

July 2017

INSIDE THIS ISSUE

- Lead Exposure Linked to School Problems and Crime
- The Gender Pay Gap Widens with Age
- Assessing the Fed's Tools at the Zero Lower Bound
- Profit Shifting Affects Calculations of U.S. Growth
- For Women in Finance, an Unlevel Playing Field

Decentralization Helps Firms Cope with Downturns

The Great Recession sparked public debate about whether different approaches to organizing a firm affect its capacity to survive and recover from hard times. Are decisions about pricing, marketing, and hiring better made in corporate headquarters, by executives who can exploit a broad perspective, or by local plant managers, who have a more-intimate knowledge of conditions facing the product line but may lack a grander vision?

Philippe Aghion, Nicholas Bloom, Brian Lucking, Raffaella Sadun, and John Van Reenen find, in their study of **Turbulence, Firm Decentralization, and Growth in Bad Times** (NBER Working Paper No. 23354) that firms which delegated more decision-making responsibility to plant managers performed better in the years during and immediately after the global financial crisis. Recessions create large increases in uncertainty. When this happens, the researchers suggest, effective crisis management involves giving control to front-line managers who have a better sense of conditions on the ground than those at the center.

"[T]here is a trade-off between incentives and local information," they add. "Since there are agency problems between the CEO and plant manager, centralization may seem natural. But the plant manager is likely to have better local information than the CEO, which is a force for decentralization. When the environment becomes more turbulent, the CEO is even less well informed than in normal times... [L]ocal information becomes more important and decentralization becomes more valuable."

The researchers create two large micro datasets to study firm performance. One includes responses from 1,300 firms in 10 OECD countries to the World Management Survey; the other, constructed in coopera-

tion with the Bureau of the Census from its Management and Organizational Practices Survey, covers 8,700 U.S. plants. They find that in the years before the Great Recession, decentralized firms did not outperform centralized firms. During and

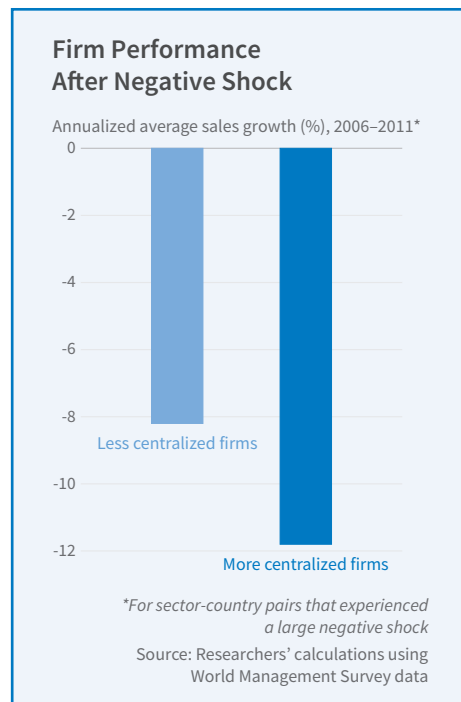
after the downturn, however, decentralized firms in sectors hardest hit by the crisis did much better than their centralized counterparts. The researchers devise several measures of turbulence in an industry, such as

In sectors hit hard by the Great Recession, decentralized firms were more likely to survive. They experienced smaller declines in sales, productivity, and profits than their centralized counterparts.

“product churn,” the ratio of the number of new products introduced and old products dropped to the number of products made. They find that the benefits of decentralization were greater in industries with greater product churn. Similarly, the benefits were larger in industries with greater increases in stock market volatility, another measure of market turbulence. Since turbulence rose most in sectors hit hardest by the crisis, this explains the outperformance of decentralized firms in crisis situations.

Decentralization can take many forms, and the form appears to matter for firm performance. Firms that delegate decisions about outputs, such as which products to produce and in what quantities, performed relatively better than firms that only delegated decisions about inputs, such as the amounts of labor and capital to employ.

Although organizational structure is slow to change and requires considerable investment, the researchers do observe a slow trend toward decentralization for the hardest hit firms. The greater the negative shock a centralized firm experienced, the more likely it was to decentralize after that shock.



The researchers conclude that the effects of decentralization are large enough to affect economic aggregates such as GDP. They find

that greater decentralization in the United States could account for about 16 percent of the country's superior GDP growth follow-

ing the Great Recession compared to other OECD countries in their sample.

—Deborah Kreuze

Lead Exposure Linked to School Problems and Crime

The use of lead in gasoline, paint, and other products has been sharply restricted since the 1970s as part of a national effort to reduce the incidence of neurological and other medical problems associated with lead ingestion, particularly by children. In **Lead and Juvenile Delinquency: New Evidence from Linked Birth, School, and Juvenile Detention Records** (NBER Working Paper No. 23392), [Anna Aizer](#) and [Janet Currie](#) analyze a particularly rich dataset on lead levels in the blood of 120,000 children born 1990–2004 in Rhode Island. They find a strong link between childhood lead exposure and anti-social behavior in individual-level data. Higher lead levels are associated with higher school suspension and juvenile detention rates, as well as higher incarceration rates later in life.

Lead mimics calcium in the body and interferes with all systems that require calcium to function effectively, including the central nervous system. It impairs brain development and disrupts neurotransmitter functions in ways that

impact cognition, attention, and memory. Children are far more susceptible to the damaging effects of lead exposure than adults.

Although lead in household paints was banned in 1978 and phased out of gasoline between 1976 and 1986, lead levels remain high in some older homes and in roadside soil contaminated years ago by lead-emitting vehicles. The regulatory bans on lead use have resulted in decreased childhood exposure to lead, and some scholars argue that

the drop in crime rates in recent decades is partly explained by declining lead exposure. But because lead exposure is often associated with other challenging childhood circumstances, the links between lead exposure in

and corrections agencies. They also analyze data collected during medical examinations of individuals living near heavily trafficked streets where gasoline-lead emissions and contamination of roadside soil were high.

New evidence shows that childhood lead exposure has substantial adverse effects on school suspension and juvenile detention rates.

children and later criminal behavior patterns has remained subject to debate.

The researchers provide more compelling evidence by focusing on behavior ear-

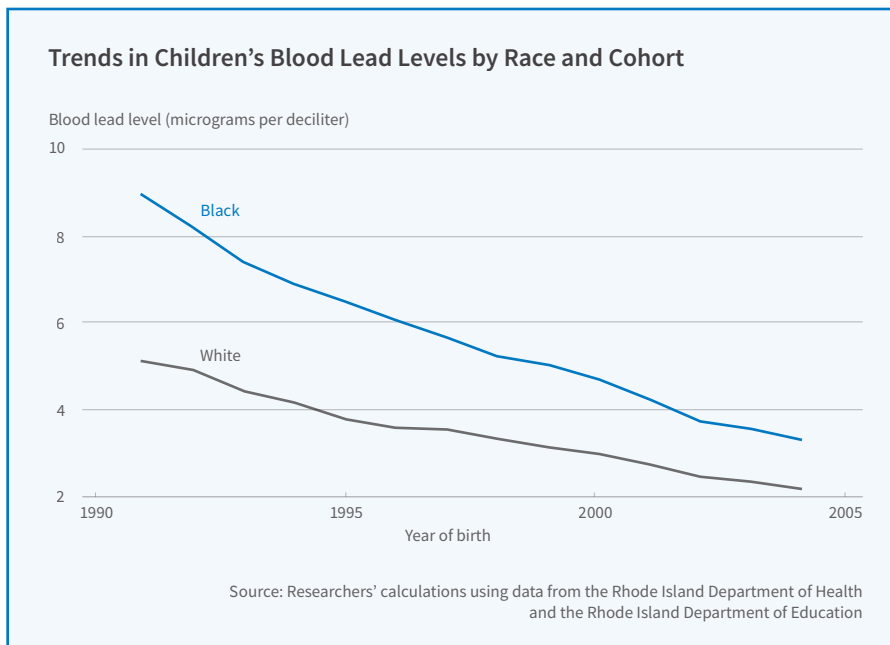
This allows them to measure variations in exposure within neighborhoods.

By comparing multiple measures of BLL for the same children, the researchers conclude that one-time measurements of BLL can lead to substantial error in measuring lead exposure. After applying econometric techniques that correct for such errors, they find that a microgram per deciliter increase in lead increased the probability of suspension from school by about 6.5 percent for boys and by between 6.4 and 9.3 percent for girls. They found a positive effect of BLL on the incarceration rate for boys; although they could

reject the null hypothesis of a zero effect, the estimates ranged between a 27 and 74 percent increase per 1 µg/dl increase in BLL.

The researchers conclude that their “results support the hypothesis that reductions in blood lead levels may indeed have been responsible for a significant part of the observed decrease in anti-social behavior among youths and young adults in recent decades.”

—Jay Fitzgerald



lier in children's lives, in particular on school disciplinary problems, which may be potential indicators of future anti-social behavior and incarcerations. They examine data from Rhode Island, which has a record of aggressively measuring and monitoring blood lead levels (BLLs). The state subjects children to multiple BLL tests and tests children at rates that are well above the national average. The researchers combine data from Rhode Island's health, education, juvenile detention,

The Gender Pay Gap Widens with Age

Despite dramatic workforce gains by women in recent decades, a substantial gender earnings gap persists. In **The Dynamics of Gender Earnings Differentials: Evidence from Establishment Data** (NBER Working Paper No. 23381), [Erling Barth](#), [Sari Pekkala Kerr](#), and [Claudia Olivetti](#) find that this gap increases in magnitude over the course of men's and women's careers, particularly for those who are married. Their study explores various drivers of both the overall earnings gap and the manner in which it widens over time. Their analysis is based on an observation that there are earnings differences across establishments, and a key question is thus the extent to which the widening of the gender pay gap over time arises from differences in career advances within the same establishment versus differential gains from job-to-job moves across establishments over their careers.

The researchers divide the change in the gender earnings gap as men and women age into the “within-establishment” gap and the “between-establishment” gap. The first—the within-establishment gap, or the pay gap between male and female workers at the same firm or establishment—arises mostly from promotions and raises that workers at a given establishment accrue over time. The between-establishment gap—the pay gap due to workers sorting at different firms—is driven by the presence of different wage levels across firms and gender-based variation in the likelihood that a worker will both change jobs and receive a higher salary as a result of that job change.

The researchers point out that women may face both between- and within-establishment gaps. Due to family and caretaking obligations, women may be less able to put in the long hours required to score a big promotion at their employer, or to invest in the networking and job search activities that facilitate finan-

cially advantageous job changes. These effects may be compounded if employers believe that women are less likely to remain in the labor force over the long term, or if women are less likely to seek promotions and raises within and

points—for workers without a degree.

Within-establishment and between-establishment gaps affect different types of workers differently. For workers without a college degree, the within-establishment gap is

Earnings growth for married men with college degrees is substantially higher than for comparably qualified married women over the course of their prime working years.

across firms in anticipation of needing more time flexibility or because of family location decisions in which the career of the primary earner, usually the husband, takes precedence.

Using data from the 2000 Decennial Census of the United States and the

not a significant contributor to the change in the earnings gap over time. It increases between the ages of 25 and 35, but then narrows. By the age of 45, women in this group have caught up to, and surpassed, men with respect to within-establishment earnings growth. The between-establishment gap is the sole driver of the widening of the gender earnings gap over time for this group.

The opposite is true for workers with a college degree, for whom the within-establishment gap is large, sustained, and the main driver of the widening of the gender earnings gap. While the between-establishment gender gap also widens over time for college-educated men and women, it explains only 27 percent of the widening of the total gender wage gap for this group.

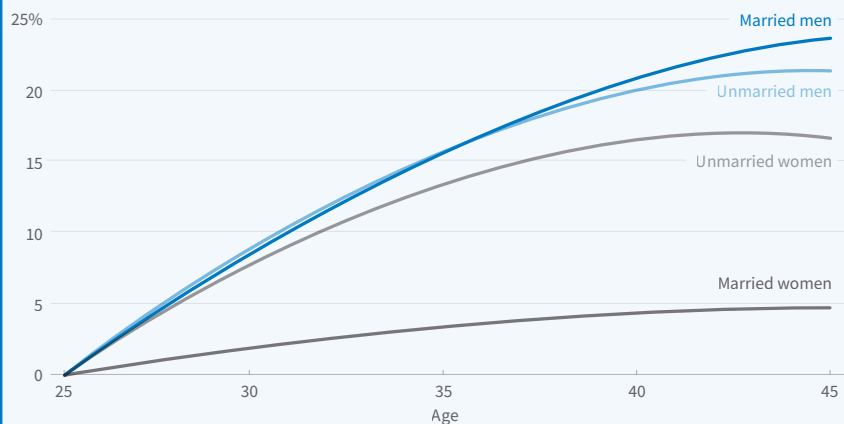
The researchers find that the between-establish-

ment earnings gap arises almost entirely from the earnings trajectories of married workers. The development of the establishment pay premium looks about the same for never-married men, never-married women, and married men; married women, however, lag dramatically. The slowdown in their average earnings growth coincides with the traditional child-bearing years. The researchers suggest that this may indicate that the division of labor among married couples limits women's career choices and contributes to the widening of the overall gender earnings gap.

—Dwyer Gunn

College-Educated Workers' Wage Gains from Job Change

Earnings growth by gender and marital status from establishment switches



Source: Researchers' calculations using data from the Longitudinal Employer-Household Dynamics database and the 2000 Decennial Census of Population

Longitudinal Employer-Household Dynamics (LEHD) database, the researchers study the earnings trajectories of workers aged 25–44 in relatively permanent work arrangements in large metropolitan areas between 1995 and 2008. Consistent with past research, they find a substantial gender earnings gap that widens with age among the workers in the sample. Earnings growth for men with college degrees is on average 50 percent higher than for comparably qualified women over the course of their prime working years. The gender difference in earnings growth is much smaller—only about 3 percentage

Assessing the Fed's Tools at the Zero Lower Bound

From 2009 to 2015, when the Federal Reserve's target short-term interest rate was close to zero, the central bank employed two other mechanisms in its efforts to boost the economy: forward guidance—information about the future path of the short-term interest rate—and large-scale asset purchases (LSAPs). In *Measuring the Effects of Federal Reserve Forward Guidance and Asset Purchases on Financial Markets* (NBER Working Paper No. 23311), [Eric T. Swanson](#) reports that both tools had substantial impacts on medium-term Treasury yields, stock prices, and the value of the dollar—impacts not unlike those achieved by changes to the federal funds rate before 2009. Short-term Treasury yields responded more to forward guidance, while LSAPs had a more pronounced effect on longer-term Treasury and corporate bond yields, his study finds. The effects of LSAPs also seem to have been more persistent.

Measuring the market impact of the two nontraditional tools is difficult for a number of reasons.

First, the Fed often made announcements about both tools at the same time, making it difficult to disentangle their financial market effects. Second, markets may have interpreted LSAP announcements as having forward-guidance-like implications for the future federal funds rate. Third, financial markets are forward-looking and typically respond only to the unexpected component of Fed announcements, but there is little or no data directly measuring market expectations of these uncon-

ventional monetary policy announcements by the Fed.

Swanson addresses these challenges by studying high-frequency

Forward guidance and large-scale asset purchases were effective alternatives when the Federal Reserve was unable to stimulate the economy by lowering interest rates.

changes in a range of indicators of short-, medium-, and long-term interest rates. He looks at market reactions from 1991 to 2015 in a 30-minute window surrounding each Fed announcement regarding the federal funds rate, forward guidance, and/or LSAPs. To

lower bound in late 2008.

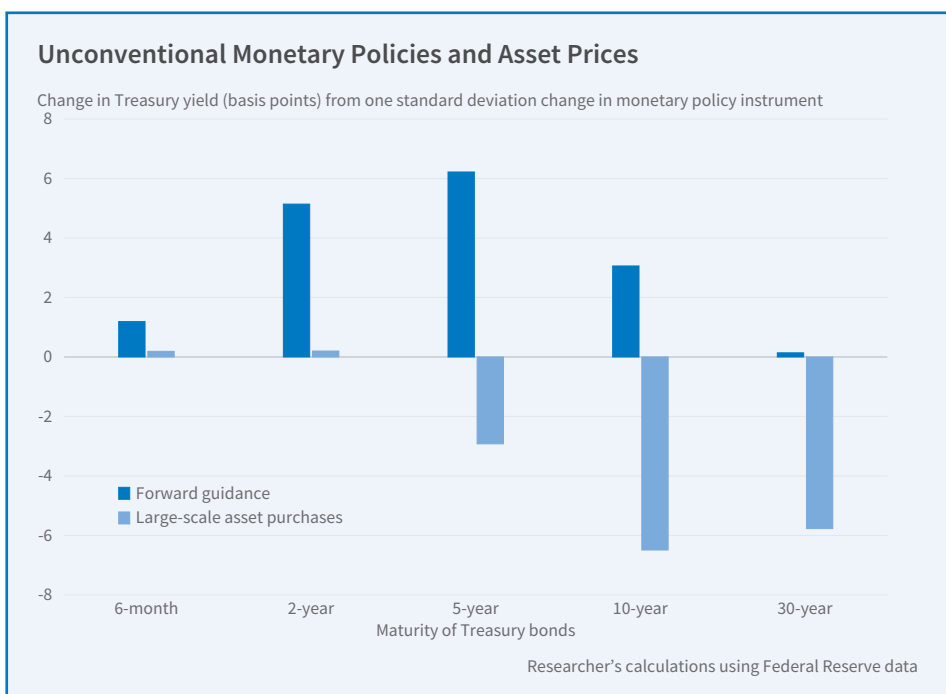
To illustrate the findings, consider the Fed's March 2009 announcement of its first LSAP program—popu-

larly known as quantitative easing, or QE1. This announcement caught the markets by surprise. The study estimates this announcement consisted of a 5.6 standard deviation increase in the LSAP factor, and a 1.5 standard deviation decrease in forward guidance. Similarly, in December 2014 and again in March and September of 2015, market participants expected the Fed to signal a rise in rates in the near future, but the central bank instead sounded a cautious approach; these announcements are interpreted as 1.5 to 2.5 standard deviation declines in forward guidance.

After examining the financial market effects of these uncon-

ventional Fed policy tools, Swanson concludes that “both forward guidance and LSAPs were essentially just as effective as the federal funds rate itself,” when each of these measures is normalized to a consistent measurement framework. However, the effects of LSAPs seem to be largely permanent, while those of forward guidance are less persistent, having a half-life of only about one to four months.

—*Laurent Belsie*



identify the distinct effects of each of these policy tools, the study makes three key assumptions: First, LSAPs have no effect on the current federal funds rate. Second, forward guidance affects future, but not current, federal funds rates. And third, LSAPs had a minimal effect on asset prices before 2008. This third assumption is consistent with the Fed essentially not conducting LSAP-type operations until the federal funds rate reached the zero

Profit Shifting Affects Calculations of U.S. Growth Rate

Recent reports of declining U.S. productivity growth have spurred discussion of whether official statistics accurately measure the impact of certain technologies, such as smartphones and broadband Internet. While the usual concern is that the impact of these goods on the real value of consumption is understated, in **Offshore Profit Shifting and Domestic Productivity Measurement** (NBER Working Paper No. 23324), [Fatih Guvenen](#), [Raymond J. Mataloni, Jr.](#), [Dylan G. Rassier](#), and [Kim J. Ruhl](#) suggest that international profit shifting by U.S.-based multinational companies, particularly in R&D-intensive industries, may affect the measurement of gross domestic product (GDP) and productivity growth.

Differences in corporate tax rates across countries give multinational enterprises (MNEs) an incentive to legally book earnings in foreign affiliates located in low-tax countries. This overstates the economic activity of the foreign affiliates relative to the domestic parent. This type of profit shifting may occur when a U.S. parent company engineers parts of its product, such as software and design, domestically, then transfers the profits from these intangible assets to a foreign affiliate. Calculations of U.S. gross national product (GNP) incorporate the transferred profits as “earnings on U.S. direct investment abroad (USDIA),” but these earnings are not counted as domestic product in measuring GDP. Earnings on USDIA comprised less than 1 percent of U.S. business-sector value added from 1973 to 1993 but equaled 3.7 percent of business-sector value added in 2012.

To examine the impact of profit shifting on the measurement of official statistics, the researchers employ Bureau of Economic

Analysis data on MNEs from 1982–2014 to reattribute earnings on USDIA. They use labor compensation and sales to unaffiliated parties as proxies for the “true” location of economic activity. The researchers reattribute 65

When a U.S. parent company engineers product components domestically, then transfers the profits from these intangible assets to a foreign affiliate, measured U.S. growth may suffer.

percent of earnings on USDIA to the United States — mostly from low-tax countries such as Bermuda, Ireland, and the Netherlands.

The researchers’ adjustments raise U.S. business-sector value added by about 0.5 percent annually from 1973 until the late 1990s. The adjustments becomes larger in the 2000s: their estimate of business-sector value added is 2.5 percent higher in 2010 than that reported in the official statistics. After the adjustments,

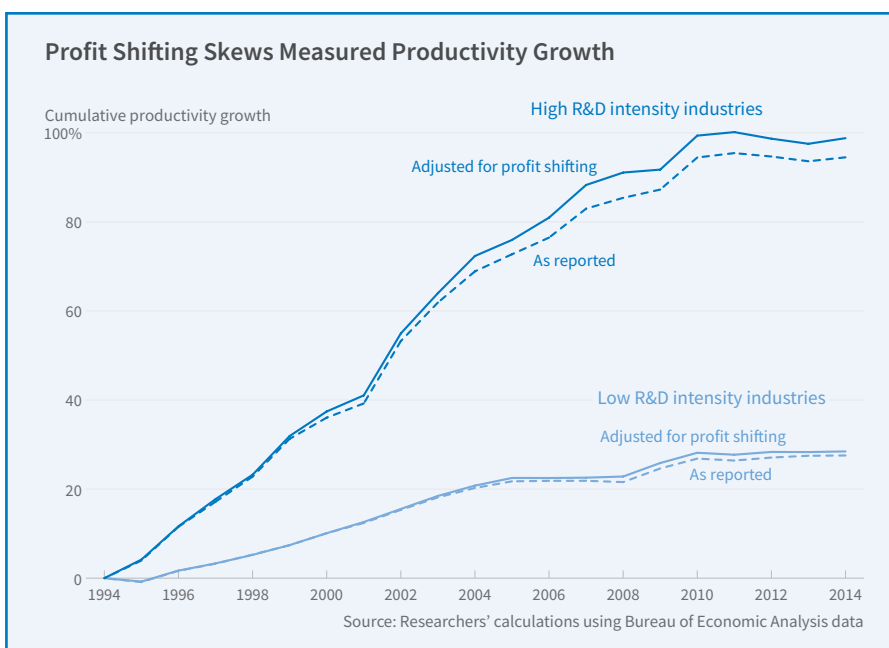
from 1994–2004.

The results are more striking in R&D-intensive industries. The researchers find that the adjustments raise value added by as much as 8 percent and productivity growth by 0.6

percent annually in the mid-2000s for enterprises ranked above the 75th percentile of R&D intensity. They focus in particular on MNEs that produce information technology (IT) services. For enterprises with more than half of their sales classified as IT products, the adjustments increase productivity growth by 3.6 percent, in contrast to a productivity growth increment of 1.6 percent for enterprises that do not produce IT. There is significant overlap between R&D-intensive and IT-producing enterprises.

Just as U.S. parent companies engage in profit shifting to foreign affiliates, foreign parent companies have an incentive to shift profits away from their U.S. affiliates if their home country tax rate is lower than in the United States. Data limitations prevent the researchers from fully measuring these effects, but they are able to reattribute profits for 98 large foreign-owned businesses in 2012 and 68 large foreign-owned businesses in 2007. Profits would have been \$21 billion higher for the 98 U.S. affiliates in 2012 and \$13 billion higher for the 68 U.S. affiliates in 2007. These findings suggest that foreign MNEs shift their profits away from U.S. affiliates. Thus, the researchers’ adjustments are likely a conservative estimate of the impact of profit shifting on measurement of U.S. GDP and productivity growth.

—Morgan Foy



productivity growth is unchanged prior to the 1990s, 0.1 percent higher annually from 1994 to 2004, 0.25 percent higher each year from 2004 to 2008, and unchanged after 2008. The findings reduce the estimated magnitude of the productivity slowdown in the last two decades, but do not eliminate it. From 2004 to 2014, the adjustments raise annual productivity growth from 1.44 to 1.48 percent, still much below the annual 3 percent growth seen

For Women in Finance, an Unlevel Playing Field

Gender disparities in the financial industry extend beyond discrimination in pay and hiring decisions to the severity of consequences for wrongdoing. This is the conclusion of a study by Mark L. Egan, Gregor Matvos, and Amit Seru, **When Harry Fired Sally: The Double Standard in Punishing Misconduct** (NBER Working Paper No. 23242). The researchers find that after a misconduct incident, women are 20 percent more likely than men to lose their jobs and 30 percent less likely to find new positions within one year.

The researchers analyze data from the Financial Industry Regulatory Authority covering 1.2 million registered financial advisers between 2005 and 2015. Women comprise 25 percent of the total financial adviser workforce and 16 percent of all owners and executives. Advisers are required to disclose all disputes and disciplinary actions, including everything from a customer complaint to a court proceeding. The researchers define “misconduct” as any disclosure involving fraud or wrongdoing. To measure whether female and male advisers are treated differently post-misconduct, the researchers compare advisers at the same firm, location, and point in time, and control for adviser experience and qualifications.

In a given year, 0.7 percent of men and 0.3 percent of women are associated with some form of misconduct.

After an incident of misconduct, 46 percent of men and 55 percent of women lose their jobs. This means that women are 20 percent more likely to suffer a job

separation following misconduct.

Women also are less likely to find employment at another firm after a separation. In any year, regardless of whether they have been associated

Following an incident of misconduct, women are more likely than men to lose their jobs and are less likely than men to find a new job within a year.

with a misconduct episode, female advisers who leave their firm are 6 percentage points less likely to be hired into a new position in the industry. In the year after an incident of misconduct that leads to job loss, women are 14 percentage points less likely to find a new job in the industry than their male counterparts. Furthermore, women who engage

and that, on average, offenses by women are 15 to 20 percent less costly than offenses by men.

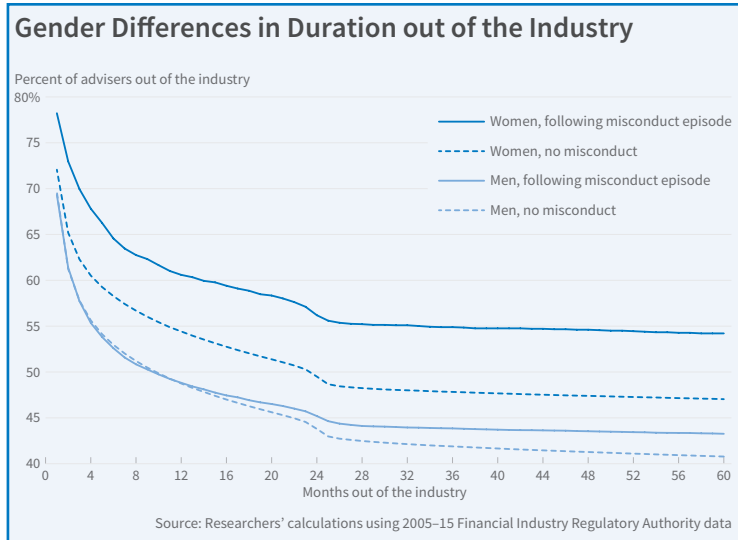
The researchers conclude that discrimination by male employers is the most likely explanation

for the observed differences in misconduct punishment. They note that misconduct complaints can be initiated by customers, regulators, or employers. While men receive more complaints than women on average, conditional on receiving a complaint, those against women are substantially more likely to be levied by an employer. Firms with

more female executives, however, are less likely to show differences in the severity of punishment across men and women. When one-third or more of a firm’s executive team is made up of women, there is no evidence of punishment differences between female and male advisers.

The study’s findings cannot be explained by career interruptions, productivity differences, or adviser experience. Firms are also no more likely to fire women in distressed times, an indication that women are no less productive than men. The discrimination results — both the likelihood of loss of employment and the difficulty of finding a new job — are greatest in regions of the country with large wage gaps and labor force participation differences between men and women.

—Morgan Foy



in misconduct are 67 percent less likely to be promoted relative to other women; men who commit misconduct are only 19 percent less likely to be promoted relative to other men. These findings emerge despite the fact that men are two times more likely than women to be repeat offenders,

tion results — both the likelihood of loss of employment and the difficulty of finding a new job — are greatest in regions of the country with large wage gaps and labor force participation differences between men and women.

NBER

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

James M. Poterba—President & Chief Executive Officer
Martin B. Zimmerman—Chairman
Karen N. Horn—Vice Chairman

The NBER Digest summarizes selected Working Papers recently produced as part of the Bureau’s program of research. Working Papers are intended to make preliminary research results available to economists in the hope of encouraging discussion and suggestions for revision. The Digest is issued for similar informational purposes and to stimulate discussion of Working Papers before their final publication. Neither the Working Papers nor the Digest has been reviewed by the Board of Directors of the NBER.

The Digest is not copyrighted and may be reproduced freely with appropriate attribution of source. Please provide the NBER’s Public Information Department with copies of anything reproduced.

Individual copies of the NBER Working Papers summarized here (and others) are available free of charge to Corporate Associates and to the affiliates of other organizations, such as universities and colleges, with subscriptions. For all others, there is a charge of \$5.00 per downloaded paper or \$10.00 per hard copy paper. Outside of the United States, add \$10.00 per order for postage and handling. Advance payment is required on all orders. To order, call the Publications Department at (617) 868-3900 or visit www.nber.org/papers. Please have the Working Paper Number(s) ready.

Subscriptions to the full NBER Working Paper series include all 1000 or more papers issued each year. Subscriptions are free to Corporate

Associates. For others within the United States, the standard rate for a full subscription is \$9665; for academic libraries and faculty members, \$7730. Higher rates apply for foreign orders. The on-line standard rate for a full subscription is \$2325 and the on-line academic rate is \$1075.

Partial Working Paper subscriptions, delineated by program, are also available. For further information, see our Web site, or please write: National Bureau of Economic Research, 1050 Massachusetts Avenue, Cambridge, MA 02138-5398.

Requests for Digest subscriptions, changes of address, and cancellations should be sent to Digest, NBER, 1050 Massachusetts Avenue, Cambridge, MA 02138-5398 (please include the current mailing label), or by sending email to subs@nber.org. Print copies of the Digest are only mailed to subscribers in the U.S. and Canada; those in other nations may request electronic subscriptions at www.nber.org/dsubscribe/.