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New Insights on Past and Present Impacts of Automation

Whether automation is driving down the wages of middle-class workers, particularly those without college degrees, is a topic of great current interest as well as controversy. In **Automation and New Tasks: How Technology Displaces and Reinstates Labor** (NBER Working Paper No. 25684), Daron Acemoglu and Pascual Restrepo develop a conceptual framework for assessing the link between automation and the demand for labor and apply it to the post-World War II U.S. economy.

The researchers focus on how producers allocate tasks between capital and labor. For example, a company that produces and sells shirts must decide whether the many discrete tasks involved—such as design, knitting, processing, accounting, and sales—should be completed by humans or by human-operated machines, by software programs, or by industrial robots.

Automation has two competing effects on the demand for labor. A displacement effect—in which capital assumes tasks previously performed by humans—reduces labor demand, while a productivity effect—in which automation increases productivity and creates new tasks better suited for humans

to execute—increases it. Automation always reduces labor's share of output. Whether it raises or lowers the demand for labor depends on the relative magnitude of these effects.

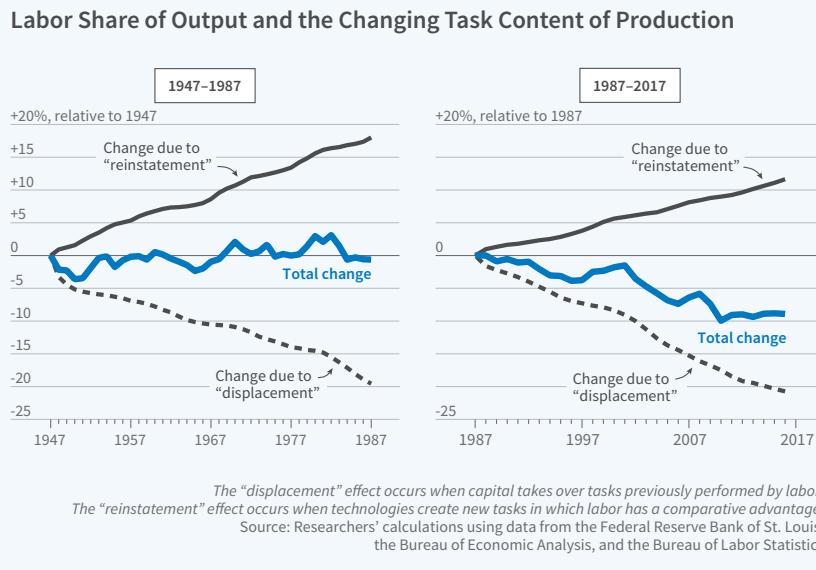
Rapid wage growth and a stable labor share of national income coincided with automation in the past because other technological changes counterbalanced its impact.

Technologies that produce displacement effects larger than their productivity effects will reduce the demand for labor and put downward pressure on wages, while those

the internet, by enabling much more efficient searches for information, likely lowered overall demand for corporate librarians and related workers, but also generated jobs for

search engine optimizers, web page designers, and related positions. The researchers conclude that in the past, the displacement effects of automation were largely offset by other, coincident developments that generated new tasks for labor.

Using this framework, the researchers analyze the economy-wide wage bill and study trends in overall demand for labor since World War II. Between 1947 and 1987, there were no significant changes in labor's share of value across the construction, services, manufacturing, and agricultural sectors. There were small declines in



for which the productivity effect dominates will raise the demand for human labor. In addition, technological change also generates a “reinstatement effect,” whereby new jobs for workers are created. For example,

the mining and transportation industries. The per-capita wage bill grew by 2.5 percent per year, largely driven by strong productivity. The displacement that took place during this time period was balanced by an

equal-sized reinstatement effect.

Between 1987 and 2017, however, growth in the demand for labor slowed. The per-capita wage bill grew only 1.33 percent per year and has been virtually stagnant since 2000. The researchers attribute this to a slowdown in productivity growth to about 1.54 percent per year,

as well as a change in the task content of production. The displacement effect was significantly larger and the reinstatement effect was much smaller. The trend is particularly noticeable in manufacturing, where displacement reduced the demand for labor by approximately 30 percent between 1987 and 2017.

"[T]he deceleration of labor demand growth over the last 30 years is due to a combination of anemic productivity growth and adverse shifts in the task contents of production owing to rapid automation that is not being counterbalanced by the creation of new tasks," the researchers conclude.

—Dwyer Gunn

How Strongly Do Expectations about Returns Affect Portfolio Choice?

Textbooks in economics and finance often caution investors against trying to "time the market," but survey evidence suggests that there is substantial variation over time in the return investors expect to earn by holding corporate stocks. How does such variation in expected returns translate into portfolio choices? In **Five Facts about Beliefs and Portfolios** (NBER Working Paper No. 25744), [Stefano Giglio](#), [Matteo Maggioli](#), [Johannes Stroebel](#), and [Stephen Utkus](#) use an online survey of Vanguard customers' beliefs about future stock returns, GDP growth, and bond returns to compare investors' expectations with their subsequent behavior.

Randomly chosen Vanguard customers participated in online survey waves from February 2017 through August 2018. There were about 2,000 survey responses per wave. If a customer responded in a wave, he was contacted again in subsequent waves. About 35 percent of the responses came from investors who responded to only one survey. Over 25 percent of respondents participated in at least four survey waves.

Compared to a nationally representative set of investors, survey participants tended to be older—the average age was 58.7—and richer. Respondents had an average of

\$467,000 invested with Vanguard. The average expected one-year market return among survey participants was 5.23 percent.

The survey data show that there is a

increases portfolio equity holdings by about 0.7 percentage points.

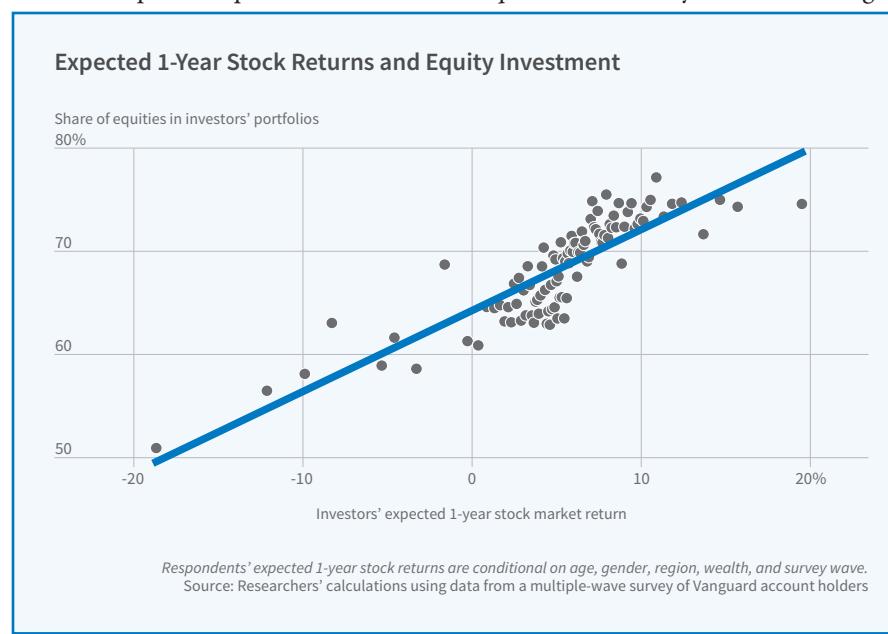
While this sensitivity of portfolios to beliefs is lower than in frictionless mod-

Investors increase the share of equities in their portfolios by about 0.7 percentage points when the return that they expect to earn on stocks rises by one percentage point.

positive relationship between an investor's expectation of the return in the next year on a stock portfolio and that investor's portfolio composition, but that the share of the portfolio allocated to equities is relatively

els, there is substantial heterogeneity in that sensitivity across investors lines up with different frictions investors face. Portfolios in tax-advantaged accounts were more sensitive to changes in investors' expectations than portfolios subject to capital gains taxes, especially if holdings were above \$100,000.

Portfolios in institutionally managed defined-contribution plans were about half as sensitive to changes in expectations as portfolios in individually managed plans. Investors who paid more attention to their accounts, investors who traded more frequently, and investors who were more confident in their beliefs, all had portfolios that were more strongly



less sensitive to changes in expected return compared with predictions from frictionless benchmark macro-finance models. On average, an investor expecting a 1 percentage point increase in returns over the next year

aligned with their expected stock returns.

There are large persistent differences across individuals in the expected stock returns. Individual fixed effects account for more than half of the variation in expectations: beliefs

of optimists and pessimists are both far apart and persistent. These expectations are not well predicted by observable characteristics such as gender, age, wealth, or geographic location.

The survey asked about expectations that range beyond stock returns, and individual expectations tend to be correlated across

responses. Beliefs about GDP growth and short- and long-run stock expectations are positively correlated. Those who think a stock market disaster is more likely also expect lower future cash flows and lower future returns. The empirical results imply that investors disagree about the very-long-term evolution of the mar-

ket price, and that this disagreement plays an important role in determining investor beliefs. They also suggest that survey data can reveal beliefs relevant for actual investor behavior, and therefore emphasize the potential for survey data to inform macro-finance theories.

—Linda Gorman

If There's a Doctor in the Family, Health Outcomes Improve

There is a large and rising gap between life expectancy for high- and low-income individuals in the United States. For men born in 1930, for example, life expectancy at age 50 for those in the top fifth of the income distribution is more than five years longer than for those in the bottom fifth. Many factors — including lifestyle, differential access to insurance, and quality of medical care — may contribute to this gap.

In **The Roots of Health Inequality and the Value of Intra-Family Expertise** (NBER Working Paper No. 25618), Yiqun Chen, Petra Persson, and Maria Polyakova explore another explanation: how access to medical expertise affects health. They study how health outcomes in Sweden are affected by whether a person has a family member who is a doctor or other medical professional. On average, individuals with doctors as relatives live longer and are more likely to engage preventive health care services.

Sweden's rich data infrastructure allows the researchers to map family trees and to track longevity as well as experiences with medical care.

Despite a universal health care system that equalizes formal access to care, there are substantial differences in health outcomes across income groups. This finding leads the researchers to search for factors other than access to care that might explain the socioeconomic

gradient in health status. They focus on access to health knowledge, which they proxy by the presence of a health professional in the family. Families that include such professionals are less likely to suffer from chronic conditions, even

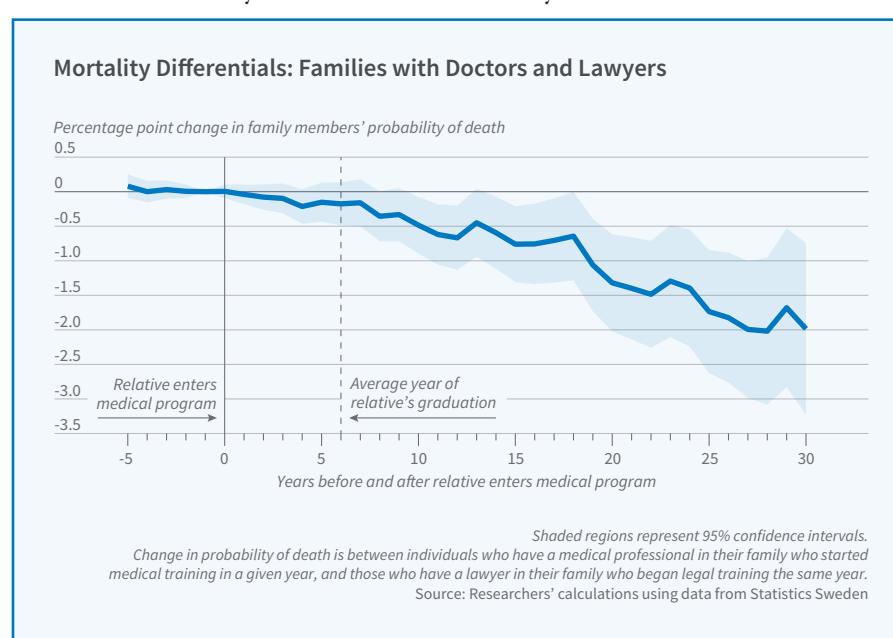
a natural experiment in Swedish medical school admissions. The threshold for admission is a certain grade point average, but so many individuals exceed the threshold that admissions among the eligi-

A study using Swedish data finds that individuals in families that include a health professional are more likely to engage in preventive health care, live longer, and are less likely to suffer from chronic conditions.

conditional on income. They are 10 percent less likely than others to die before age 80. The effect is stronger for individuals with family incomes below the median. Parents in a family with a doctor are more likely to have their

ble group are randomized. The researchers find that families with a member who were admitted are healthier on average than families with an individual who applied to medical school but did not win the lottery.

Eight years after an enrollee starts medical school, that person's older relatives are less likely to have a heart attack or heart failure and more likely to take medication to prevent heart attacks than the older relatives of those who applied to medical school but did not have the opportunity to attend. Younger relatives of the medical school enrollees benefit as well: they make larger preventive investments, are more



children receive HPV vaccinations and are less likely to smoke while their children are *in utero*.

To assess whether these effects are causal — that is, whether individuals are healthier *because* of the health professional in their family — the researchers analyze

likely to get vaccinated, and have fewer hospital admissions and addiction cases.

To analyze longer-term outcomes, the researchers compare family members' health before and after an individual receives a medical degree, relative to the

health of those in families with a student who graduates from law school. They use families of law graduates as a control group, as law is another high-status, well-paid profession. A family member becoming a doctor reduces other members' mortality by 10 percent 25 years after the doctor graduates from medical school. It also lowers family

members' rates of diabetes and lung cancer.

The researchers find evidence that the familial benefits are not due to preferential medical treatment, such as faster or better care. Rather, they find that the effects arise because of healthier habits and better decisions relating to preventive care. The effects are stronger if the medical profes-

sional is in one's nuclear family or lives in closer geographic proximity.

Based on their findings, the researchers estimate that expanding access to medical expertise could close up to 18 percent of the gap in health inequality with no negative impacts on higher-income families.

—Morgan Foy

The News about Equity Market Volatility Is Changing

Drawing on newspaper stories about stock market volatility, Scott R. Baker, Nicholas Bloom, Steven J. Davis, and Kyle J. Kost examine the importance of various types of news in contributing to swings in equity prices.

The researchers create an Equity Market Volatility (EMV) tracker that links articles about economic, political, and national security developments to the VIX index, a measure of expected stock market volatility based on option prices. In **Policy News and Stock Market Volatility** (NBER Working Paper No. 25720), they report that movements in their EMV tracker closely mirror the ups and downs in the realized and option-implied volatility of the S&P 500 between January 1985 and October 2018.

The EMV tracker is constructed by searching articles published in 11 major U.S. newspapers, including *The New York Times*, the *Los Angeles Times*, *The Dallas Morning News*, and *The Wall Street Journal*.

The researchers classified the EMV articles into about 30 categories of factors that influence volatility. These included 10 related to general economic factors, such as macroeconomic news, labor disputes, and financial crises. The rest related to political or policy factors

such as taxes, government spending, and monetary policy. Each category is associated with a set of search terms. In most cases, journalists who authored the articles tied

of the articles; national security matters were cited in just 13 percent of the articles.

The share of news stories about market volatility that fell into each category fluctu-

Press reports on contributors to market volatility have long emphasized news about GDP, inflation, and other economic aggregates, but news about policy has become increasingly important.

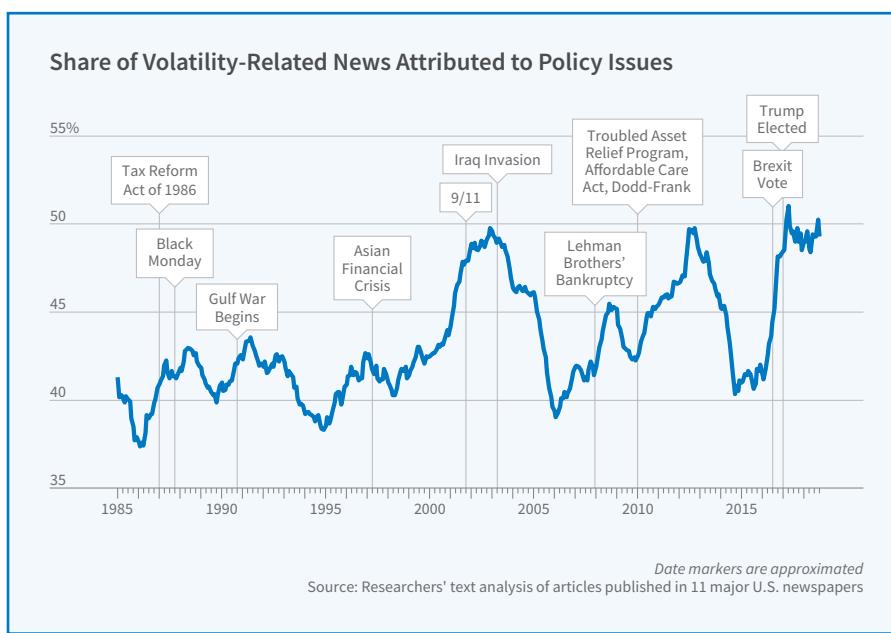
instability to factors in multiple categories.

News about the macroeconomic outlook appears in 72 percent of the articles that enter into the EMV tracker. This category covers reports about GDP, inflation, housing starts,

ated over time. For example, the period since the 2016 election has seen a sharp increase in trade policy concerns as an apparent source of market volatility.

The researchers created not just an overall

EMV tracker, but several category-based versions as well. The EMV tracker for macroeconomic news jumped in response to the October 1987 market crash, the Russian financial crisis, and the 2008–09 global financial crisis. In contrast, it registered little reaction to the Enron and WorldCom scandals. The “financial crisis” EMV tracker has registered consistently higher volatility in the years since the 2008–09 meltdown, but it also reacted strongly to earlier



jobs, and other indicators of the broad economic outlook. That compares with 44 percent of EMV articles in the “commodity market” category, citing terms such as wheat, steel, and oil pipeline. Journalists attributed volatility to news about interest rates in 31 percent

crises such as those involving the Mexican peso in 1994 and the Russian and Asian financial crises in 1997–98. An EMV tracker for petroleum markets, using such search terms as oil, Alaska pipeline, and Keystone pipeline, mirrors most movements in oil-price volatility but

missed badly during times of economic crisis like the 1987 stock market crash and the 2008–09 global financial crisis.

News about policy matters is an important and growing contributor to volatility.

The researchers find that 35 percent of EMV articles refer to fiscal policy, mostly taxes, 30 percent discuss monetary policy, 25 percent refer to one or more forms of regulation, and 13 percent mention national security. They

find “an upward drift over time” in the share of articles about market volatility that discuss policy matters, with a peak contribution of policy matters in 2017–18.

—Steve Maas

Analyzing Efforts to Rein in Misinformation on Social Media

Concern about the societal implications of the rise of fake news sites on social media platforms has led to calls for a variety of public policy actions, as well as internal changes in some platforms. In **Trends in the Diffusion of Misinformation on Social Media** (NBER Working Paper No. 25500), Hunt Allcott, Matthew Gentzkow, and Chuan Yu provide new information on the trends in social media users’ interactions with fake content.

The researchers compiled a list of 569 websites recognized as purveyors of misinformation in two academic studies and in articles by PolitiFact, FactCheck.org, and BuzzFeed. They found a steady rise in interactions with fake news sites by users of both Facebook and Twitter from January 2015 to the end of 2016.

Around the time of the 2016 election, the researchers find, fake news sites received about two-thirds as many Facebook engagements as 38 major news sites in their sample. At about that time, Facebook initiated a series of protocols that were designed to root out misinformation. These included expanded fact-checking, flagging some content as “Disputed,” and increased promotion of “Related Content” to provide context for individual news items. These

changes appear to have mattered: Between late 2016 and mid-2018, interactions with fake news sites fell by more than 60 percent on Facebook, but continued to increase on Twitter. The researchers compute the ratio of Facebook engagements—shares, comments, and reactions such as “likes”—to shares of con-

tent on Twitter. The ratio of Facebook engagements to Twitter shares of fake news content was steady at about 45:1 during 2015 and 2016, but declined to 15:1 by mid-2018.

The decline in Facebook engagements notwithstanding, the level of interaction with fake

researchers considered engagements and shares associated with these 38 news sites, 78 smaller news providers, and 54 business and culture sites. For these sites collectively, the Facebook-to-Twitter ratio remained stable over the study period.

Interactions with fake news sites by users of both Facebook and Twitter rose steadily in 2015 and 2016, but have fallen more than 60% since then on Facebook.

news sites remains high. At the end of the study period, there were 60 million Facebook engagements per month with fake news sites, down from a peak of 160 million per month in late 2016. That compares with 200–250 million Facebook engagements per month in the sample of 38 major news sites, which includes *The New York Times*, *The Wall Street Journal*, CNN, and

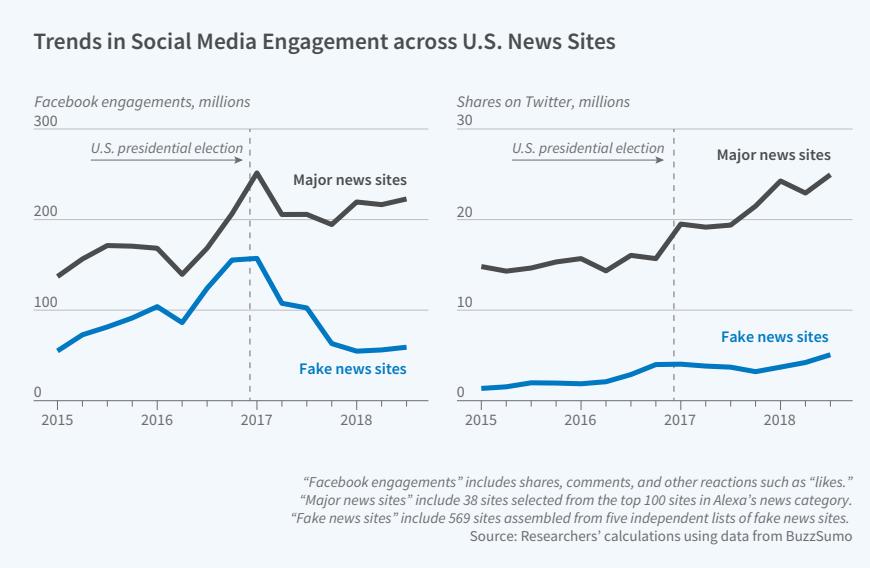
In another test, the researchers collected a sample of 9,540 false articles that appeared during the study period. They found that the ratio of Facebook engagements to Twitter shares declined by half or more after the 2016 election, bolstering the website-level findings.

The researchers conclude that “some factor has slowed the relative diffusion of misinforma-

tion on Facebook” during their sample period, but they cannot identify a specific cause of this change. They also raise cautions about their findings. For example, they note that that PolitiFact and FactCheck.org, two sources they used to identify fake news sites, work with Facebook to weed out fake news stories. That could imply that the fake news website sample is weighted toward sites that Facebook would take action against. The

researchers also note that while they have analyzed the major providers of false stories, web domains that are small or that were only briefly active may have escaped their analysis. Other sites may have found ways to evade detection, such as by changing domain names.

—Steve Maas



Fox News. Twitter shares of false content ranged from 3 million to 5 million per month in the period between the end of 2016 and July 2018, compared with a steady rate of 20 million per month for the 38 major news sites combined.

To develop a benchmark for activity on Facebook vis-à-vis activity on Twitter, the

Assessing Federal Subsidies for Purchases of Electric Vehicles

Federal tax incentives, which totaled \$725 million in 2014, are generally credited for the rapid increase in sales of electric vehicles (EVs) in the past decade. Because EVs offer a locally cleaner alternative to cars that run on gasoline, the U.S. government encourages EV purchases by offering tax credits ranging from \$2,500 to \$7,500.

Did these subsidies induce consumers to ditch their gas-guzzlers, or would consumers who obtained the tax benefits have bought EVs anyway? In **What Does an Electric Vehicle Replace?** (NBER Working Paper No. 25771), Jianwei Xing, Benjamin Leard, and Shanjun Li find that federal tax credits induce EV sales, but that the majority of the credits went to households that would have purchased an EV without any tax incentive.

Mass-market EVs became available in late 2010 at a premium relative to other fuel-efficient cars. For example, in 2014 the Honda Accord Hybrid cost about \$30,000, but the electric plug-in Honda Accord cost over \$40,000.

To assess the economic and environmental benefits of EV adoption, the researchers estimate what vehicles households would have purchased in place of EVs. To do this, they analyze 2010–14 household survey data, which include information on households' car purchases as well as the other vehicles that the household considered buying, to create a counterfactual scenario without EV

tax incentives.

The researchers estimate that without tax subsidies, EV purchases would have fallen by about 29 percent. They find that "EVs mainly attracted consum-

ers more likely to buy EVs in the absence of an incentive, relative to lower-income households. The researchers calculate that a modified program that provided a larger tax incentive for low-income vehi-

A modified program that raised the tax incentive for low-income vehicle buyers and lowered it for high-income buyers could have induced the same increase in overall EV purchases at a smaller revenue cost.

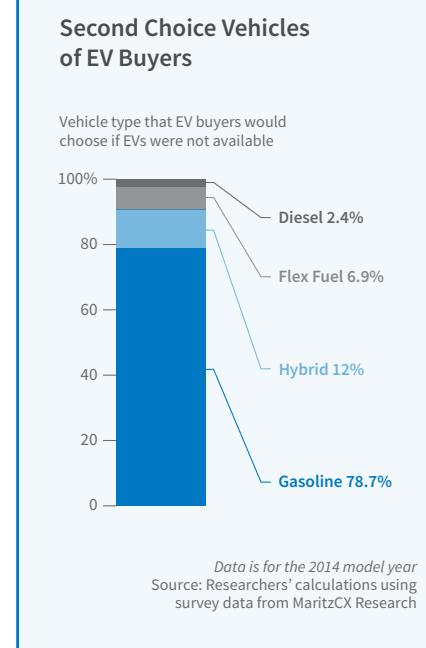
ers who were originally choosing mid-size and fuel-efficient gasoline or hybrid vehicles, rather than gas-guzzlers such as large SUVs or trucks." High-income households were more likely to reap the benefits of the tax subsidy but were also

buyers, who are more price-sensitive than their high-income counterparts, could have induced the same increase in overall EV purchase at a smaller revenue cost.

While electric vehicle purchases have grown over the last decade, sales of conventional hybrid vehicles have plateaued. The researchers find that this occurred not because EVs replaced hybrids, but rather because the federal government stopped offering tax incentives for hybrids.

The study estimates that the tax subsidy for EVs is responsible for about 30 percent of the CO₂ emissions reduction from the current EV fleet in the U.S. These calculations assume that EVs replace the cars that households would have bought otherwise, not the "average" car on the U.S. highway. Because EV buyers on average are more environmentally conscious than the overall car-buying population, the emissions reduction is smaller—by about 27 percent—than it would be if EVs replaced average U.S. vehicles.

—Morgan Foy



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