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INSIDE THIS ISSUE

- Differences in the Borrowing Behavior of Public and Private Firms
- The French (Trade) Revolution of 1860: A Win-Win Liberalization
- The Association between Job-Finding Expectations and Success
- The Falling Environmental Cost of U.S. Electricity Generation
- Can 'Forward Guidance' Work for Fiscal Policy?

India's Demonetization Reduced Employment and Economic Activity

Cash still matters in India. In the fourth quarter of 2016, a sudden, temporary, and almost complete disappearance of large-denomination bills caused a decline in the quarterly growth rate (not annualized) of employment, economic output, and in bank credit of 2 percentage points, according to a study by [Gabriel Chodorow-Reich](#), [Gita Gopinath](#), [Prachi Mishra](#), and [Abhinav Narayanan](#). The Indian experience therefore rejects the view that in a modern economy the interest rate is all that matters and the availability of paper money is of little consequence.

"In modern India cash serves an essential role facilitating economic activity," the researchers conclude in **Cash and the Economy: Evidence from India's Demonetization** (NBER Working Paper No. 25370).

In an attempt to stem corruption and counterfeiting, the Indian government made an unexpected announcement on November 8, 2016, declaring it illegal to use 500 and 1,000 rupee notes as legal tender. The popular notes, worth \$7.50 and \$15, respectively, represented 86 percent of the cash in circulation. Residents had until December 31 to deposit their notes into their bank accounts.

After depositing the old notes, they could withdraw funds in new 500 or 2,000 rupee notes.

The government was slow to produce and distribute the replacement bills, which caused

the value of its old bills in new notes, while in the one at the 10th percentile only 13 percent of old notes had been replaced. The significant cross-district disparities enabled the research-

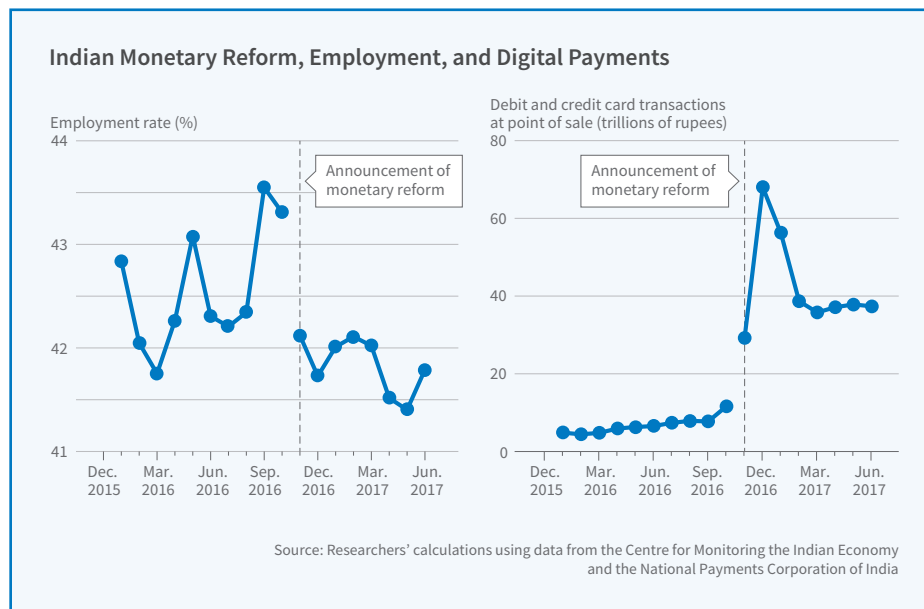
Declines in employment, output, and credit occurred when cash suddenly was in short supply due to a government anticorruption effort.

a temporary but sharp cash squeeze. Using data on the geographic distribution of the new notes, the researchers find that in December 2016 the value of the new notes in circulation in the median geographic district amounted

ers to study the consequences of demonetization using geographic variation in the value of notes replaced.

Hard-hit districts, those with a sharper fall-off in currency in circulation, saw a sharper fall-off in economic activity as measured using a household survey of employment and satellite data on human-generated night-time light. At its peak, demonetization had roughly the same impact on economic output as researchers have estimated that a 200 basis point tightening of the federal funds rate would have on U.S. economic activity.

The researchers note that while economic activity fell, the output decline was an order of magnitude smaller than the decline in cash itself. They conclude that households adjusted to the lack of cash by using other forms of payment



to only 31 percent of the value of the old notes in circulation before November 8. That percentage varied greatly by region. The district at the 90th percentile had received 64 percent of

or even informal lines of credit to make purchases. Between October and December 2016, transactions using an Indian e-wallet technology doubled. The increase was even more in harder hit districts. Credit- and debit-card transactions using point-of-sale

systems also increased substantially.

The impact of the cash shortage was temporary. The researchers estimate that demonetization reduced economic activity in India by at least 3 percentage points in November and December 2016, but the

effects began to dissipate in the following months. By March 2017, new bills in circulation in the median district represented 77 percent of the value of the old currency, and by June 2017 the shortage was mostly over.

—*Laurent Belsie*

Differences in the Borrowing Behavior of Public and Private Firms

Privately held firms account for more than half of U.S. gross output and nearly two thirds of employment, but they have been studied much less than publicly traded firms. In *Leverage over the Life Cycle and Implications for Firm Growth and Shock Responsiveness* (NBER Working Paper No. 25226), [Emin Dinlersoz](#), [Sebnem Kalemli-Ozcan](#), [Henry Hyatt](#), and [Veronika Penciakova](#) focus on the leverage behavior of private firms. They find that there are important differences in whether, when, and how public and private firms borrow. These differences are potentially important for understanding how the corporate sector behaves during economic downturns.

The researchers construct a novel database from the balance sheets of publicly listed and privately held firms, which they match to the Longitudinal Business Database of the U.S. Census Bureau. They exclude firms in the finance, insurance, real estate, rental, and leasing sectors. Their database includes more than 180,000 firms, 97 percent of them privately held. The publicly listed firms are much larger than their unlisted counterparts. On average, the publicly traded firms are 34 times larger on an employment basis and boast 64 times higher revenue. The database includes small as well as large firms. The researchers condition most of their analysis on the age of the firm and other observables at the firm level.

Public and private firms follow different

patterns with respect to firm growth and leverage, which makes them differentially sensitive to financial shocks. Private firms appear to have more trouble than public firms accessing long-

term debt.

These financing behaviors are potentially important during economic downturns, when lending slows and businesses

Private firms increase their leverage as they grow, relying particularly on short-term debt, while many public firms de-leverage as they expand.

term financing. As they grow, they increase their leverage, relying especially on short-term debt. For privately held firms, a one standard deviation increase in size is associated with a 24 percent rise in overall leverage, a 37 percent rise in short-term leverage, and a 19 percent rise in long-term leverage. Size appears to be a better predictor than firm age for whether a private

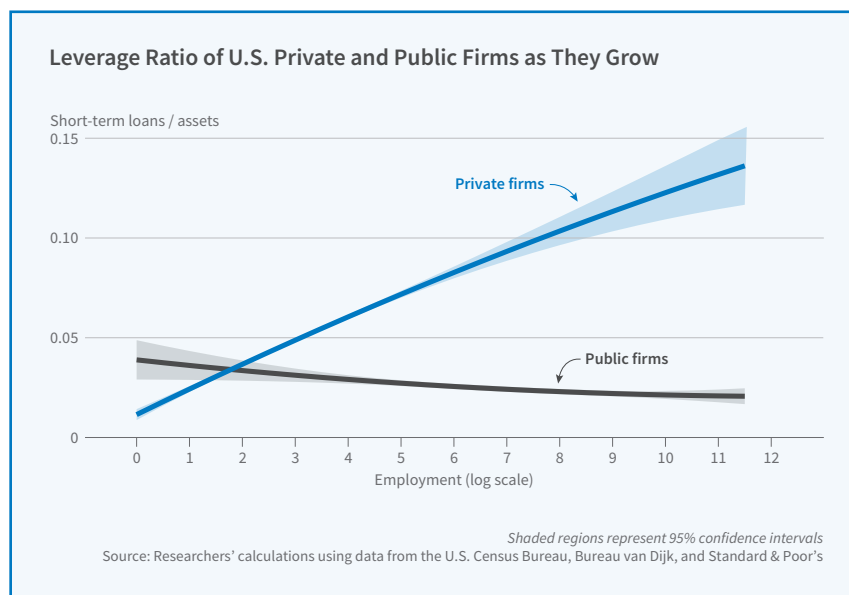
may struggle to stay solvent. The researchers study borrowing patterns during the Great Recession to better understand how a credit squeeze affects different types of firms.

They find that higher leverage is associated with higher growth for private firms, which suggests that access to credit fosters firm expansion. This pattern was weaker during the recent financial crisis than at other times, a potential indication of binding financial constraints. Firm growth is higher for those public companies with less short-term debt; this relationship did not appear to change during the financial crisis.

The differences in the role of debt finance at public and private firms, and the differences in access to credit markets for these two groups of firms, can lead to disparities in the way public and private firms respond to times of tight credit. The

researchers conclude that “the stark differences in the life-cycle leverage patterns exhibited by public versus private firms point to a need for a more nuanced approach to modeling financial frictions for these two types of firms.”

—*Anna Louie Sussman*



firm likely faces financial constraints.

For public firms, there is a U-shaped relationship between firm size and leverage. While leverage declines and equity rises with firm size for smaller public firms, very large public firms often have substantial leverage in

The French (Trade) Revolution of 1860: A Win-Win Liberalization

While in exile in Britain in the 1830s, France’s Louis Napoléon had a ringside seat as his host country took its first steps toward liberalizing trade. He liked what he saw, and envisioned jump-starting the French economy by eliminating trade barriers and lowering tariffs.

When he became emperor in 1852, Napoléon III found that leading industrialists staunchly defended protectionist trade laws, fearing that without them they would lose market share to foreign competition. After consolidating power, he assigned Michel Chevalier to undertake secret negotiations with the British to dramatically reduce trade barriers. The result, the Cobden-Chevalier treaty of 1860, was “a watershed in the history of modern international trade,” according to Stéphane Becuwe, Bertrand Blancheton, and Christopher M. Meissner, who have analyzed this treaty’s impact in **International Competition and Adjustment: Evidence from the First Great Liberalization** (NBER Working Paper No. 25173).

Because the treaty was concluded without direct input from commercial interests, it came as a shock. Nevertheless, French industry adapted smoothly to the new competitive environment. Studying these effects may provide insights on the consequences of trade policy changes both today and in the first wave of globalization.

In 1860, Great Britain and France were the world’s largest and second-largest exporters. France had banned imports of the great majority of woolen and cotton fabrics. A common fear was that without these protections, more-efficient British

competitors would gain market share at the expense of domestic producers. But the doomsday predictions did not materialize. Supported by government adjust-

When tariffs fell, instead of losing market share to Great Britain and becoming a net importer, France was able to sustain global sales even as imports surged.

ment loans, French producers upgraded their operations, diversified their export base and differentiated their product lines. Intra-industry trade patterns adjusted,

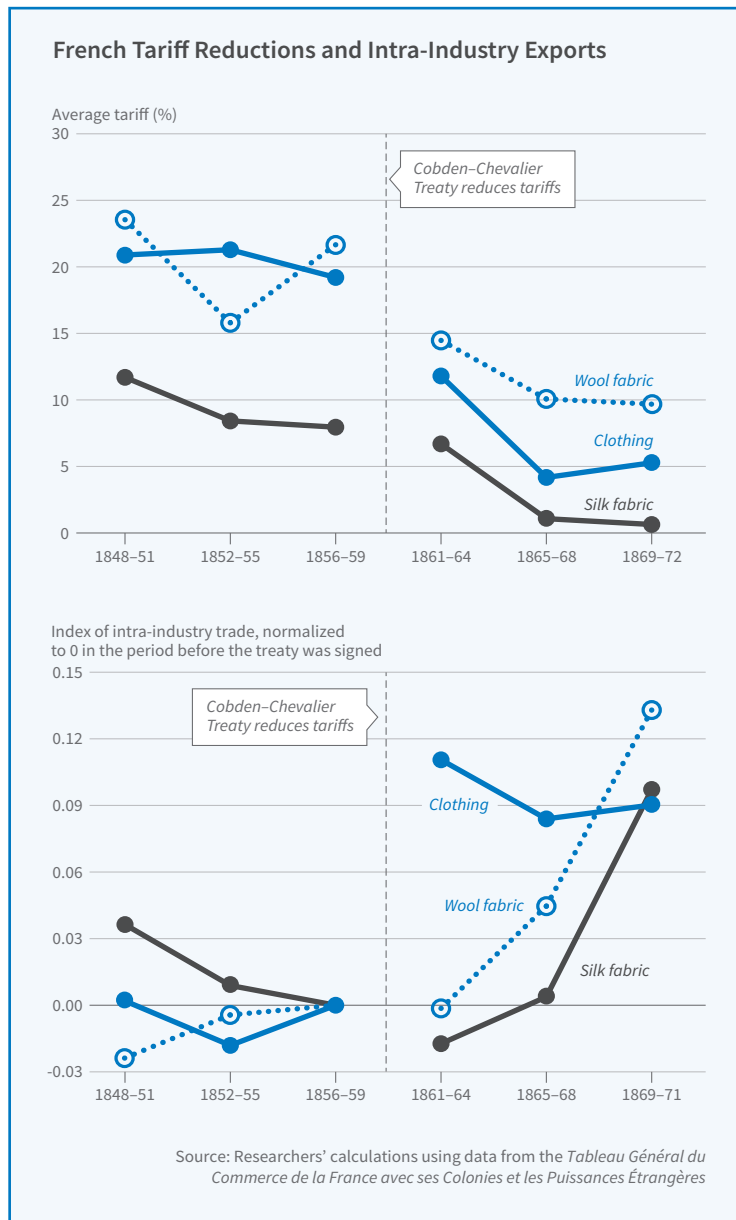
allowing for a smooth adjustment to the new trade environment. “Instead of losing market share to Great Britain and moving towards net import status,” the research-

ers find, “France was able to sustain global sales even as imports surged.” In contrast, they note, an inter-industry response to falling tariffs would have involved disruptive, large-scale reallocation of labor and resources.

Intra-industry trade as a share of total French trade tripled between 1859–60, when it accounted for about 14 percent of trade, and 1872, when it accounted for 38 percent. While some products lost market share, French factories survived and thrived by producing unique brands. The researchers point out that the sectors that concerned protectionists most — cotton, wool, and silk cloth — did see intensified competition, but exports and imports rose together.

In the wake of the Cobden-Chevalier treaty the French signed commercial pacts with more than half a dozen other nations. These, too, were associated with increases in the share of trade accounted for by intra-industrial products. The researchers conclude that these reforms benefited both French industry and French consumers. “French industry and trade seems to have remained buoyant. ... French consumers are also likely to have gained through a higher variety of products available and at lower cost.”

— Steve Maas



The Association between Job-Finding Expectations and Success

About 20 percent of unemployed Americans have been searching for a job for longer than 27 weeks. Known as the “long-term unemployed,” these workers have lower job-finding rates than other unemployed workers, which has led to speculation that they may become discouraged about their job prospects over time.

But in **Job Seekers’ Perceptions and Employment Prospects: Heterogeneity, Duration Dependence, and Bias** (NBER Working Paper No. 25294) [Andreas I. Mueller](#), [Johannes Spinnewijn](#), and [Giorgio Topa](#) find that the long-term unemployed are actually too optimistic regarding their job-finding prospects and do not adjust their job-finding expectations downward as they remain jobless longer. The researchers estimate that overly optimistic beliefs about employment prospects explain about 10 percent of the incidence of long-term unemployment.

The analysis focuses on two datasets. The first, the Survey of Consumer Expectations (SCE), is a nationally representative survey that asks respondents if they expect to be employed in the next three, and the next 12, months. The second, the Survey of Unemployed Workers in New Jersey (NJ), asks New Jersey unemployment insurance recipients if they expect to be employed within four weeks. Both surveys question respondents at regular intervals, allowing the researchers to determine how employment expectations change over time.

The data reveal that the unemployed over-estimate their likelihood of finding a job in the near future. In the NJ sample, on average, 26 percent of respondents expect to have a job in one month, while the actual rate of employment in one month is 10 percent. In the SCE, 47 percent of respondents expect to have a job within three months; the actual

job-finding rate is about 40 percent.

The researchers also analyze the relationship between perceptions and the well-documented pattern that the longer an individual goes without work, the harder it is to find a

2 percentage points for every additional month of unemployment. While individual beliefs become more optimistic on average as individuals’ unemployment spells continue, the group of individuals who remain unemployed longer

Job-finding rates are lower for those who have been unemployed longer, but the long-term unemployed are still optimistic about their prospects.

job. Both surveys confirm the existence of such “duration dependence,” as actual job-finding rates are lower for individuals with longer unemployment spells. Perceptions exhibit a similar pattern: Of respondents in the SCE who have been unemployed for less than three months, 59 percent expect to have a job within three months. However, only 34 percent of those who have been unemployed for 13 months or more

have lower job-finding expectations on average. Thus it is the composition of who remains unemployed for many months that drives the overall decline in the job-finding perception with unemployment-spell length.

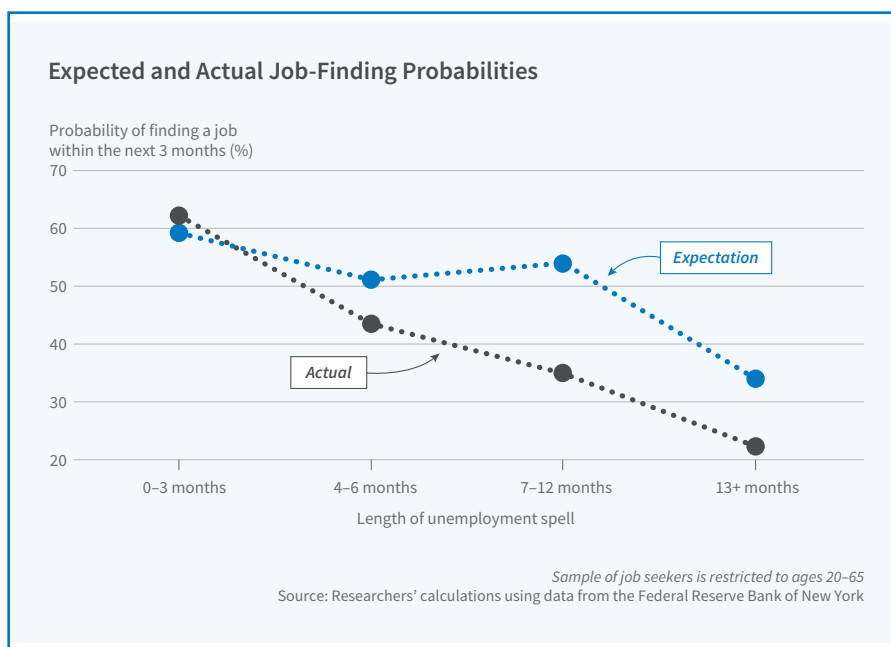
Expectations are positively correlated with job-finding rates. For the short-term unemployed in the SCE, the average likelihood of finding a job is 0.6 percentage points

higher for each percentage point increase in the expectation of finding a job, even after the researchers control for individual characteristics such as race, household income, and education. For the long-term unemployed, each additional percentage point of job-finding expectation is associated with a 0.4 percentage point rise in actual job-finding. The researchers leverage this relationship between expectations and job-finding rates to estimate the heterogeneity in job finding and how accurately the

unemployed perceive their differences.

The researchers estimate that if unemployed individuals had accurate, rather than overly optimistic, expectations about their job-finding prospects, they would alter their behavior — engaging in more job search, and accepting less attractive positions, for example — in ways that would reduce the share of unemployment spells lasting more than six months by about 10 percent.

—Morgan Foy



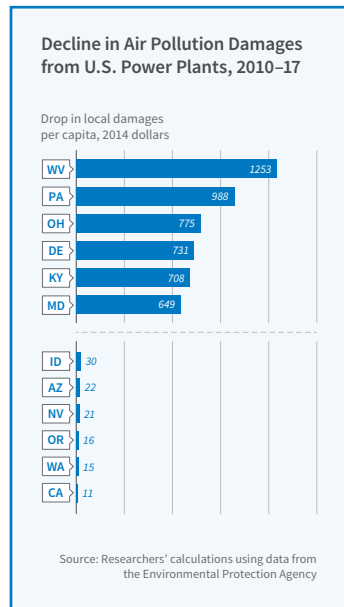
expect employment within three months.

The findings do not indicate whether perceptions are lower for the long-term unemployed because individuals who are most optimistic about their employment prospects find jobs and leave the sample or whether longer-unemployed respondents’ job-finding beliefs change over time. To answer this, the researchers examine how perceptions change at the individual level. They find that perceived employment probabilities actually increase by an additional

The Falling Environmental Cost of U.S. Electricity Generation

Environmental Rules, Cheaper Natural Gas, and More Renewables Have Reduced Damages

Annual damages from air pollution produced by U.S. power plants fell from \$245 billion in 2010 to \$133 billion in 2017, a 46 percent reduction, according to research reported by [Stephen P. Holland](#), [Erin T. Mansur](#), [Nicholas Z. Muller](#), and [Andrew J. Yates](#) in **Decompositions and Policy Consequences of an Extraordinary Decline in Air Pollution from Electricity Generation** (NBER Working Paper No. 25339).



Most of the decline in damages is due to reduced sulfur dioxide emissions, decreased generation from coal-fired power plants, and changes in power plants in the East. Per person, damages declined by about \$1,000 for residents in West Virginia, Pennsylvania, and Ohio. The reductions in pollution damages between 2010 and 2017 were greater in poorer areas. The researchers estimate that average damages decreased from about \$600 to \$200 per capita for individuals in the lowest-income decile, and from about \$450 to \$150 for those in the highest decile.

The study highlights four avenues through which the net \$112 billion reduction in damages occurred. Reduction in emissions per power plant, mostly due to the installation of emissions control technologies, accounted for \$63 billion of the total decline. Shifting power generation from dirtier (coal) plants to cleaner (natural gas) plants explained \$60 billion of the decline. For example, shifts away from fossil-fuel-based generation towards renewable generation reduced damages by \$25 billion. In opposition to these declines, the damage costs per unit of emissions increased damages by \$35 billion. This increase was due to a combination of population growth and demographic changes, atmospheric changes, and a rising social cost of carbon.

The researchers use their findings to quantify the potential implications for policy. They estimate that over this seven-year period, marginal damages decreased from 8.6¢ per kilowatt hour (kWh) to 6.0¢ per kWh in the East. However, marginal damages in the West and Texas increased slightly. These numbers are then used to calculate the benefits of electric cars and household solar panel adoption. They find that, in 2010, the average electric car had a higher annual pollution cost, by about \$81, than a gasoline-fueled car. By 2017, the average electric car was cleaner by \$72. Household solar panels, meanwhile, had an annual environmental benefit of \$356 in 2017, down slightly from \$418 in 2010. The averages mask the substantial geographic variation.

—Morgan Foy

Benefits of Rooftop Solar Vary Widely across Major Regions of the Country

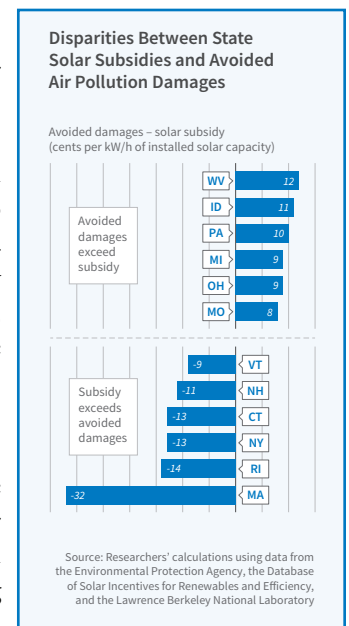
Government subsidies have encouraged Americans to put solar panels on more than 1 million rooftops and soon they'll deploy panels on 1 million more. There are substantial differences across states in the incentives to install solar generation systems. These incentives, however, are not well aligned with the potential benefits of renewable generation, as [Steven E. Sexton](#), [A. Justin Kirkpatrick](#), [Robert Harris](#), and [Nicholas Z. Muller](#) calculate in **Heterogeneous Environmental and Grid Benefits from Rooftop Solar and the Costs of Inefficient Siting Decisions** (NBER Working Paper No. 25241).

Most rooftop solar systems are located in the West. However, because of differences in the sources of electricity generation, the greatest pollution avoidance from switching to solar from conventional power is in the Midwest and the Mid-Atlantic states. In California, which has pushed rooftop solar as a way to alleviate congestion on the grid and lower carbon emissions, the environmental benefits are modest at best. "If installed solar capacity could be costlessly reallocated across states, annual total capacity benefits would increase by as much as \$1.3 billion, reflecting predominantly gains in environmental benefits," the researchers conclude.

The geographic variation in both the environmental benefits of switching to solar power and the subsidies provided to switchers is very large. The researchers calculate solar's avoided environmental damages in the nation's 30,105 zip codes. They find that, in some places, new solar panels receive \$25,000 more in subsidies than they deliver in environmental benefits over their expected lifetime. In other locations, panels deliver \$10,000 more in environmental benefits than they receive in subsidies.

Benefits also vary widely within states. The study estimates that a rooftop solar array in Maynard, Massachusetts, a western suburb of Boston, delivers only a \$61 annual environmental benefit, while one in Bloxom, Virginia, on the Chesapeake Bay, delivers a \$1,224 benefit. A major reason for this difference is the type of energy that solar is displacing. If it's coal-fired energy, as in Bloxom, the environmental benefits are much greater than when solar displaces generation from natural gas, as in Maynard. Putting the energy value and environmental benefits together, the researchers find that the Midwest and Mid-Atlantic states would benefit most from more solar capacity, while the West would benefit least. The present value of a 4-kilowatt solar system is \$15,000 more if it's installed in Maryland than in Oregon, but the West Coast remains home to two-thirds of the nation's rooftop solar arrays.

—Laurent Belsie



Can 'Forward Guidance' Work for Fiscal Policy?

What can government authorities do if central bank interest rates are at zero and regulators still wish to stimulate the economy? [Scott R. Baker](#), [Lorenz Kueng](#), [Leslie McGranahan](#), and [Brian T. Melzer](#) study the impact of pre-announced sales tax increases on new auto purchases. They find that such tax increases accelerate household consumption, bringing future purchases to the present, and potentially increasing demand during downturns.

In **Do Household Finances Constrain Unconventional Fiscal Policy?** (NBER Working Paper No. 25212), the researchers find that households respond to anticipated sales tax increases on automobiles with a substantial increase in purchasing in the month prior to the announced increase and a decrease in the month of the tax hike.

In the United States, state and local sales taxes on automobiles are collected where the vehicle is registered, not where it is sold. States, counties, cities, and local districts responsible for schools, water, and sewerage may all collect sales taxes. States that collect a motor vehicle excise tax rather than a sales tax were omitted from the study sample.

To study the links between sales tax changes and consumer behavior, the researchers use data on state and local automobile sales tax rates from 1999 to

2017. In their data sample, the total sales tax on autos ranged from 0 to 12 percent. State sales taxes averaged 5.5 percent, and local sales taxes averaged about 1.3 percent. Their sample

Announcing sales tax increases before they take effect substantially spurs auto purchases in the month before the tax increase kicks in.

includes 57 state sales tax changes, including 42 increases, and more than 2,000 local sales tax changes. The state sales tax increases averaged about 0.61 percentage points.

Tax data were combined with data from the Federal Reserve Bank of New York Consumer

secured and unsecured loans and lines of credit. Assuming that an auto loan initiation leads to an auto purchase, the researchers measure the number of new auto loans in each month by zip code

and credit score.

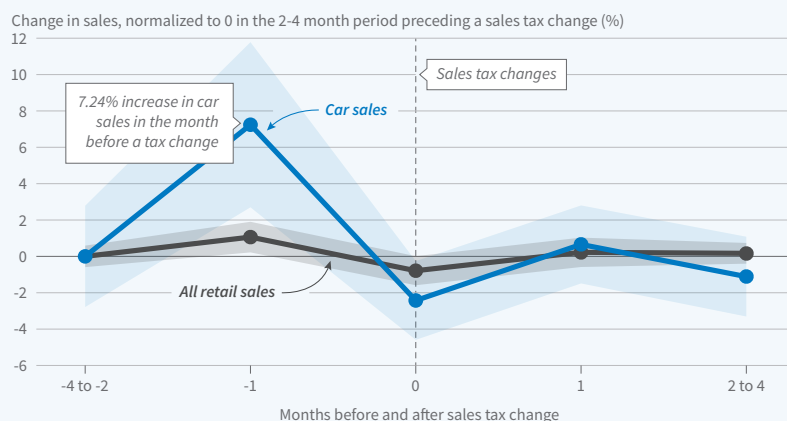
They find that the increase in new auto sales in anticipation of a sales tax increase is large, at least 8 percent for every 1 percent increase in the sales tax. Purchases of the most creditworthy households are more than twice as

responsive as the purchases of the least creditworthy households, suggesting that credit frictions affect households' ability to re-time their purchases. In addition, the researchers find that the overall sales response to a 1 percent tax increase is twice as large during recessions, which implies that the spending effect of pre-announced taxes might be particularly large during economic downturns.

The researchers caution that most of the sales tax increases in their sample were small, and that announcing a large tax increase might have different effects than those associated with the tax changes in their study.

—Linda Gorman

The Effect of Pre-Announced State Sales Tax Changes on Car Sales



Retail sales represent spending covered by Nielsen scanner data. Shaded areas represent 95% confidence intervals. Source: Researchers' calculations using data from the Federal Reserve Bank of New York Consumer Credit Panel, the Experian AutoCount database, and Nielsen

Credit Panel/Equifax tradeline database, a 5 percent random sample of individuals who have an Equifax credit report. The data include both

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