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Cancellation of Student Loans Led to a General Deleveraging

In the first quarter of 2018, outstanding student debt in the United States reached \$1.5 trillion. Student debt is now the second-largest type of consumer debt, ahead of auto loans, credit card debt, and home-equity lines of credit. In recent years, economists and policymakers have asked whether this debt may have consequences for individual students' prospects and for overall economic growth.

In **Second Chance: Life without Student Debt** (NBER Working Paper No. 25810), [Marco Di Maggio](#), [Ankit Kalda](#), and [Vincent Yao](#) explore how student debt relief affects credit and labor market outcomes. The researchers study a natural experiment: debt relief that occurred when National Collegiate, the country's largest holder of private student loan debt, was forced, in court cases, to discharge thousands of student loans in default because it could not prove that it owned these loans in the first place. The researchers matched the affected borrowers to their credit bureau data; they then

compared outcomes for these borrowers to a control group of similar borrowers who were also behind on their loan payments but did not benefit from the debt relief shock.

Debt cancellation for borrowers who were in default on their student loans resulted in more rapid repayment of other outstanding debts and a subsequent increase in average income.

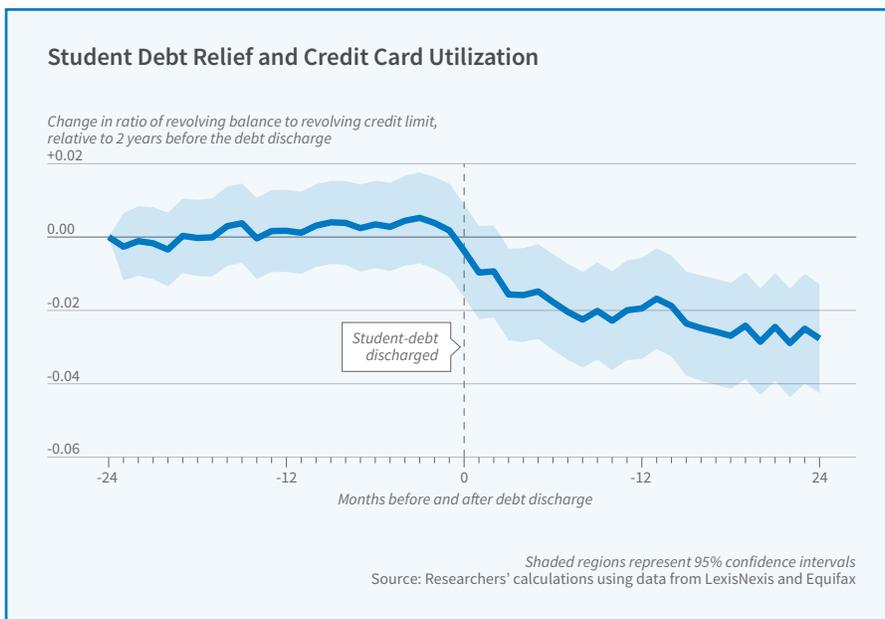
The researchers find that borrowers who benefited from the debt relief significantly reduced their borrowing across different types of debt, including credit cards, auto loans, and home loans. They reduced

both the total number of other accounts they held and their total debt by about 25 percent, or \$4,000. The lower account balances were the result of both reduced credit

demand and higher repayments.

Borrowers who benefited from the debt relief shock were 12 percent less likely to default on other types of debt later on, largely due to a reduced likelihood of falling behind on credit card payments. "Overall, these results provide evidence that one of the effects of relieving borrowers from their student loans is to allow them to better manage their finances and start significantly deleveraging, which is likely to make them more resilient to negative shocks," the researchers conclude.

They also study the effects of debt relief on mobility and income. Borrowers whose loans were discharged were 4



percent more likely to move to a different state. These borrowers were also more likely to change jobs and to land higher-paying jobs in new industries, resulting in over \$4,000 in additional earnings, on average, over a three-year period. Although the discharge does not result in additional disposable income for the borrowers, because most delinquent bor-

rowers were not repaying their loans, debt overhang might be responsible for distorting their labor market choices.

While the researchers did not have access to detailed information on consumption decisions after debt relief, they were able to impute car purchases as a proxy for durable consumption and found that bor-

rowers are more likely to purchase a car following debt relief. The researchers conclude that the findings “strongly suggest that the increase in student loans burden for young borrowers might be an important drag on their economic outcomes by limiting their ability to pursue better opportunities.”

—Dwyer Gunn

Why Does the Debt-to-GDP Ratio Constrain Crisis Response?

Over the last four decades, OECD nations with lower debt-to-GDP ratios have responded to financial crises, on average, with more expansionary fiscal policy than their higher-debt counterparts. Recoveries from the crises were also faster, and the lost economic output was smaller, in the nations with lower debt-to-GDP ratios.

Why do more indebted nations respond less aggressively to crises? One standard explanation is that they are unable to borrow in international credit markets at reasonable terms. In **Fiscal Space and the Aftermath of Financial Crises: How It Matters and Why** (NBER Working Paper No. 25768), [Christina D. Romer](#) and [David H. Romer](#) examine why the debt-to-GDP ratio is such a strong predictor of crisis response, and in particular the role of sovereign credit market access in damping the fiscal response.

A high debt ratio can make it difficult for a nation to access the capital market. When lenders fear they won't be repaid, they charge high rates to compensate for the risk, or they may refuse to lend to a country entirely.

To test whether elevated debt ratios affect the policy response through a credit access channel, the researchers examine data on financial distress, debt ratios, and market access metrics

such as interest rates on government debt, sovereign credit default swap spreads, and credit-agency ratings in 30 OECD countries from 1980 to 2017. They then study how important those factors were in predicting a country's fiscal response to economic turmoil.

When a financial crisis hits, countries with a high debt-to-GDP ratio are less likely to pursue expansionary policy. Debt-related limits on market access are only part of the story.

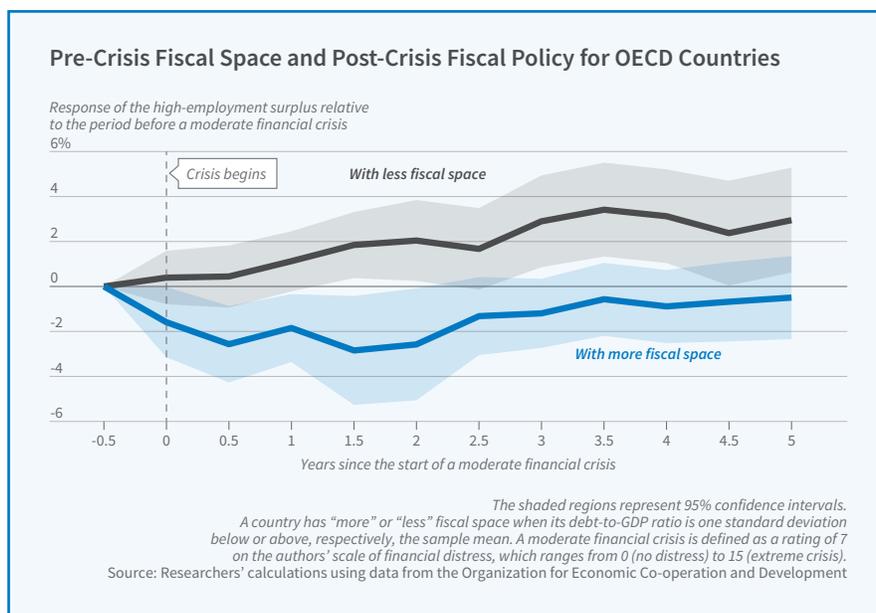
The effects of borrowing costs and other quantitative measures of sovereign market access on the fiscal response to a crisis “are generally moderate and only moderately sig-

fiscal response, the debt ratio remains significant and quantitatively important. The limited role of market access in predicting a country's policy response, coupled with the evidence that a country's debt-to-GDP ratio continues to have strong predictive power

for the response even controlling for the direct measures of market access, suggests that the debt ratio matters largely through policymakers' choices.

The researchers complement their statistical findings with an analysis of crisis narratives drawn from the Economist Intelligence Unit (EIU), a forecasting and advisory service, for 22 episodes of high financial distress. In roughly half the cases of post-crisis fiscal austerity, the EIU indicated that policymakers' ideas were more important than market access, they find. They note, however, that the EIU also often cited market access as a significant influence in policymaker decisions—suggesting that while it is not the sole driver of policy responses to crises, it is nonetheless a factor.

—Anna Louie Sussman



nificant” in predicting a country's policy response, the researchers find. More importantly, when both the debt ratio and market access measures are used to estimate the

WWII Policy Kept Patents Secret, Slowed Innovation

Since congressional passage of the Patent Act of 1790, the United States has broadly encouraged inventors to disclose their secrets in the belief that the free flow of scientific information would spur future innovations by competitors and other inventors. In exchange, the government has protected inventors' commercial rights for a limited period of time.

During World War II, however, the U.S. Patent and Trademark Office (USPTO) ordered patent applicants to keep inventions in more than 11,000 patent applications secret. The idea was to keep war-related inventions out of the hands of America's enemies. The effects of that policy are analyzed by [Daniel P. Gross](#) in **The Consequences of Invention Secrecy: Evidence from the USPTO Patent Secrecy Program in World War II** (NBER Working Paper No. 25545).

"Compulsory invention secrecy reduced follow-on invention and restricted commercialization, but as part of the security policies in place during the war it appears to have been effective at keeping sensitive technology out of the public view," Gross concludes.

"Taken together, the results suggest there are consequences to a compulsory secrecy policy to be weighed against the security concerns."

In 1940, with war raging in Europe, Congress renewed 1917 legislation — originally passed to restrict disclosure of sensitive technology in

the First World War — that authorized the USPTO to issue secrecy orders on patent applications and to withhold the grant of a patent if publication might compromise the war effort. Some 11,200 patent applications were targeted. Under threat of loss of patent rights, imprisonment, and \$10,000 in fines, inventors were told not to disclose their innovations or to file for patents in foreign countries.

Requiring that select patent applications not be published kept inventions out of enemy hands, but lowered the rate of follow-on discovery.

From July 1940 until just after the war, when most of the secrecy orders were lifted and the relevant patents were allowed to be issued, the restrictive policy appears to have achieved

important inventions than those that were not restricted, comparing all secret versus non-secret patent applications would not provide a clear picture of the effects of secrecy. Instead, Gross compares patents that were filed near the end of the war, and thus had shorter secrecy terms, to patents filed earlier in the war, with longer secrecy terms. He finds that secret patents filed in 1945 were nearly 15 percent more likely to

be cited in later patent applications than those filed in 1940 or 1941, relative to non-secret patents of the same vintage and technology area. These effects are weaker for patents filed

by firms which were performing R&D for the war effort. Such firms were sometimes — if not often — permitted to share information on otherwise-secret inventions to further contract work. The study also finds some evidence that secrecy may have hindered the commercialization of new inventions.

Secrecy orders are still in use today, under the authority of the Invention Secrecy Act of 1951,

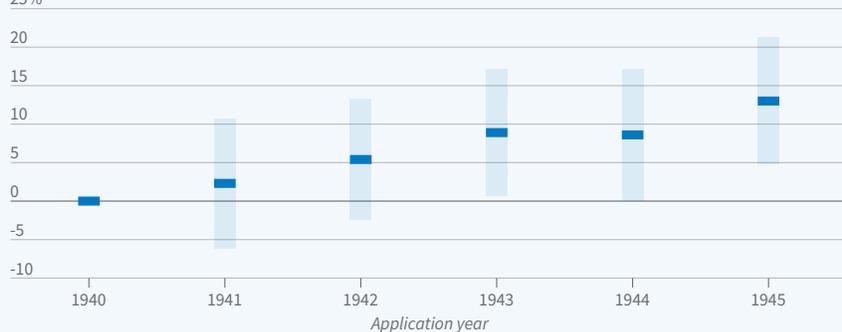
and inventors and companies, concerned about imitation or intellectual-property theft, often prefer to keep their discoveries secret rather than patent them. The experience from World War II suggests that such actions may impede technological progress.

— *Laurent Belsie*

Patent Secrecy During World War II and Future Citations

Patents filed and issued a secrecy order near the end of the war were on average secret for less time than those filed earlier.

Difference between secret and non-secret patents in the probability of being cited in future patents, by year, relative to 1940 25%



Shaded regions represent 95% confidence intervals.

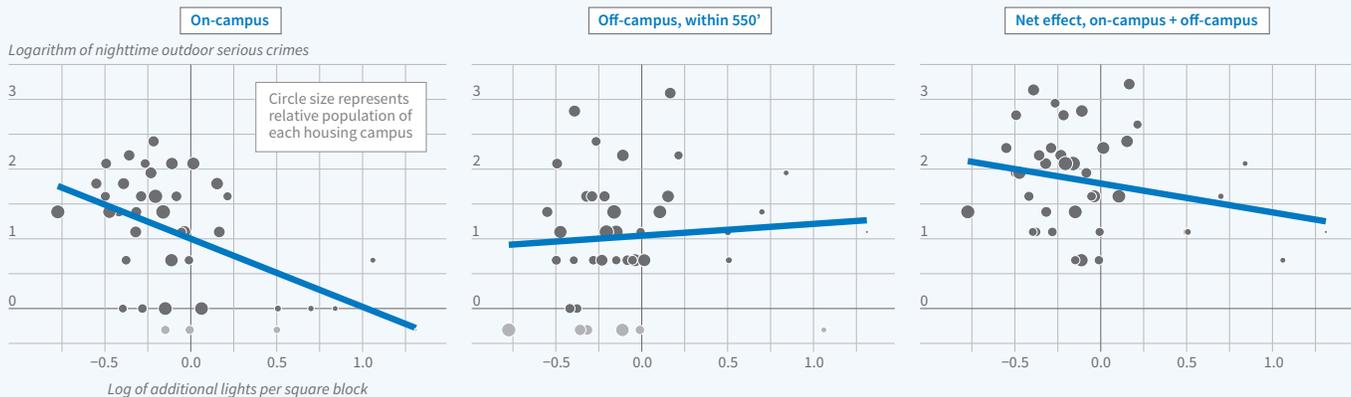
Results are specifically for patents filed by firms which were not supplying research to the war effort.

Source: Researchers' calculations using data from the U.S. Patent and Trademark Office, FreePatentsOnline.com, archival records from the Office of Scientific Research and Development, Office of Production Research and Development, and the U.S. Army Judge Advocate General

the desired effect. The study finds a sharp jump starting in 1945 — when secrecy ended — in the use of technical words from secret patents. But the policy appears to have inhibited follow-on invention.

Because the patents targeted with secrecy orders were on average more

Street Lighting and Outdoor Crime on NYC Public Housing Campuses



"Serious crimes" in this study include murder and non-negligent manslaughter, robbery, felony assault, burglary, grand larceny, and motor vehicle theft. A few sites did not experience any crimes over the study period (light gray circles). An approximation to the log value for these data points is obtained using a parametric correction. Source: Researchers' calculations using data from the New York Police Department, the New York City Housing Authority, and the U.S. Census Bureau

Bright Lights, Fewer Serious Crimes in New York City Projects

A small change in a neighborhood environment, like extra nighttime lighting, can have a large effect in reducing crime, new research suggests.

When researchers partnered with New York City police and municipal officials to place lighting towers randomly in some of the city's highest-crime public housing complexes, in 2016, they found that serious nighttime crimes plunged 60 percent in those areas over the next six months. Because lighting may simply push criminals to operate a few blocks away where no extra lighting exists, the researchers also estimated the reduction over the entire community. That led to a more conservative but still striking estimate: at least a 36 percent decline in serious crimes. About 11 percent of the crimes being considered happen outdoors at night in New York's public housing. Thus, a 36 percent drop in those crimes translates into a 4 percent overall decline in the rate of these crimes in public housing.

These findings suggest a relatively low-cost way to reduce crime, according to [Aaron Chalfin](#), [Benjamin Hansen](#), [Jason Lerner](#), and [Lucie Parker](#) in **Reducing Crime Through Environmental Design: Evidence from a Randomized Experiment of Street Lighting in New York City** (NBER Working Paper No. 25798).

Previous research suggests that violent crime tends to be geographically concentrated and that criminals tend to focus on short- rather than long-

term factors in deciding whether to commit such crimes. Thus, a small change—such as more street lighting—in areas where there is a high likelihood of illegal activity may have more impact than a longer-term threat of, say, stiffer prison sentences.

Lighting is clearly associated with perceptions of safety. A recent survey of New York public housing found that 50 percent of residents felt safe

Sharp reductions in assaults and robberies after the installation of intense streetlights suggest a potential low-cost way to deter crime.

walking around in daytime, but only 21 percent at night. From 2010 to 2016, street lighting outages were the third most common complaint to the city's 311 services and reporting line.

One of the new study's innovations is its use of experimental data on the location of new lighting. This avoids a problem that may have confounded previous investigations: when the location of new street lights is not random, the estimated effect of such lighting on crime may not extrapolate to a general program of lighting expansion. The researchers identified 80 projects with high crime rates, and randomly picked half to receive the new temporary lighting. Then, again randomly, they assigned where the lights would be located. In all, 397 lighting towers were placed in projects where the aver-

age rate of serious crimes—7,500 per 100,000 population annually—was more than double that of the highest-crime state.

The researchers restricted their focus to index crimes, which include murder and non-negligent manslaughter, robbery, felony assault, burglary, grand larceny, and motor vehicle theft. These are the most serious crimes and also the most likely to be reported. The two most common felonies committed outdoors at night in the areas under study were felony assault and robbery.

Using their estimate of a 36 percent drop in nighttime crime, along with an estimate of the social cost of crime, the researchers found that the benefits of the lighting program outweighed the costs by a factor of 4 to 1. Over a 10-year period, the addition of permanent lighting and the extra electricity would cost \$200,000 per public housing complex per year, they estimate, but the drop in outdoor nighttime crime would equal a savings of some \$770,000 in social costs per complex per year.

Some uncertainty remains around how the results of the temporary lighting study would translate to public housing with increased permanent lighting. The temporary lights were particularly bright and prominent in a way that permanent lighting would not be, leaving open the question of whether standard permanent lighting would reduce crime to the same extent.

—*Laurent Belsie*

Chance to Work with Emerging IT Helps Firms Recruit

Firms compete aggressively for IT workers. In **Paying to Program? Engineering Brand and High-Tech Wages** (NBER Working Paper No. 25552), [Prasanna Tambe](#), [Xuan Ye](#), and [Peter Cappelli](#) explore how investments in cutting-edge IT systems affect the recruitment and retention of IT workers.

Using data from a large U.S. jobs board and Glassdoor, an employer review website, the researchers created a detailed dataset on firm characteristics, including IT systems in use at the firm, and workers' current and target wages. (The latter serve as a proxy for reservation wages.) The researchers then test their hypothesis that workers may be willing to accept lower compensation in exchange for the opportunity to work with emerging IT systems, perhaps with the goal of acquiring valuable and in-demand skills that may advance their careers.

The data show that companies that invest in emerging IT systems can engage workers at 2–4 percent lower cost. The effect is larger, in the range of 5 percent lower cost, among employers that emphasize skill development. The researchers note that “this implies that workers who make \$100,000 require an additional \$5,000 to leave employment where they use new technologies.”

Investments in emerging IT technologies, however, also come with a price. Workers who use these technologies leave their firms more quickly. In fact, within a given firm, those who use emerging technologies are as much as 20 percent more likely to exit than workers who do not. This suggests that workers are willing to exchange some amount of compensation in the relative short term for the

chance to obtain valuable skills in the longer term. The researchers note that “[a]mong potential omitted variables, few lead workers to set higher target wages *and* exit the firm more quickly, except human capital.”

Companies that invest in cutting-edge technologies can engage labor at lower cost than less-advanced rivals, with added savings for firms that emphasize skills development.

The researchers find some heterogeneity in the effects they measure. Younger IT workers, for example, are more likely to value access to new systems. The effects are also stronger in markets where employers are actively seeking and hiring workers who know how to use emerging systems — in other words, in tight labor markets.

that employer.” The relationship between use of emerging systems and employees valuing compensation, by contrast, is negative. At firms that use older, less-popular IT systems, employees primar-

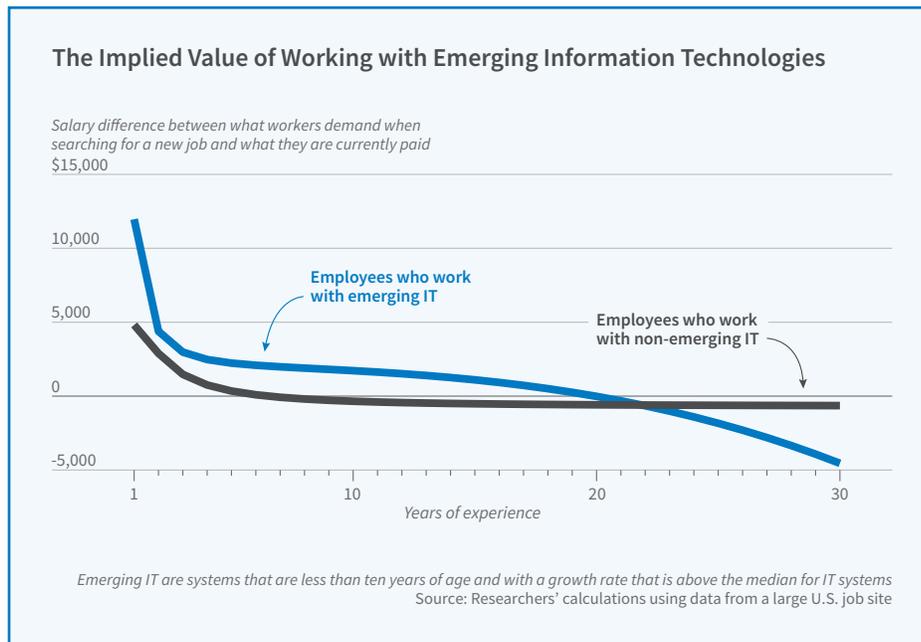
ily value compensation. Taken together, the evidence “supports the notion that IT workers value access to interesting IT systems above most other employer attributes.”

The researchers conclude by noting several implications of their findings. First, showing that investments in IT can help employers attract higher-pro-

ductivity workers may shed light on how and why those investments affect firm performance. Second, firms in markets without labor market mobility restrictions, such as those posed by non-compete agreements, may have more of an incentive to invest in emerging technology since “they can capture more of the value they provide to workers through

this channel.” Finally, the suggestion that workers of different experience levels value exposure to emerging systems differently “suggests that IT factors can influence how different age workers sort across firms, which may be important given the many diversity concerns that high-tech firms face.”

—Dwyer Gunn



To substantiate further their hypothesis that workers value the opportunity to work with emerging technologies, the researchers also conduct a textual analysis of employer reviews at Glassdoor. They find a positive relationship between a firm's use of emerging technologies and IT workers “valuing technology and learning as sources of value derived from

Car Buyers Seem to Undervalue Fuel Economy

After an audit by the U.S. Environmental Protection Agency in 2012, automakers Hyundai and Kia agreed that they had overstated the fuel efficiency of thirteen 2011–13 models by up to six miles per gallon. The restatement affected roughly 1.6 million vehicles sold. Attributing the misreporting to a “procedural error,” the automakers immediately changed the fuel-economy ratings featured on automotive websites and dealer lots for these cars, which include the Hyundai Elantra and Kia Rio. The episode was widely reported in the national news media.

Using detailed microdata on all new vehicle transactions in the United States from August 2011 to June 2014, Kenneth Gillingham, Sébastien Houde, and Arthur van Benthem estimate that the prices of affected models fell by 1.2 percent, or just under \$300, after the fuel-economy restatement. The fuel efficiency error created a natural experiment that allowed the researchers to infer how much buyers value fuel economy. In **Consumer Myopia in Vehicle Purchases: Evidence from a Natural Experiment** (NBER Working

Paper No. 25845), they combine the vehicle transactions and characteristics data with data on miles driven from the National Household Travel Survey and gasoline

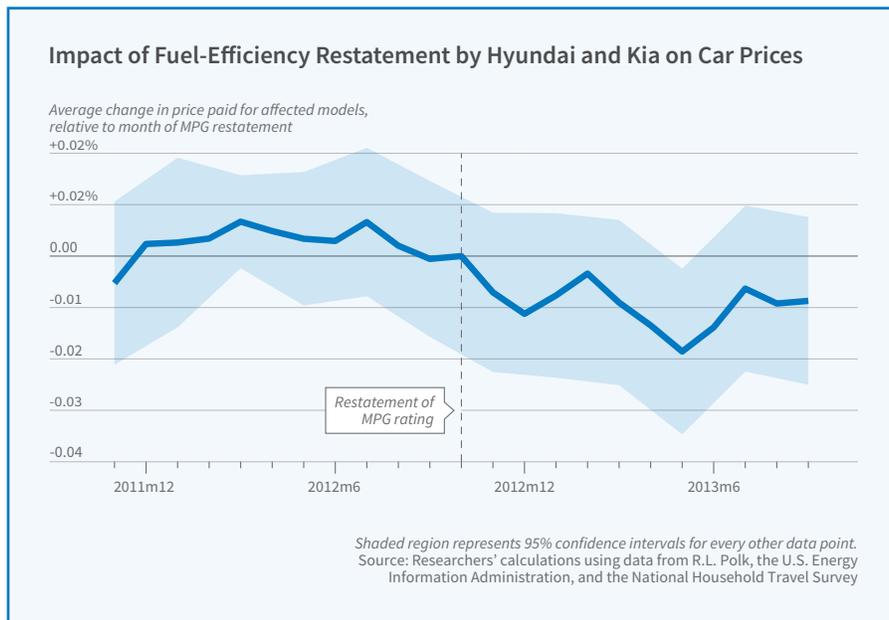
for 2013 models. The researchers interpret this as evidence of substantial consumer myopia with regard to future vehicle operating costs.

prices from the U.S. Energy Information Administration. This allows them to estimate that if the future gasoline expenses for a typical driver are discounted at 4 percent

Though the researchers note that their results depend on assumptions about driving behavior, discount rates, and underlying market structure, they find that fuel economy is valued at less than 50 cents per dollar saved under a wide variety of such assumptions. With standard projections for future vehicle usage, the implied undervaluation ranges from 14 cents per dollar saved at a 1 percent discount rate to 22 to 25 cents per dollar saved at a discount rate of 12 percent.

The conclusion that car buyers undervalue fuel economy in new vehicle purchases by more than previously thought implies that it is possible for a policy that shifts consumers into more efficient vehicles to be welfare-improving.

—Linda Gorman



per year, buyers appear to have reduced the price they were prepared to pay for a vehicle by 38 cents per dollar of future fuel savings for 2011–12 models, and by 15 cents

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