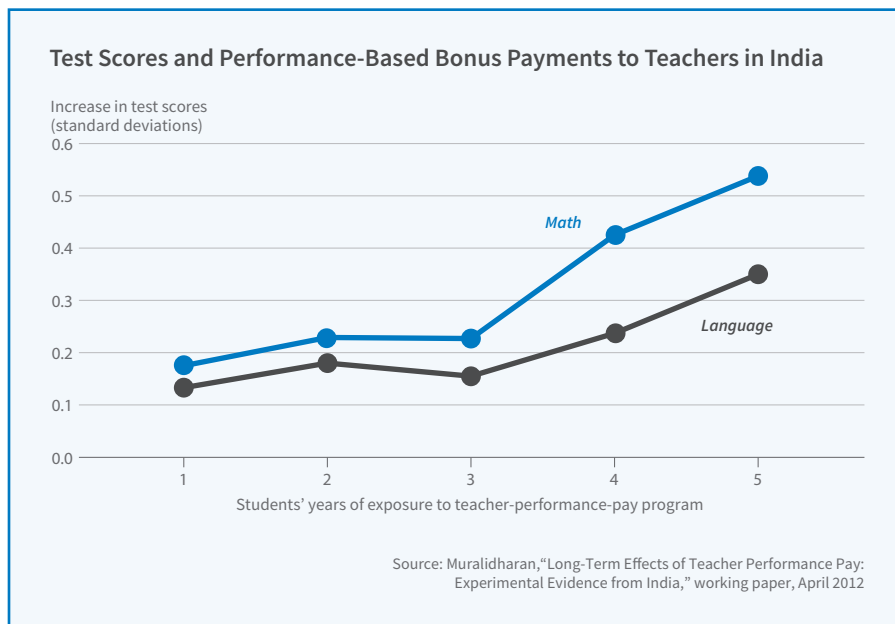


Figure 2

Policy Implications

A vexing challenge for the global development community is that economically disadvantaged places also tend to have weaker governance. A robust pattern we see in the data is that teacher absence rates are higher in countries and states with lower per-capita income. Thus, places that are most in need of additional resources to provide basic services like education and health are also places that are likely to be the least efficient at converting additional spending into improved outcomes.

The results presented above suggest that performance-based pay for teachers and other frontline service providers may help improve the effectiveness of spending on public services in developing countries. In particular, the evidence suggests that it would have larger effects on student learning than unconditional salary increases. The evidence suggests that teacher incentives may also improve the effectiveness of other school inputs and spending.

It may be both fiscally and politically possible to implement teacher incentive programs by replacing scheduled across-the-board salary increases with a revenue-neutral alternative with a lower base increase but greater performance-linked pay. In such a scenario, the main long-term cost of a teacher incentive program would be the administrative cost of implementation, including maintaining integrity in test administration and grading, rather than the cost of performance-linked bonuses *per se*. The estimates of cost effectiveness in the papers summarized above all suggest that these costs will be a small fraction of the total salary bill, and that implementing performance-pay in practice can be quite cost effective.

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The Rate of Return on Everything

Alan M. Taylor

Asset returns occupy a special place in the history of economic thought. From John Stuart Mill to Karl Marx, the profession's most influential thinkers have devoted much of their time to the study of interest and profits. Today, the rate of return on capital still plays a pivotal role in shaping current macroeconomic debates.

Asset returns encapsulate fundamental features about an economy's dynamics, such as attitudes toward risk and preferences over future consumption, demographic shifts in the share of borrowers versus savers, and the ebb and flow of inequality. Understanding such features is critical in designing economic policy.

My latest research, in collaboration with Òscar Jordà, Katharina Knoll, Dmitry Kuvshinov, and Moritz Schularick, sheds new light on many of these big issues in economics. This research forms part of a larger agenda, a collaborative effort to reconstruct the quantitative macro-financial history of the advanced economies since 1870, and to use that laboratory to study

questions of interest to academics and policymakers that have taken on added urgency since the global financial crisis.

The first phase of our research program focused on rebuilding the history of aggregate leverage in the economy, based on bank lending and exploring the relationship between bank balance sheets and leverage, crisis risk, and macroeconomic fluctuations.¹ The new data and some of the key findings from that work were presented in a paper published recently in the *NBER Macroeconomics Annual*.²

In our program's latest phase, attention has shifted to the links between the above phenomena and developments in asset markets. This goal led us to reconstruct the history of returns on major asset classes, which we presented in a recent NBER Working Paper.³

After several years of work, we developed our findings from a new dataset covering the total returns on four main asset classes in the advanced economies over the last 150 years. We collected from scratch new historical data, including, for the first time, the returns

on residential real estate — the largest component of household wealth — of which little has been known until now.

Our data offer new insights on several long-standing puzzles in economics and uncover new relationships that may seem at odds with some fundamental economic tenets. This is a review of a few perplexing insights that we have uncovered and their economic significance.

Long-run Rates of Return on All Major Asset Classes

First, a quick review of the new data. We construct three types of returns: investment income (yield), capital gains (price changes), and total returns (the sum of the two). We do these calculations for four major asset classes, two of them risky — equities and housing — and two of them seen as relatively safe — government bonds and short-term bills. Importantly, our data consist of actual asset returns taken from market data. In that regard, our “bottom up” annual-frequency data are more detailed than returns inferred “top down” from



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Taylor currently serves as a co-editor of the *Journal of International Economics*. In 2004 he was a Guggenheim Fellow, and in 2009–10 a Houblon-Norman/George Fellow at the Bank of England. He worked as a senior adviser at Morgan Stanley in 2010–11.

Taylor's research interests span international economics, macroeconomics, finance, growth, development, and economic history. His first book, *Global Capital Markets: Integration, Crisis, and Growth*, written with Maurice Obstfeld, examined the evolution of the international financial system; his second, *Straining at the Anchor: The Argentine Currency Board and the Search for Macroeconomic Stability, 1880–1935*, written with

Gerardo della Paolera, tells the story of Argentina's first convertibility experiment.

Over the last decade, in collaboration with Moritz Schularick and Òscar Jordà, Taylor has focused on the macro-financial history of advanced economies in the last 150 years. This work produced new datasets on aggregate credit, bank balance sheets, and asset prices, and linked these to other macroeconomic data to enable study of the causes and consequences of financial crises, the role of leverage and asset bubbles, and the rates of return on major asset classes.

wealth estimates in discrete benchmark years, such as in the work of Thomas Piketty and Raymond Goldsmith.⁴

For the first time, we compile historical returns on housing, the largest but an often-ignored component of household wealth. We follow earlier work in documenting annual equity, bond, and bill returns, but have taken the project further. We recompute all these measures from original sources, improve the links across some important historical market discontinuities (e.g., closures and other gaps associated with wars and political instability), and in a number of cases we access new and previously unused raw data sources. Here are some of the puzzling results we have uncovered.

The Housing Puzzle

Perhaps the most surprising finding is that total real returns on residential real estate are on a par with the returns to equities — on average about 7 percent per annum — but they are far less volatile.

Figure 1, above, shows decadal moving averages for real returns on equity and housing. In some countries for some periods, equities have performed slightly better than housing, but only at the cost of much higher volatility and higher synchronicity with the business cycle.

This is puzzling. Housing portfolios are more difficult to diversify than equity portfolios, and transaction costs are admittedly higher. But even accounting for local level variability in house prices, a great deal of this hous-

related across countries over time, we can also show that housing returns have remained globally uncorrelated. International diversification of housing investment may be harder to achieve, but the thought experiment suggests

that the representative investor would do well to hold an internationally diversified portfolio of real estate holdings.

The Safe Rate Puzzle

Our second important finding is that the real returns on safe assets have been very volatile over the long run — and, surprisingly, as much if not more so than risky returns, as Figure 2 demonstrates. Each of the world wars was a time of very low real safe rates, well below zero. So were the 1970s inflation and growth crises. The peaks in the real safe rate occurred during gold standard times, in the interwar period, and in the mid-1980s fight against inflation, when monetary policy sharply tightened.

International evidence presented by Holston, Laubach, and Williams suggests that the natural interest rate has declined internation-

ally since the mid-1980s.⁵ Our richer cross-country sample registers a similarly sharp fall in real safe rates over the same time period. But from a long-run perspective, the puzzle may well be why

International Returns on Housing and Corporate Equity, 1875–2010

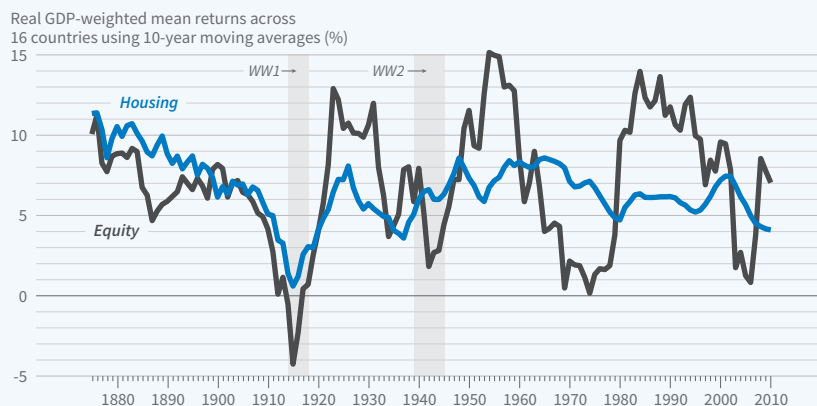


Figure 1

International Returns on Government Debt, 1875–2010

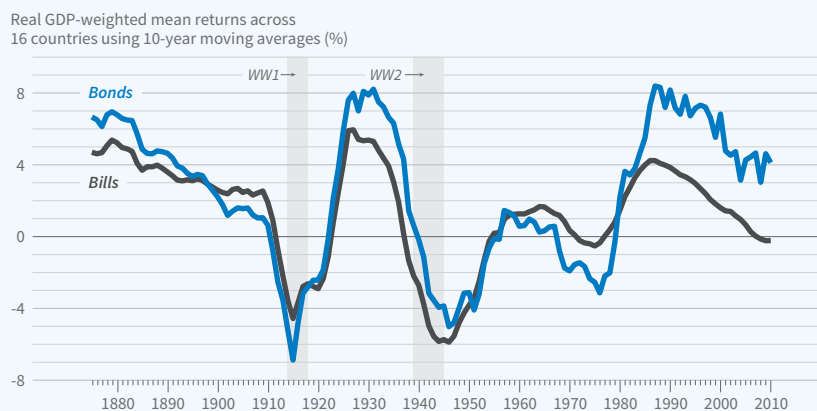


Figure 2

ing puzzle is difficult to fully explain.

The mystery deepens when we consider international diversification. Whereas we can show that equity returns have become increasingly cor-

the safe rate was so high in the mid-1980s, rather than why it has declined so much since then.

Real safe returns have been low on average, in the 1 to 3 percent range for most peacetime periods. Although this combination of low bill and bond returns and high volatility has offered a poor risk-return trade-off to risk-averse investors, it has been a boon to government finances.

The Risk Premium Puzzle

The more an asset pays off when the economy does poorly, the more it insures the investor against economic malaise, and the more the investor will be willing to pay for that insurance—thus depressing its returns and hence commanding what is usually referred to as a risk premium. A vast literature in finance looks at the co-movement between asset pay-offs and economic fluctuations to gauge whether assets are hence properly priced.⁶

However, we find substantial swings in the risk premium at lower frequencies that sometimes endured for decades, far beyond the range of business-cycle swings. In peacetime, the risk premium has been stable at about 4 to 5 percent. There is no visible long-run trend, and, with a few well-understood exceptions, mean reversion appears strong. Curiously, the bursts of risk premium in the wartime and interwar years were mostly phenomena of collapsing safe rates rather than dramatic increases in risky returns. In fact, the risky rate has often been smoother and more stable than safe rates, averaging 6 to 8 percent across all eras. Recently, with safe rates falling, the risk premium has widened only a little, and the gap between the two rates of return is still close to their historical range.

The Final Puzzle: $r \gg g$

One of the most intensely debated economic questions in recent years is the relationship between real returns

on wealth and the real rate of growth. In his influential book *Capital in the Twenty-First Century*, Piketty argued that if the return to capital exceeded the rate of economic growth, rentiers would accumulate wealth at a faster rate than incomes grow. Comparing returns to growth, or “ r minus g ” in Piketty’s vernacular, we uncover that in fact “ $r \gg g$ ” for more countries, more years, and more dramatically than Piketty himself reported.

The only exceptions to “ $r \gg g$ ” happen in very special periods: the years in or right around wartime. In the pre-WWII period, r minus g was on average 5 percent per annum, excluding WWI. As of today, this gap is still quite large, in the range of 3 to 4 percent; it narrowed to 2 percent during the 1970s oil crises before widening in the years leading up to the global financial crisis of 2007–08.

Yet an important puzzle that emerges from our analysis is that the “ r minus g ” gap does not fluctuate systematically with the growth rate of the economy. This feature of the data poses a conundrum for the battling views of factor income, distribution, and substitution in the ongoing debate.⁷

Conclusions

The returns to risky assets, and risk premiums, have been high and stable over the past 150 years, and substantial diversification opportunities exist between risky asset classes and across countries. Arguably the most surprising result of our study is that long-run returns on housing and equity look remarkably similar. Yet while returns are comparable, residential real estate is less volatile on a national level and less globally interrelated, opening up new and interesting risk-premium puzzles.

In light of the new historical data, we might say invest in stocks for the long run—and houses too. But if that is encouraging an upward revision on the returns on all risk assets, we lean if anything toward downward revisions

for safe assets. Low real rates may not just be the new normal; in light of our new evidence, they might be seen as more typical of the old normal as well. Safe real rates have almost never been as high as they were in the 1980s, so that decade may not be a reliable benchmark at all.

Our research also speaks directly to the relationship between r , the rate of return on wealth, and g , the growth rate of the economy. The gap between r minus g figures prominently in the current debate on inequality sparked by Piketty. A robust finding in this paper is that r is much higher than g . On a global level and across most countries, the weighted rate of return on capital was twice as high as the growth rate in the past 150 years.

These and other findings set out a rich agenda for future research. Many issues remain to be explored, in particular the fundamental determinants that drive the returns on each of the asset class in typical economies. For now, we hope our introduction of this new universe of asset return data can provide a basis for new explorations of fundamental economic questions in years to come.

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New Research Associates and Faculty Research Fellows for 2018

The [NBER Board of Directors](#) appointed 58 research associates at its two meetings in 2018. New research associates (RAs), who must be tenured faculty members at North American colleges or universities, are recommended to the board by the directors of the NBER's 20 research programs. The program directors usually consult with a steering committee of leading scholars in the program. Forty-one of the 58 new research associates were previously faculty research fellows.

Faculty research fellows (FRFs), who are appointed by the NBER president, also must hold primary academic appointments in North America. They also are recommended by program directors and their steering committees in the culmination of a highly competitive process that begins with a call for nominations in February. Candidates are evaluated based on their research records and their capacity to contribute to the NBER's activities. In 2018, 214 researchers were nominated for faculty

research fellowships; 45 were selected.

The 103 newly appointed RAs and FRFs are affiliated with 54 different colleges and universities, and completed graduate studies at 29 different institutions. At the close of 2018, there were 1,211 NBER research associates and 300 faculty research fellows.

These are the newly appointed researchers, their universities, and their NBER program affiliations, with italics indicating research associates who previously were faculty research fellows:

Research Associates

Manuel Adelino, Duke University (Corporate Finance)

Ufuk Akcigit, University of Chicago (Productivity, Innovation, and Entrepreneurship)

Randall Akee, University of California, Los Angeles (Labor Studies)

Isaiah Andrews, Harvard University (Labor Studies)

Lorenzo Caliendo, Yale University (International Trade and Investment)

Filipe Campante, Johns Hopkins University (Political Economy)

David Cesarini, New York University (Aging)

Jeffrey Clemens, University of California, San Diego (Public Economics)

Olivier Coibion, University of Texas at Austin (Monetary Economics)

Riccardo Colacito, University of North Carolina (International Finance and Macroeconomics)

Lisa Cook, Michigan State University (Development of the American Economy)

Benjamin Cowan, Washington State University (Health Economics)

Mariano Max Croce, University of North Carolina (International Finance and Macroeconomics)

Melissa Dell, Harvard University (Development of the American Economy)

Klaus Desmet, Southern Methodist University (International Trade and Investment)

Arindrajit Dube, University of Massachusetts (Labor Studies)

Oeindrila Dube, University of Chicago (Development Economics)

Keith Marzilli Ericson, Boston University (Health Care)

Daniel Fetter, Wellesley College (Development of the American Economy)

Chao Fu, University of Wisconsin (Labor Studies)

Stefania Garetto, Boston University (International Trade and Investment)

Stefano Giglio, Yale University (Asset Pricing)

Joshua Gottlieb, University of British Columbia, (Health Care)

*Garth Heutel, Georgia State University
(Environmental and Energy Economics)*

*Kelsey Jack, University of California, Santa Barbara
(Environmental and Energy Economics)*

*Matthew Jaremski, Utah State University
(Development of the American Economy)*

Paul Joskow, MIT (Environmental and Energy Economics)

Lisa Kahn, University of Rochester (Labor Studies)

Daniel Keniston, Yale University (Development Economics)

*Anton Korinek, University of Virginia
(International Finance and Macroeconomics)*

*Brian Kovak, Carnegie Mellon University
(International Trade and Investment)*

Amanda Kowalski, University of Michigan (Health Care)

Camelia Kuhnen, University of North Carolina (Asset Pricing)

*Lars Lefgren, Brigham Young University
(Economics of Education)*

Catherine Maclean, Temple University (Health Economics)

Neale Mahoney, University of Chicago (Public Economics)

Gerard Padró i Miquel, Yale University (Political Economy)

Konstantin Milbradt, Northwestern University (Asset Pricing)

Timothy Moore, Purdue University (Health Economics)

Melinda Morrill, North Carolina State University, (Aging)

*Suresh Naidu, Columbia University
(Development of the American Economy)*

*Volker Nocke, University of California, Los Angeles (Industrial
Organization)*

*Alexander Oertl, Georgia Institute of Technology
(Productivity, Innovation, and Entrepreneurship Program)*

Amanda Pallais, Harvard University (Labor Studies)

*John Parman, College of William and Mary
(Development of the American Economy)*

Nancy Qian, Northwestern University (Development Economics)

*Mar Reguant, Northwestern University
(Industrial Organization)*

*Kim J. Ruhl, Pennsylvania State University
(International Finance and Macroeconomics)*

Lucie Schmidt, Williams College (Children)

*Ananth Seshadri, University of Wisconsin
(Economic Fluctuations and Growth)*

*Joseph Shapiro, University of California, Berkeley
(Environmental and Energy Economics)*

Kelly Shue, Yale University (Corporate Finance)

Stefanie Stantcheva, Harvard University (Public Economics)

*Reed Walker, University of California, Berkeley
(Environmental and Energy Economics)*

*Ali Yurukoglu, Stanford University
(Industrial Organization)*

Basit Zafar, Arizona State University (Labor Studies)

Owen Zidar, Princeton University (Public Economics)

*Fabrizio Zilibotti, Yale University
(Economic Fluctuations and Growth)*

Faculty Research Fellows

*Rodrigo Adão, University of Chicago
(International Trade and Investment)*

Amanda Agan, Rutgers University (Labor Studies)

Abby Alpert, University of Pennsylvania (Health Care)

*D. Mark Anderson, Montana State University
(Health Economics)*

*Christiane Baumeister, University of Notre Dame
(Environmental and Energy Economics)*

Samuel Bazzi, Boston University (Development Economics)

Michael Best, Columbia University, (Public Economics)

*Anmol Bhandari, University of Minnesota
(Economic Fluctuations and Growth)*

Barbara Biasi, Yale University (Economics of Education)

Kamran Bilir, University of Wisconsin
(International Trade and Investment)

Peter Blair, Clemson University (Economics of Education)

Corina Boar, New York University
(Economic Fluctuations and Growth)

Colleen Carey, Cornell University (Health Care)

Christian Catalini, MIT
(Productivity, Innovation, and Entrepreneurship)

Laura Dague, Texas A&M University (Health Economics)

Michael Darden, George Washington University
(Health Economics)

Rebecca Dizon-Ross, University of Chicago
(Development Economics)

Erik Gilje, University of Pennsylvania (Corporate Finance)

Michela Giorcelli, University of California, Los Angeles
(Development of the American Economy)

Jacob Goldin, Stanford University, (Public Economics)

Benjamin Hébert, Stanford University (Asset Pricing)

Peter Hull, University of Chicago (Labor Studies)

Amir Jina, University of Chicago
(Environmental and Energy Economics)

Namrata Kala, MIT (Development Economics)

Adam Kapor, Princeton University (Industrial Organization)

Matthias Kehrig, Duke University
(Productivity, Innovation, and Entrepreneurship)

Thibaut Lamadon, University of Chicago (Labor Studies)

Tim Landvoigt, University of Pennsylvania (Asset Pricing)

Katherine Meckel, University of California, Los Angeles
(Children)

Simon Mongey, University of Chicago
(Economic Fluctuations and Growth)

Timothy Moore, Purdue University (Health Economics)

Lindsay Page, University of Pittsburgh
(Economics of Education)

Christopher Palmer, MIT (Corporate Finance)

Nicholas Papageorge, Johns Hopkins University (Aging)

Fernando Parro, Johns Hopkins University
(International Trade and Investment)

Carolyn Pflueger, University of British Columbia
(Asset Pricing)

Vincent Pons, Harvard University (Political Economy)

Pablo Querubín, New York University (Political Economy)

Julian Reif, University of Illinois (Health Care)

Matthew Rognlie, Northwestern University
(Monetary Economics)

Bryce Steinberg, Brown University (Children)

Claudia Steinwender, MIT
(Productivity, Innovation, and Entrepreneurship)

Margarita Tsoutsoura, Cornell University (Corporate Finance)

Thomas Wollmann, University of Chicago
(Industrial Organization)

Ariell Zimran, Vanderbilt University
(Development of the American Economy)

NBER Researchers Tapped for Leading Policy Roles

Five NBER research associates have taken leave from their academic and NBER posts to serve in important policy positions.

Paul Beaudry, a professor of economics at the Vancouver School of Economics of the University of British Columbia and a research associate affiliated with the Economic Fluctuations and Growth (EFG) and Labor Studies (LS) programs, will become a deputy governor of the Bank of Canada in February 2019.



Paul Beaudry



Richard Clarida

Richard Clarida, the C. Lowell Harris Professor of Economics and International Affairs at Columbia University and a research associate in the International Finance and Macroeconomics (IFM) and International Trade and Investment (ITI) programs, was confirmed by the U.S. Senate in August 2018 as the vice chair of the Federal Reserve Board. He follows several other NBER researchers, including Alan Blinder, Stanley Fischer, and Janet Yellen, in this role.

Pinelopi (“Penny”) Goldberg, the Elihu Professor of Economics at Yale University and a research associate in the ITI and Development Economics Programs, is the new chief economist of the World Bank. A number of NBER researchers have previously served in this role, including Stanley Fischer, Anne Krueger, Martin Ravallion, Paul Romer, Joseph Stiglitz, and Lawrence Summers.



Penny Goldberg



Gita Gopinath

Gita Gopinath, the John Zwaanstra Professor of International Studies and Economics at Harvard University, the co-director of the NBER IFM Program and a research associate in the EFG and Monetary Economics (ME) programs, will become economic counselor and director of research at the International Monetary Fund in January 2019. Other NBER affiliates who have previously served in this position include Olivier Blanchard, Jacob Frenkel, Simon Johnson, Michael Massa, Raghu Rajan, Kenneth Rogoff, and, most recently, Maurice Obstfeld.

Amir Yaron, the Robert Morris Professor of Banking at the Wharton School at the University of Pennsylvania, was confirmed in November as the next governor of the Bank of Israel. He assumed his duties in late December. Yaron is a research associate in the Asset Pricing (AP) program. He follows two other NBER affiliates, Stanley Fischer and Jacob Frenkel, in the governor’s role.



Amir Yaron

Seema Jayachandran and Ben Olken Named Co-Directors of Development Economics Program

Seema Jayachandran, a professor in the economics department at Northwestern University, and Benjamin Olken, an economics professor at MIT, are the new co-directors of the NBER's Program on Development Economics. They succeed Duncan Thomas of Duke University, the program's founding director. The Development Economics Program was launched in 2012.

Both researchers have studied a wide range of issues in development economics. Jayachandran focuses on education, gender issues, health, and the design of transfer programs. An NBER affiliate since 2007, she received her undergraduate degree from MIT, a master's degree at Oxford, and her PhD from Harvard.

Olken, who has been an NBER affiliate since 2005, studies climate



Seema Jayachandran

change and environmental policy, corruption, bureaucracy, institutional design, and taxation in developing nations. He received his undergraduate degree from Yale and his PhD from Harvard. He is a director of the Abdul Latif Jameel Poverty Action Lab at MIT.



Ben Olken

The new co-directors are also co-editors of the *American Economic Journal: Applied Economics*, and board members and fellows of the Bureau for Research and Economic Analysis of Development, an international network of development economists.

Conferences

Economics of Artificial Intelligence

An NBER conference on Economics of Artificial Intelligence took place in Toronto September 13–14. Research Associates Ajay K. Agrawal, Joshua S. Gans, and Avi Goldfarb of University of Toronto and Catherine Tucker of MIT organized the meeting, which was sponsored by the Alfred P. Sloan Foundation, the Canadian Institute for Advanced Research, and the Creative Destruction Lab. These researchers' papers were presented and discussed:

- **Emilio Calvano**, **Vencenzo Denicolò**, and **Sergio Pastorello**, University of Bologna, and **Giacomo Calzolari**, European University Institute, “Q-Learning to Cooperate”
- **Prasanna Tambe**, University of Pennsylvania, “Machine Learning and Domain Knowledge”
- **Erik Brynjolfsson**, MIT and NBER; **Tom Mitchell**, Carnegie Mellon University; and **Daniel Rock**, MIT, “Machine Learning and Occupational Change”
- **Anton Korinek**, University of Virginia and NBER, “Artificially Intelligent Agents in Our Economy”
- **Paul M. Romer**, New York University and NBER, “Machine Learning as a ‘Wind Tunnel’ for Research on Human Learning”
- **Edmund S. Phelps**, Columbia University, “Two Kinds of Robots in Growth Models: An Introduction”
- **Susan Athey**, Stanford University and NBER, “Contextual Bandits”
- **Matthew Gentzkow**, Stanford University and NBER, “Artificial Intelligence, Media, and Fake News”
- **Sendhil Mullainathan**, University of Chicago and NBER, “Using Machine Learning to Understand Human Decision-Making: Application to Health Care”
- **Kathryn L. Shaw**, Stanford University and NBER, “AI and Personnel Economics”
- **Michael Schwarz**, Microsoft, “Open Questions and Research Directions — AI and the Marginal Value of Data”
- **James Bessen**, Boston University, and **Robert Seamans**, New York University, “Startups’ Use of Data for Artificial Intelligence”
- **Joao Guerreiro**, Northwestern University; **Sergio Rebelo**, Northwestern University and NBER; and **Pedro Teles**, Banco de Portugal, “Should Robots be Taxed?” (NBER Working Paper No. [23806](#))
- **Jason Furman**, Harvard Kennedy School, “AI Policy Considerations”
- **Mitsuru Igami**, Yale University, “Artificial Intelligence as Structural Estimation: Economic Interpretations of Deep Blue, Bonanza, and AlphaGo”
- **Hal Varian**, University of California, Berkeley, “Automation v. Procreation”

- **Isil Erel**, Ohio State University; **Léa H. Stern**, University of Washington; **Chenhao Tan**, University of Colorado, Boulder; and **Michael S. Weisbach**, Ohio State University and NBER, “Selecting Directors Using Machine Learning” (NBER Working Paper No. [24435](#))
- **Kristina McElheran**, University of Toronto, “Economic Measurement of AI”
- **Bo Cowgill**, Columbia University, “Impact of Algorithms on Judicial Discretion: Evidence from Regression Discontinuities”
- **Daron Acemoglu**, MIT and NBER, and **Pascual Restrepo**, Boston University, “Automation and New Tasks: The Implications of Task Content of Technology for Labor Demand”
- **Gillian Hadfield**, University of Toronto, “Incomplete Contracts and AI Alignment”

Summaries of these papers are at www.nber.org/conferences/2018/AIf18/summary.html

Tax Policy and the Economy

An NBER conference on Tax Policy and the Economy took place September 27 in Washington, DC. Research Associate Robert A. Moffitt of Johns Hopkins University organized the meeting, which was supported by the Harry and Lynde Bradley Foundation. These researchers’ papers were presented and discussed:

- **Jeffrey B. Liebman**, Harvard University and NBER, “Independent Taxation, Horizontal Equity, and Return-Free Filing”
- **Alan J. Auerbach**, University of California, Berkeley and NBER, “Tax Equivalences and Their Implications” (NBER Working Paper No. [25158](#))
- **Alexander W. Blocker**, Harvard University; **Laurence J. Kotlikoff**, Boston University and NBER; **Stephen A. Ross**, MIT; and **Sergio Villar Vallenas**, Boston University, “The True Cost of Social Security” (NBER Working Paper No. [14427](#))
- **Michelle Hanlon**, MIT; **Jeffrey L. Hoopes**, University of North Carolina; and **Joel Slemrod**, University of Michigan and NBER, “Tax Reform Made Me Do It”
- **Scott R. Baker**, Northwestern University; **Lorenz Kueng**, Northwestern University and NBER; **Leslie McGranahan**, Federal Reserve Bank of Chicago; and **Brian T. Melzer**, Dartmouth College, “Do Household Finances Constrain Unconventional Fiscal Policy?”

Summaries of these papers are at www.nber.org/conferences/2018/TPE18/summary.html

Labor Market Consequences of International Trade

An NBER conference on Labor Market Consequences of International Trade took place October 4 in Washington, DC. Research Associates Stephen J. Redding of Princeton University and Gordon H. Hanson of University of California, San Diego organized the meeting, which was sponsored by the Smith Richardson Foundation. These researchers' papers were presented and discussed:

- **Gordon H. Hanson**, "Distributional Consequences of Trade and Technology"
- **Eunhee Lee**, University of Maryland, and **Kei-Mu Yi**, University of Houston and NBER, "Trade and Global Value Chains"
- **Nina Pavcnik**, Dartmouth College and NBER, and **Pinelopi K. Goldberg**, Yale University and NBER, "The Effects of Trade Policy: A Global Perspective" (NBER Working Paper No. [21957](#))
- **Robert C. Feenstra**, University of California, Davis and NBER, and **Hong Ma** and **Yuan Xu**, Tsinghua University, "U.S. Exports and Employment" (NBER Working Paper No. [24056](#))

Summaries of these papers are at www.nber.org/conferences/2018/TLMf18/summary.html

Taxation of Business Income

An NBER conference on Taxation of Business Income took place October 12 in Cambridge. Research Associates Joshua Rauh of Stanford University and Owen M. Zidar of Princeton University organized the meeting, which was sponsored by the Smith Richardson Foundation and the National Science Foundation. These researchers' papers were presented and discussed:

- **James R. Hines**, University of Michigan and NBER, "Corporate Taxation and the Distribution of Income"
- **Eric C. Ohrn**, Grinnell College, "Corporate Tax Breaks and Executive Compensation"
- **Ufuk Akcigit**, University of Chicago and NBER; **John Grigsby**, University of Chicago; **Tom Nicholas**, Harvard University; and **Stefanie Stantcheva**, Harvard University and NBER, "Taxation and Innovation in the 20th Century" (NBER Working Paper No. [24982](#))
- **Juan Carlos Suárez Serrato**, Duke University and NBER, "Unintended Consequences of Eliminating Tax Havens" (NBER Working Paper No. [24850](#))
- **Suresh Nallareddy**, Duke University; **Ethan Rouen**, Harvard Business School; and **Juan Carlos Suárez Serrato**, Duke University and NBER, "Corporate Tax Cuts Increase Income Inequality" (NBER Working Paper No. [24598](#))
- **Thomas R. Tørslov** and **Ludvig S. Wier**, University of Copenhagen; and **Gabriel Zucman**, University of California, Berkeley and NBER, "The Missing Profits of Nations" (NBER Working Paper No. [24701](#))
- **James F. Albertus**, Carnegie Mellon University, "Does Foreign Tax Arbitrage Promote Innovation?"
- **Alisa Tazhitdinova**, University of California, Santa Barbara, "Entrepreneurial Entry vs Income Shifting, and the High Cost of Incorporation"

Summaries of these papers are at www.nber.org/conferences/2018/TBIf18/summary.html

15th Workshop on Methods and Applications for Dynamic Stochastic General Equilibrium Models

The 15th Workshop on Methods and Applications for Dynamic Stochastic General Equilibrium Models took place October 12–13 in Chicago. Research Associates Jesús Fernández-Villaverde and Frank Schorfheide, both of the University of Pennsylvania; Leonardo Melosi of Federal Reserve Bank of Chicago, and Research Associate Giorgio Primiceri of Northwestern University organized the meeting. These researchers' papers were presented and discussed:

- **Francesco Bianchi**, Duke University and NBER, and **Howard Kung** and **Mikhail Tirsikh**, London Business School, “The Origins and Effects of Macroeconomic Uncertainty”
- **Taeyoung Doh** and **Andrew L. Smith**, Federal Reserve Bank of Kansas City, “Reconciling VAR-based Forecasts with Survey Forecasts”
- **Florin O. Bilbiie**, Paris School of Economics, “A Catch-22 for HANK Models: No Puzzles, No Amplification”
- **Pablo A. Guerrón-Quintana**, Boston College, and **Grey Gordon**, Indiana University, “A Quantitative Theory of Hard and Soft Sovereign Defaults”
- **Michael D. Cai**, **Marco Del Negro**, and **Abhi Gupta**, Federal Reserve Bank of New York; **Marc Giannoni**, Federal Reserve Bank of Dallas; **Pearl Li**, Stanford University; and **Erica Moszkowski**, Harvard University, “DSGE Forecasts of the Lost Recovery”
- **Dario Caldara**, **Chiara Scotti**, and **Molin Zhong**, Federal Reserve Board, “Uncertainty and Financial Stability: A VAR Analysis”
- **Jesper Lindé**, Sveriges Riksbank, and **Mathias Trabandt**, Freie Universität Berlin, “Resolving the Missing Deflation Puzzle”
- **Pablo Ottonello**, University of Michigan, and **Thomas Winberry**, University of Chicago and NBER, “Financial Heterogeneity and the Investment Channel of Monetary Policy” (NBER Working Paper No. [24221](#))

Summaries of these papers are at www.nber.org/conferences/2018/EFSF18/summary.html

The Rise of the Megafirm: Causes and Consequences for Labor and Product Markets

An NBER conference on The Rise of the Megafirm: Causes and Consequences for Labor and Product Markets took place October 19 in Cambridge. Research Associates Kathryn L. Shaw of Stanford University and John Van Reenen of MIT organized the meeting, which was sponsored by the Smith Richardson Foundation. These researchers' papers were presented and discussed:

- **Chinhui Juhn**, University of Houston and NBER; **Kristin McCue**, U.S. Census Bureau; **Brooks Pierce**, Bureau of Labor Statistics; and **Kathryn L. Shaw**, “The Use of Performance-Based Pay versus Wage Insurance within the Megafirm: Implications for the Within-Person Volatility of Income”

- **Nicholas Bloom**, Stanford University and NBER; **Fatih Guvenen**, University of Minnesota and NBER; **Benjamin S. Smith**, University of California, Los Angeles; **Jae Song**, Social Security Administration; and **Till M. von Wachter**, University of California, Los Angeles and NBER, “The Disappearing Large-Firm Wage Premium”
- **Robert E. Hall**, Stanford University and NBER, “New Evidence on Market Power, Profit, Concentration, and the Role of Mega-Firms in the U.S. Economy” (NBER Working Paper No. [24574](#))
- **Sharat Ganapati**, Georgetown University, “The Modern Wholesaler: Global Sourcing, Domestic Distribution, and Scale Economies”
- **Xavier Gabaix**, Harvard University and NBER, and **Ralph Koijen**, University of Chicago and NBER, “Granular Identification”
- **José A. Azar**, IESE Business School, University of Navarra; **Ioana Marinescu**, University of Pennsylvania and NBER; and **Marshall I. Steinbaum**, Roosevelt Institute, “Labor Market Concentration” (NBER Working Paper No. [24147](#))
- **Ryan Decker**, Federal Reserve Board; **John C. Haltiwanger**, University of Maryland and NBER; and **Ron S. Jarmin** and **Javier Miranda**, U.S. Bureau of the Census, “Changing Business Dynamism and Productivity: Shocks vs. Responsiveness” (NBER Working Paper No. [24236](#))
- **John Van Reenen**, “Increasing Differences between Firms: Market Power and the Macro-Economy”

Summaries of these papers are at www.nber.org/conferences/2018/LPMf18/summary.html

Economics of Indigenous Peoples and Institutions

An NBER conference on Economics of Indigenous Peoples and Institutions took place November 8 in Cambridge. Research Associate Randall Akee of University of California, Los Angeles, and Faculty Research Fellow Emilia Simeonova of Johns Hopkins University organized the meeting. These researchers’ papers were presented and discussed:

- **Valentina Dimitrova-Grazl**, Virginia Military Institute; **Peter Grajzl** and **Joseph Guse**, Washington and Lee University; and **Michou Kokodoko** and **Richard Todd**, Federal Reserve Bank of Minneapolis, “CDFIs and Credit in Indian Country”
- **Laurel Wheeler**, Duke University, “Property Rights, Place-Based Policies, and Economic Development”
- **Thaddieus Conner** and **Christian Martinez**, New Mexico State University, and **Aimee Franklin**, University of Oklahoma, “A Distal Theory of Policy Design: How State Regulatory Environments Condition the Impact of Indian Gaming”
- **Donna Feir** and **Rob Gillezeau**, University of Victoria; and **Maggie Jones**, Queen’s University, “The Slaughter of the Bison and Reversal of Fortunes on the Great Plains”
- **Victoria Fan**, **Timothy Halliday**, **Megan Inada**, and **Tetine Sentell**, University of Hawaii at Manoa; **Randall Akee**; and **Jill Miyamura**, Hawaii Health Information Corporation, “The Impact of Public Health Insurance on Medical Utilization in a Vulnerable Population: Evidence from COFA Migrants”
- **Deborah A. Cobb-Clark**, **Nathan Kettlewell**, and **Stefanie Schurer**, University of Sydney, and **Sven Silburn**, Menzies School of Health Research, “The Effect of Quarantining Welfare on School Attendance in Indigenous Communities”

- **Jeffrey D. Burnette** and **David Wick**, Rochester Institute of Technology, and **Jason Younker**, University of Oregon, “Statistical Termination or Fewer Self-Identified Students: What Is Causing the Decline in American Indian and Alaska Native College Enrollments?”

Summaries of these papers are at www.nber.org/conferences/2018/IPf18/summary.html

India in the Global Economy Conference

The NBER, along with India’s National Council for Applied Economic Research (NCAER) and the Indian Council for Research on International Economic Relations, sponsored a meeting in New Delhi and Neemrana, India, December 14-16, on “India in the Global Economy.” This meeting, the 20th in this series of research exchanges, was supported by Charles Kaye, the Tata Trusts, and Warburg-Pincus.

The meeting included NBER researchers as well as economists from Indian universities, research institutions, and government departments. NBER Research Associate **Abhijit Banerjee** of MIT organized the conference jointly with Shekhar Shah and Anil Sharma of NCAER. The meeting included remarks on current policy developments from Arun Jaitley, India’s Union Finance Minister.

The NBER participants were: **Abhijit Banerjee** and **James Poterba**, MIT; **Ariel Burstein**, University of

California, Los Angeles; **Kathryn Dominguez**, University of Michigan; **Rema Hanna**, **Nicole Maestas** and **Rohini Pande**, Harvard University; **Anne Krueger** and **John Lipsky**, Johns Hopkins University; **Karthik Muralidharan**, University of California, San Diego; **Raghu Rajan** and **Luigi Zingales**, University of Chicago; **Valerie Ramey**, University of California, San Diego; **Amit Seru**, Stanford University; and **Danny Yagan**, University of California, Berkeley. Each researcher delivered a research presentation and participated in discussion with Indian counterparts in related fields.

Topics discussed included the role of governance and market institutions in contributing to economic growth; the impact of public policies on human capital acquisition; recent developments in banking reform and monetary policy; the efficient delivery of public services; fiscal policy and taxation; and links between trade, infrastructure, and business investment.

Program and Working Group Meetings

Economic Fluctuations and Growth

Members of the NBER's Economic Fluctuations and Growth Program met October 19 in New York City. Research Associates Raquel Fernández of New York University and Stephanie Schmitt-Grohé of Columbia University organized the meeting. These researchers' papers were presented and discussed:

- **Chris Edmond**, University of Melbourne; **Virgiliu Midrigan**, New York University and NBER; and **Daniel Xu**, Duke University and NBER, "How Costly Are Markups?" (NBER Working Paper No. [24800](#))
- **David Baqaee**, London School of Economics, and **Emmanuel Farhi**, Harvard University and NBER, "Productivity and Misallocation in General Equilibrium" (NBER Working Paper No. [24007](#))
- **Bill Dupor**, Federal Reserve Bank of St. Louis; **M. Saif Mehkari**, University of Richmond; **Rong Li**, Renmin University of China; and **Yi-Chan Tsai**, National Taiwan University, "The 2008 U.S. Auto Market Collapse"
- **Martin S. Eichenbaum** and **Sergio Rebelo**, Northwestern University and NBER; and **Arlene Wong**, Princeton University and NBER, "State Dependent Effects of Monetary Policy: The Refinancing Channel" (NBER Working Paper No. [25152](#))
- **Ernest Liu**, Princeton University; **Atif R. Mian**, Princeton University and NBER; and **Amir Sufi**, University of Chicago and NBER, "Low Interest Rates, Market Power, and Productivity Growth"
- **Simon Jäger**, MIT and NBER; **Benjamin Schoefer**, University of California, Berkeley; **Samuel G. Young**, MIT; and **Josef Zweimüller**, University of Zurich, "Wages and the Value of Nonemployment" (NBER Working Paper No. [25230](#))

Summaries of these papers are at www.nber.org/conferences/2018/EFGf18/summary.html

Market Design

Members of the NBER's Market Design Working Group met at Stanford University on October 19–20. Research Associates Michael Ostrovsky of Stanford and Parag A. Pathak of MIT organized the meeting. These researchers' papers were presented and discussed:

- **Mohammad Akbarpour** and **Negar Matoorian**, Stanford University, and **Farshad Fatemi**, Sharif University of Technology, "A Monetary Market for Kidneys"
- **Alvin E. Roth**, Stanford University and NBER, "Recent Developments in Kidney Exchange: Market Design in a Large World"
- **Piotr Dworczak**, Northwestern University; **Scott Duke Kominers**, Harvard University; and **Mohammad Akbarpour**, Stanford University, "Redistribution through Markets"
- **Yeon-Koo Che**, Columbia University, and **Olivier Tercieux**, Paris School of Economics, "Top Trading Cycles in Prioritized Matching: An Irrelevance of Priorities in Large Markets"

- **Atila Abdulkadiroglu**, Duke University and NBER; **Yeon-Koo Che**, Columbia University; **Parag A. Pathak**; **Alvin E. Roth**; and **Olivier Tercieux**, Paris School of Economics, “Minimizing Justified Envy in School Choice: The Design of New Orleans’ OneApp” (NBER Working Paper No. [23265](#))
- **Hongyao Ma** and **David Parkes**, Harvard University, and **Fei Fang**, Carnegie Mellon University, “Spatio-Temporal Pricing for Ridesharing Platforms”
- **Atila Abdulkadiroglu**; **Joshua Angrist**, MIT and NBER; **Yusuke Narita**, Yale University; and **Parag A. Pathak**, “Impact Evaluation in Matching Markets with General Tie-Breaking” (NBER Working Paper No. [24172](#))
- **Surender Baswana**, India Institute of Technology (IIT) Kanpur; **Partha Pratim Chakrabarti**, IIT Kharagpur; **Sharat Chandran**, IIT Bombay; and **Yash Kanoria** and **Utkarsh Patange**, Columbia University, “Centralized Admissions for Engineering Colleges in India”
- **Dirk Bergemann**, Yale University; **Benjamin A. Brooks**, University of Chicago; and **Stephen Morris**, Princeton University, “Revenue Guarantee Equivalence”
- **Onur Kesten**, Carnegie Mellon University, and **Selcuk Ozyurt**, Sabanci University, “Efficient and Incentive Compatible Mediation: An Ordinal Market Design Approach”
- **Yuichiro Kamada**, Harvard University, and **Fuhito Kojima**, Stanford University, “Fair Matching under Constraints: Theory and Applications”
- **Tamas Fleiner**, Budapest University of Technology and Economics; **Ravi Jagadeesan**, Harvard University; **Zsuzsanna Jankó**, Corvinus University; and **Alexander Teytelboym**, University of Oxford, “Trading Networks with Frictions”
- **Xiao Liu**, Tsinghua University; **Zhixi Wan**, Didi Chuxing Technology Co.; and **Chenyu Yang**, University of Rochester, “The Efficiency of A Dynamic Decentralized Two-Sided Matching Market”

Summaries of these papers are at www.nber.org/conferences/2018/MDf18/summary.html

Public Economics

Members of the NBER’s Public Economics Program met in Cambridge on October 25–26. Program Director Amy Finkelstein of MIT and Research Associate Henrik Kleven of Princeton University organized the meeting. These researchers’ papers were presented and discussed:

- **Henrik Kleven**, “Taxation and Labor Force Participation: The EITC Reconsidered”
- **Itzik Fadlon**, University of California, San Diego and NBER; **Shanthi P. Ramnath**, U.S. Department of the Treasury; and **Patricia Tong**, RAND Corporation, “Household Responses to Transfers and Liquidity: Evidence from Social Security’s Survivors Benefits”
- **Manasi Deshpande**, University of Chicago and NBER; **Tal Gross**, Boston University and NBER; and **Yalun Su**, University of Chicago, “Disability and Distress: The Effect of Disability Programs on Financial Outcomes”
- **Susan Athey**, Stanford University and NBER; **Zakary Campbell**, Brown University; **Eric Chyn**, University of Virginia; **Justine S. Hastings**, Brown University and NBER; and **Preston S. White**, Rhode Island Innovation Policy Lab, “The Social Value of Targeting Interventions: Evidence from Reemployment Services”

- **Thomas R. Tørslov** and **Ludvig S. Wier**, University of Copenhagen, and **Gabriel Zucman**, University of California, Berkeley and NBER, “The Missing Profits of Nations” (NBER Working Paper No. [24701](#))
- **Jesse M. Shapiro**, Brown University and NBER; **Justine S. Hastings**, Brown University and NBER; and **Ryan E. Kessler**, Brown University, “The Effect of SNAP on the Composition of Purchased Foods: Evidence and Implications”
- **Giulia Giupponi** and **Camille Landais**, London School of Economics, “Subsidizing Labor Hoarding in Recessions: Employment & Welfare Effects of Short-Time Work”
- **Raj Chetty** and **Nathaniel Hendren**, Harvard University and NBER; **John N. Friedman**, Brown University and NBER; and **Maggie R. Jones** and **Sonya Porter**, U.S. Bureau of the Census, “The Opportunity Atlas: Mapping the Childhood Roots of Social Mobility” (NBER Working Paper No. [25147](#))
- **Qiping Xu**, University of Notre Dame, and **Eric Zwick**, University of Chicago and NBER, “Kinky Tax Policy and Abnormal Investment Behavior”
- **Juan Carlos Suárez Serrato**, Duke University and NBER, “Unintended Consequences of Eliminating Tax Havens” (NBER Working Paper No. [24850](#))
- **Peter Ganong**, University of Chicago and NBER, and **Pascal J. Noel**, University of Chicago, “Liquidity vs. Wealth in Household Debt Obligations: Evidence from Housing Policy in the Great Recession” (NBER Working Paper No. [24964](#))

Summaries of these papers are at www.nber.org/conferences/2018/PEf18/summary.html

Political Economy

Members of the NBER’s Political Economy Program met in Cambridge on October 26. Program Director Alberto F. Alesina of Harvard University organized the meeting. These researchers’ papers were presented and discussed:

- **Stefano Gagliarducci**, University of Rome Tor Vergata; **M. Daniele Paserman**, Boston University and NBER; and **Eleonora Patacchini**, Cornell University, “Hurricanes, Climate Change, and Political Accountability”
- **Ernesto Dal Bó** and **Frederico Finan**, University of California, Berkeley and NBER; **Olle Folke**, SIPA, Columbia University; **Torsten Persson**, Institute for International Economic Studies and NBER; and **Johanna Rickne**, Swedish Institute for Social Research, “Economic Losers and Political Winners: Sweden’s Radical Right”
- **Gianmarco Daniele**, Bocconi University; **Emilie Sartre**, Center for Research in Economics and Statistics; and **Paul Vertier**, Sciences Po, “Toxic Loans and the Entry of Extreme Candidates”
- **Oded Galor**, Brown University and NBER, and **Viacheslav Savitskiy**, Brown University, “Climatic Roots of Loss Aversion”
- **David Y. Yang**, Harvard University, and **Yuyu Chen**, Peking University, “Historical Traumas and the Roots of Political Distrust: Political Inference from the Great Chinese Famine”
- **Alberto F. Alesina** and **Stefanie Stantcheva**, Harvard University and NBER; and **Armando Miano**, Harvard University, “Immigration and Redistribution” (NBER Working Paper No. [24733](#))

Summaries of these papers are at www.nber.org/conferences/2018/POLf18/summary.html

International Finance and Macroeconomics

Members of the NBER's International Finance and Macroeconomics Program met in Cambridge October 26. Research Associates Guido Lorenzoni of Northwestern University and Vivian Yue of Emory University organized the meeting. These researchers' papers were presented and discussed:

- **Andres Drenik**, Columbia University; **Rishabh Kirpalani**, Pennsylvania State University; and **Diego Perez**, New York University, "Currency Choice in Contracts"
- **George A. Alessandria**, University of Rochester and NBER, and **Carter B. Mix**, University of Rochester, "The Global Trade Slowdown: Trade and Growth, Cause and Effect"
- **Anusha Chari**, University of North Carolina at Chapel Hill and NBER; **Ryan Leary**, University of North Carolina at Chapel Hill; and **Toan Phan**, Federal Reserve Bank of Richmond, "The Transmission of (sub)Sovereign Default Risk: Evidence from Puerto Rico"
- **Pablo Sebastián Fanelli**, Princeton University, CEMFI, "Monetary Policy, Capital Controls, and International Portfolios"
- **Pierre-Olivier Gourinchas**, University of California, Berkeley and NBER; **Philippe Martin**, Sciences Po; and **Todd E. Messer**, University of California, Berkeley, "The Economics of Sovereign Debt, Bailouts and the Eurozone Crisis"
- **Graciela L. Kaminsky**, George Washington University and NBER, "The Center and the Periphery: Two Hundred Years of International Borrowing Cycles" (NBER Working Paper No. [23975](#))
- **Cristina Arellano**, Federal Reserve Bank of Minneapolis and NBER; **Yan Bai**, University of Rochester and NBER; and **Gabriel P. Mihalache**, Stony Brook University, "Inflation Targeting with Sovereign Default Risk"

Summaries of these papers are at www.nber.org/conferences/2018/IFMf18/summary.html

Economics of Education

Members of the NBER's Economics of Education Program met in Cambridge on November 1–2. Program Director Caroline M. Hoxby of Stanford University organized the meeting. These researchers' papers were presented and discussed:

- **David J. Deming**, Harvard University and NBER, and **Kadeem L. Noray**, Harvard University, "STEM Careers and Technological Change" (NBER Working Paper No. [25065](#))
- **Michael Gilraine**, New York University, and **Robert McMillan**, University of Toronto and NBER, "Enrollment Manipulation, Class Size Caps, and Educational Segregation"
- **Meredith Phillips**, University of California, Los Angeles, and **Sarah J. Reber**, University of California, Los Angeles and NBER, "When 'Low Touch' is Not Enough: Evidence from a Random Assignment College Access Field Experiment"
- **Matthew D. Baird** and **Jennie Wenger**, RAND Corporation; **Mike Kofoed**, United States Military Academy; and **Trey Miller**, American Institutes for Research, "For-Profit Higher Education Responsiveness to Price Shocks: An Investigation of Changes in Post 9-11 GI Bill Allowed Maximum Tuitions"
- **Adam Lavecchia**, University of Ottawa; **Philip Oreopoulos**, University of Toronto and NBER; and **Robert S. Brown**, Toronto District School Board, "Long-run Effects from Comprehensive Student Support: Evidence from Pathways to Education"

- **Felipe Barrera-Orsorio** and **Andreas de Barros**, Harvard University, and **Deon Filmer**, World Bank, “Long-Term Impacts of Alternative Approaches to Increase Schooling: Experimental Evidence from a Scholarship Program in Cambodia”
- **Sam E. Asher**, World Bank; **Paul Novosad**, Dartmouth College; and **Charlie Raffkin**, MIT, “Getting Signal from Interval Data: Theory and Applications to Mortality and Intergenerational Mobility”
- **Susan Dynarski**, University of Michigan and NBER; **Carmello Libassi** and **Stephanie Owen**, University of Michigan; and **Katherine Micheltore**, Syracuse University, “Closing the Gap: The Effect of a Targeted, Tuition-Free Promise on College Choices of High-Achieving, Low-Income Students”
- **James Berry**, University of Delaware, and **Priya Mukherjee**, College of William and Mary, “Pricing Private Education in Urban India: Demand, Use, and Impact”
- **Andrew C. Johnston**, University of California, Merced, “Teacher Utility, Separating Equilibria, and Optimal Compensation: Evidence from a Discrete-Choice Experiment”
- **Desmond Ang**, Harvard University, “The Effects of Police Violence on Inner-City Students”
- **Eric Nielsen**, Federal Reserve Board, “Test Items, Outcomes, and Achievement Gaps”

Summaries of these papers are at www.nber.org/conferences/2018/EDf18/summary.html

Behavioral Finance

Members of the NBER’s Behavioral Finance Working Group met in Cambridge November 2. Research Associate Nicholas C. Barberis of Yale University organized the meeting, which was supported by Bracebridge Capital and Fuller and Thaler Asset Management. These researchers’ papers were presented and discussed:

- **Cary Frydman**, University of Southern California, and **Lawrence J. Jin**, California Institute of Technology, “Efficient Coding and Risky Choice”
- **Huseyin Gulen**, Purdue University; **Mihai Ion**, University of Arizona; and **Stefano Rossi**, Bocconi University, “Credit Cycles and Corporate Investment”
- **Alexander M. Chincio**, University of Illinois at Urbana-Champaign, “The Madness Of Crowds And The Likelihood Of Bubbles”
- **Manuel Adelino**, Duke University and NBER; **Antoinette Schoar**, MIT and NBER; and **Felipe Severino**, Dartmouth College, “Perception of House Price Risk and Homeownership” (NBER Working Paper No. [25090](#))
- **Carolyn Pflueger**, University of British Columbia and NBER; **Emil Siriwardane**, Harvard University; and **Adi Sunderam**, Harvard University and NBER, “A Measure of Risk Appetite for the Macroeconomy” (NBER Working Paper No. [24529](#))
- **Shimon Kogan**, MIT; **Tobias J. Moskowitz**, Yale University and NBER; and **Marina Niessner**, AQR Capital Management, “Fake News: Evidence from Financial Markets”

Summaries of these papers are at www.nber.org/conferences/2018/BFf18/summary.html

Monetary Economics

Members of the NBER's Monetary Economics Program Meeting met in Cambridge November 2. Faculty Research Fellow Gabriel Chodorow-Reich of Harvard University and Research Associate Simon Gilchrist of New York University organized the meeting. These researchers' papers were presented and discussed:

- **George-Marios Angeletos**, MIT and NBER, and **Zhen Huo**, Yale University, "Myopia and Anchoring" (NBER Working Paper No. [24545](#))
- **Ben S. Bernanke**, Brookings Institution, "The Real Effects of the Financial Crisis"
- **Atif R. Mian**, Princeton University and NBER, and **Amir Sufi**, University of Chicago and NBER, "Credit Supply and Housing Speculation" (NBER Working Paper No. [24823](#))
- **Olivier Coibion**, University of Texas at Austin and NBER; **Yuriy Gorodnichenko**, University of California, Berkeley and NBER; and **Tiziano Ropele**, Bank of Italy, "Inflation Expectations and Firm Decisions: New Causal Evidence"
- **David W. Berger** and **Konstantin Milbradt**, Northwestern University and NBER; **Fabrice Tourre**, Copenhagen Business School; and **Joseph S. Vavra**, University of Chicago and NBER, "Mortgage Prepayment and Path-Dependent Effects of Monetary Policy" (NBER Working Paper No. [25157](#))
- **Francesco D'Acunto**, Boston College; **Daniel Hoang**, Karlsruhe Institute of Technology; **Maritta Paloviita**, Bank of Finland; and **Michael Weber**, University of Chicago and NBER, "Human Frictions to the Transmission of Economic Policy"

Summaries of these papers are at www.nber.org/conferences/2018/MEf18/summary.html

Labor Studies

Members of the NBER's Labor Studies Program met in Chicago November 9. Program Co-Directors David Autor of MIT and Alexandre Mas of Princeton University organized the meeting. These researchers' papers were presented and discussed:

- **Stephane Bonhomme**, **Kerstin Holzheu**, and **Bradley J. Setzler**, University of Chicago; **Thibaut Lamadon** and **Magne Mogstad**, University of Chicago and NBER; and **Elena Manresa**, MIT, "How Much Should We Trust Estimates of Firm Effects and Worker Sorting?"
- **John A. List** and **Magne Mogstad**, University of Chicago and NBER, "Demand for Leisure and Flexible Work Arrangements"
- **Janna Johnson**, University of Minnesota, and **Morris M. Kleiner**, University of Minnesota and NBER, "Is Occupational Licensing a Barrier to Interstate Migration?" (NBER Working Paper No. [24107](#))
- **Zoë B. Cullen**, Harvard University, and **Ricardo Perez-Truglia**, University of California, Los Angeles and NBER, "How Much Does Your Boss Make? The Effects of Salary Comparisons"
- **Emily Breza**, Harvard University and NBER; **Supreet Kaur**, University of California, Berkeley and NBER; and **Nandita Krishnaswamy**, University of Southern California, "Scabs: The Social Suppression of Labor Supply"

- **John Conlon**, Harvard University; **Laura Pilossoph**, Federal Reserve Bank of New York; **Matthew J. Wiswall**, University of Wisconsin-Madison and NBER; and **Basit Zafar**, Arizona State University and NBER, “Labor Market Search With Imperfect Information and Learning” (NBER Working Paper No. [24988](#))
- **Kirill Borusyak**, Princeton University; **Peter Hull**, University of Chicago and NBER; and **Xavier Jaravel**, London School of Economics, “Quasi-Experimental Shift-Share Research Designs” (NBER Working Paper No. [24997](#))
- **Benjamin G. Hyman**, University of Chicago, “Can Displaced Labor Be Retrained? Evidence from Quasi-Random Assignment to Trade Adjustment Assistance”

Summaries of these papers are at www.nber.org/conferences/2018/LSf18/summary.html

Organizational Economics

Members of the NBER’s Organizational Economics Working Group met in Cambridge on November 16–17. Research Associate Robert S. Gibbons of MIT organized the meeting. These researchers’ papers were presented and discussed:

- **Anna Gumpert**, LMU Munich; **Henrike Steimer**, Stanford University; and **Manfred Antoni**, Institute of Employment Research, “Firm Organization with Multiple Establishments”
- **Samuel Hafner**, University of Basel, and **Curtis Taylor**, Duke University, “Contracting for Research: Moral Hazard and the Incentive to Overstate Significance”
- **Raphael Boleslavsky** and **Kyungmin Kim**, University of Miami, “Bayesian Persuasion and Moral Hazard”
- **Jin Li**, London School of Economics; **Michael L. Powell**, Northwestern University; and **Rongzhu Ke**, Hong Kong Baptist University, “Firm Growth and Promotion Opportunities”
- **Mitra Akhtari**, Harvard University; **Diana B. Moreira**, University of California, Davis; and **Laura C. Trucco**, Harvard University, “Political Turnover, Bureaucratic Turnover, and the Quality of Public Services”
- **Anton Kolotilin**, University of New South Wales, and **Andriy Zapechelnuk**, University of St. Andrews, “Persuasion Meets Delegation”
- **Abhijit Banerjee** and **Esther Duflo**, MIT and NBER; **Arun G. Chandrasekhar**, Stanford University and NBER; and **Matthew Jackson**, Stanford University, “Changes in Social Network Structure in Response to Exposure to Formal Credit Markets”
- **Yanhui Wu**, University of Southern California, and **Feng Zhu**, Harvard University, “Competition, Contracts, and Worker Efforts in Creative Production”
- **Charles Angelucci**, Columbia University; **Simone Meraglia**, University of Exeter; and **Nico Voigtländer**, University of California, Los Angeles and NBER, “How Merchant Towns Shaped Parliaments: From the Norman Conquest of England to the Great Reform Act” (NBER Working Paper No. [23606](#))
- **Jason Sandvik** and **Nathan Seegert**, University of Utah; **Richard Saouma**, Michigan State University; and **Christopher T. Stanton**, Harvard University and NBER, “The Power (of) Lunch and the Role of Incentives for Fostering Productive Interactions”

- **Daron Acemoglu**, MIT and NBER, and **Alexander Wolitzky**, MIT, “A Theory of Equality before the Law” (NBER Working Paper No. [24681](#))

Summaries of these papers are at www.nber.org/conferences/2018/OEf18/summary.html

Corporate Finance

Members of the NBER’s Corporate Finance Program met in Cambridge November 16. Research Associates David Sraer of University of California, Berkeley and Philip Strahan of Boston College organized the meeting. These researchers’ papers were presented and discussed:

- **Anil K. Kashyap**, University of Chicago and NBER; **Natalia Kovrijnykh**, Arizona State University; **Jian Li**, University of Chicago; and **Anna Pavlova**, London Business School, “The Benchmark Inclusion Subsidy”
- **Stephan Luck**, Federal Reserve Bank of New York, and **Sergio A. Correia** and **Mark Carlson**, Federal Reserve Board, “The Effects of Banking Competition on Growth and Financial Stability: Evidence from the National Banking Era”
- **Pengjie Gao**, University of Notre Dame and **Chang Joo Lee** and **Dermot Murphy**, University of Illinois at Chicago, “Financing Dies in Darkness? The Impact of Newspaper Closures on Public Finance”
- **Brian Boyer**, **Taylor D. Nadauld**, and **Keith Vorkink**, Brigham Young University, and **Michael S. Weisbach**, Ohio State University and NBER, “Private Equity Indices Based on Secondary Market Transactions” (NBER Working Paper No. [25207](#))
- **Tania Babina**, Columbia University, and **Sabrina T. Howell**, New York University and NBER, “Entrepreneurial Spillovers from Corporate R&D”
- **Daniel Paravisini** and **Juanita Gonzalez-Uribe**, London School of Economics, “How Sensitive is Young Firm Investment to the Cost of Outside Equity? Evidence from a UK Tax Relief”
- **João Granja**, University of Chicago, and **Christian Leuz** and **Raghuram Rajan**, University of Chicago and NBER, “Going the Extra Mile: Distant Lending and Credit Cycles” (NBER Working Paper No. [25196](#))
- **Matthew Baron**, Cornell University; **Emil Verner**, MIT; and **Wei Xiong**, Princeton University and NBER, “Bank Equity and Banking Crises”

Summaries of these papers are at www.nber.org/conferences/2018/CFf18/summary.html

Asset Pricing

Members of the NBER’s on Asset Pricing Program met at Stanford University November 30. Research Associates Tano Santos and Harrison Hong, both of Columbia University, organized the meeting, which was sponsored by the Alfred P. Sloan Foundation. These researchers’ papers were presented and discussed:

- **Yaron Levi**, University of Southern California, and **Ivo Welch**, University of California, Los Angeles and NBER, “Market-Beta and Downside Risk”

- **Michael Sockin**, University of Texas at Austin, and **Wei Xiong**, Princeton University and NBER, “A Model of Cryptocurrencies”
- **Valentin Haddad**, University of California, Los Angeles and NBER; **Paul Ho**, Princeton University; and **Erik Loualiche**, University of Minnesota, “Efficient Bubbles?”
- **Zhengyang Jiang**, Northwestern University, and **Arvind Krishnamurthy** and **Hanno Lustig**, Stanford University and NBER, “Foreign Safe Asset Demand and the Dollar Exchange Rate” (NBER Working Paper No. [24439](#))
- **Martin Lettau**, University of California, Berkeley and NBER, and **Markus Pelger**, Stanford University, “Factors that Fit the Time Series and Cross-Section of Stock Returns” (NBER Working Paper No. [24858](#))
- **Cecilia Parlatore**, New York University, and **Eduardo Dávila**, New York University and NBER, “Volatility and Informativeness”

Summaries of these papers are at www.nber.org/conferences/2018/APf18/summary.html

Development Economics

Members of the NBER’s Development Economics Program met in Cambridge on November 30-December 1. The meeting was organized by Research Associates Esther Duflo of MIT, Joseph P. Kaboski of University of Notre Dame, Jeremy Magruder of University of California, Berkeley, Mark Rosenzweig of Yale University, Christopher Woodruff of University of Oxford and Program Director Duncan Thomas of Duke University. These researchers’ papers were presented and discussed:

- **Nicholas Ryan**, Yale University and NBER, “Contract Enforcement and Productive Efficiency: Evidence from the Bidding and Renegotiation of Power Contracts in India”
- **Gautam Rao** and **Michael Kremer**, Harvard University and NBER, and **Kevin Carney** and **Xinyue Lin**, Harvard University, “The Endowment Effect and Collateralized Loans”
- **Daniel Bjorkegren**, Brown University, “Competition in Network Industries: Evidence from Mobile Telecommunications in Rwanda”
- **Paul Carrillo**, George Washington University; **Dave Donaldson**, MIT and NBER; **Dina Pomeranz**, University of Zurich; and **Monica Singhal**, University of California, Davis and NBER, “The Bigger the Better? Using Lotteries to Identify the Allocative Efficiency Effects of Firm Size”
- **Maria Micaela Sviatschi**, Princeton University, “Making a Narco: Childhood Exposure to Illegal Labor Markets and Criminal Life Paths”
- **Gabriel Kreindler**, University of Chicago, “The Welfare Effect of Road Congestion Pricing: Experimental Evidence and Equilibrium Implications”
- **Matteo Bobba**, Toulouse School of Economics, and **Luca Flabbi**, University of North Carolina at Chapel Hill, “Labor Market Search, Informality, and Schooling Investments”

Summaries of these papers are at www.nber.org/conferences/2018/DEVf18/summary.html

International Trade and Investment

Members of the NBER's International Trade and Investment Program met in Cambridge on December 7–8. Program Director Stephen J. Redding of Princeton University organized the meeting. These researchers' papers were presented and discussed:

- **Alberto Cavallo**, Harvard University and NBER; **Robert C. Feenstra**, University of California, Davis and NBER; and **Robert Inklaar**, University of Groningen, “Foreign and Domestic Trade Costs, Product Variety, and the Standard of Living Across Countries”
- **Rodrigo Adão**, University of Chicago and NBER; **Michal Kolesar**, Princeton University; and **Eduardo Morales**, Princeton University and NBER, “Shift-Share Designs: Theory and Inference” (NBER Working Paper No. [24944](#))
- **Yuhei Miyauchi**, Stanford University, “Matching and Agglomeration: Theory and Evidence from Japanese Firm-to-Firm Trade”
- **Zhen Huo**, Yale University; **Andrei A. Levchenko**, University of Michigan and NBER; and **Nitya Pandalai-Nayar**, University of Texas at Austin, “The Global Business Cycle: Measurement and Transmission”
- **Dominick G. Bartelme**, University of Michigan; **Arnaud Costinot** and **Dave Donaldson**, MIT and NBER; and **Andrés Rodríguez-Clare**, University of California, Berkeley and NBER, “External Economies of Scale and Industrial Policy: A View from Trade”
- **Jeronimo Carballo**, University of Colorado; **Kyle Handley**, University of Michigan; and **Nuno Limão**, University of Maryland and NBER, “Economic and Policy Uncertainty: Export Dynamics and the Value of Agreements” (NBER Working Paper No. [24368](#))
- **Pablo Fajgelbaum**, University of California, Los Angeles and NBER; **Pinelopi K. Goldberg**, Yale University and NBER; **Patrick Kennedy**, University of California, Berkeley; and **Amit Khandelwal**, Columbia University and NBER, “The Return to Protectionism: Causes and Consequences of the 2018 Trade War”
- **Levent Celik**, Higher School of Economics, Moscow; **Bilgehan Karabay**, RMIT University; and **John McLaren**, University of Virginia and NBER, “Fast-Track Authority: A Hold-Up Interpretation” (NBER Working Paper No. [24427](#))

Summaries of these papers are at www.nber.org/conferences/2018/ITIf18/summary.html

Health Care

Members of the NBER's Health Care Program met in Cambridge December 7. Program Director Jonathan Gruber of MIT organized the meeting. These researchers' papers were presented and discussed:

- **Sebastián Fleitas**, University of Leuven; **Gautam Gowrisankaran**, University of Arizona and NBER; and **Anthony T. Lo Sasso**, University of Illinois at Chicago, “Reclassification Risk in the Small Group Health Insurance Market” (NBER Working Paper No. [24663](#))

- **Amanda E. Kowalski**, University of Michigan and NBER, “Behavior within a Clinical Trial and Implications for Mammography Guidelines” (NBER Working Paper No. [25049](#))
- **Maria Polyakova**, Stanford University and NBER, and **Stephen P. Ryan**, Washington University in St. Louis and NBER, “In-kind Transfers, Tagging, and Market Power: Evidence from the ACA”
- **Manasi Deshpande**, University of Chicago and NBER; **Tal Gross**, Boston University and NBER; and **Yalun Su**, University of Chicago, “Disability and Distress: The Effect of Disability Programs on Financial Outcomes”
- **Michael Geruso**, University of Texas at Austin and NBER; **Timothy Layton** and **Mark Shepard**, Harvard University and NBER; and **Grace McCormack**, Harvard University, “Trade-offs between Extensive and Intensive Margin Selection in Competitive Insurance Markets”
- **Martin B. Hackmann**, University of California, Los Angeles and NBER, and **Vincent Pohl**, University of Georgia, “Patient vs. Provider Incentives in Long Term Care” (NBER Working Paper No. [25178](#))

Summaries of these papers are at www.nber.org/conferences/2018/HCF18/summary.html

Entrepreneurship

Members of the NBER’s Entrepreneurship Working Group met in Cambridge December 7. Research Associates Josh Lerner of Harvard University and David T. Robinson of Duke University organized the meeting, which was sponsored by the Ewing Marion Kauffman Foundation. These researchers’ papers were presented and discussed:

- **Bilal Zia**, World Bank, and **Patricio Dalton**, **Julius Rüschepöhler**, and **Burak Uras**, Tilburg University, “Learning Business Practices from Peers: Experimental Evidence from Small-scale Retailers in an Emerging Market”
- **Robert W. Fairlie**, University of California, Santa Cruz and NBER, and **Javier Miranda** and **Nikolas Zolas**, U.S. Bureau of the Census, “Job Creation and Survival among Entrepreneurs: Evidence from the Universe of U.S. Startups”
- **Jesse Davis** and **Xinxin Wang**, University of North Carolina, Chapel Hill and **Adair Morse**, University of California, Berkeley and NBER, “The Leveraging of Silicon Valley”
- **Steven Nafziger**, Williams College, and **Amanda G. Gregg**, Middlebury College, “The Births, Lives, and Deaths of Corporations in Late Imperial Russia”
- **Yael Hochberg**, Rice University and NBER; **John M. Barrios**, University of Chicago; and **Livia Hanyi Yi**, Rice University, “The Cost of Convenience: Ridesharing and Traffic Fatalities”
- **Christopher Geczy** and **David Musto**, University of Pennsylvania; **Jessica Jeffers**, University of Chicago; and **Anne M. Tucker**, Georgia State University, “Contracts with Benefits: The Implementation of Impact Investing”
- **Kevin Boudreau**, Northeastern University and NBER, “Amateurs”

Summaries of these papers are at www.nber.org/conferences/2018/ENTf18/summary.html

Innovation Policy and the Economy, Volume 19

Josh Lerner and Scott Stern, editors

This volume focuses on the interaction between public policy and innovation. The first chapter documents the dramatic globalization of R&D and how this development has affected the efforts of U.S. multinationals to operate on the global technology frontier. The next chapter synthesizes research on the impact of trade shocks on innovation and explains how these shocks' effects depend on the firms, industries, and countries affected. The third chapter examines the Advanced Research Projects Agency (ARPA) model of research management—an approach to funding and managing high-risk R&D—and offers

a method for diagnosing which research efforts are “ARPA-able.” Next is a study of the Orphan Drug Act and the key changes in the U.S. healthcare landscape and in drug discovery and development since passage of the act in 1983. The last two chapters focus on artificial intelligence (AI). One describes how AI diffuses through the economy and discusses implications for economic inequality, antitrust concerns, and intellectual property rights. The other investigates issues surrounding firm competition and labor force participation, such as data portability and Universal Basic Income, and evaluates ways to address these issues.

Innovation Policy and the Economy

Volume 19

National Bureau of Economic Research

Edited by Josh Lerner and Scott Stern

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- AI and the Economy

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The Economics of Poverty Traps

Christopher B. Barrett, Michael R. Carter, and Jean-Paul Chavas, editors

What circumstances or behaviors turn poverty into a cycle that perpetuates across generations? The answer to this question carries especially important implications for the design and evaluation of policies and projects intended to reduce poverty. Yet a major challenge analysts and policy-makers face in understanding poverty traps is the sheer number of mechanisms—not just financial, but also environmental, physical, and psychological—that may contribute to the persistence of poverty globally.

This volume explores the hypothesis that poverty is self-reinforcing because the equilibrium behaviors of poor peo-

ple perpetuate low standards of living. Contributions explore the dynamic, complex processes by which households accumulate assets and increase their productivity and earnings potential, as well as the conditions under which some individuals, groups, and economies struggle to escape poverty. Investigating the full range of phenomena that combine to generate poverty traps—gleaned from behavioral, health, and resource economics as well as the sociology, psychology, and environmental literatures—this volume presents new evidence that highlights both the insights and the limits of a poverty trap lens.



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THE ECONOMICS OF POVERTY TRAPS

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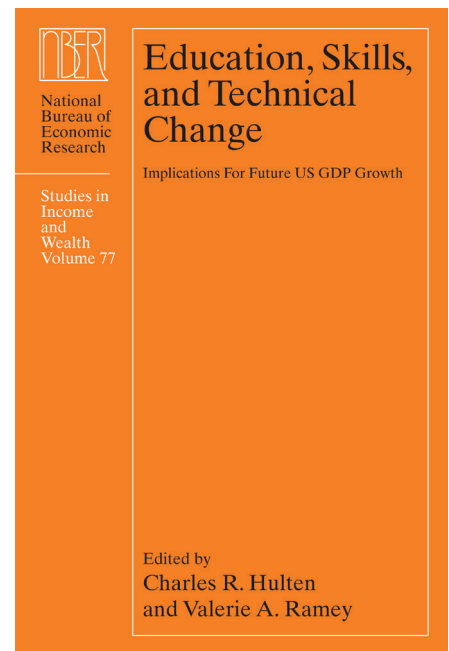
Education, Skills, and Technical Change: Implications for Future U.S. GDP Growth Studies in Income and Wealth, Volume 77

Charles R. Hulten and Valerie A. Ramey, editors

Over the past few decades, U.S. business and industry have been transformed by the advances and redundancies produced by the knowledge economy. The workplace has changed, and much of the work differs from that performed by previous generations. Can human capital accumulation in the United States keep pace with the evolving demands placed on it, and how can the workforce of tomorrow acquire the skills and competencies that are most in demand?

Education, Skills, and Technical Change explores various facets of these questions, providing an overview of edu-

cational attainment in the United States and the channels through which labor force skills and education affect GDP growth. Contributors to this volume focus on a range of educational and training institutions and bring new data to bear on how we understand the role of college and vocational education and the size and nature of the skills gap. This work links a range of research areas—such as growth accounting, skill development, higher education, and immigration—and also examines how well students are being prepared for the world of work now and in the future.



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