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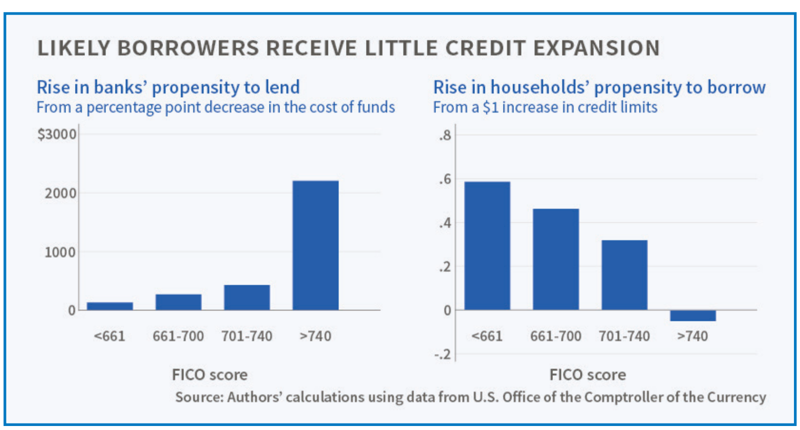
INSIDE THIS ISSUE

Did Credit Expansion Spur Consumer Spending in the Great Recession?

Interest rates on consumer loans, including credit cards, rose during the Great Recession as banks became more cautious in their lending. This led to reduced consumer spending. The Federal Reserve attempted to offset this development by providing banks with access to financing at relatively low interest rates in the hope that the banks would make credit more available to consumers and thereby spur consumption.

Sumit Agarwal, Souphala Chomsisengphet, Neale Mahoney, and Johannes Stroebel examine the impact of this policy. In **Do Banks Pass Through Credit Expansions? The Marginal Profitability of Consumer Lending During the Great Recession** (NBER Working Paper No. 21567), they find that banks disproportionately passed through credit expansions to consumers whose spending was relatively unresponsive to changes in credit limits, rather than to those who were most likely to increase spending. The findings are based on analysis of spending patterns on all credit cards issued by the eight largest U.S. banks from 2008 to 2014.

Banks passed through credit expansions not to the consumers most likely to increase spending, but to those whose spending was less responsive to changes in credit limits.



The researchers first show that households vary in their responsiveness to increases in credit limits. They do this by exploiting the fact that banks frequently offer different credit limits to households with similar FICO scores. A household with a FICO score of 719 might receive a credit limit of $2,000, while one with a FICO score of 721 might qualify for a credit limit of $5,000. By comparing the monthly statements of these essentially equivalent households, the researchers isolate the effect of credit scores on spending.

They find that households with the lowest FICO scores, which also typically have the lowest amount of available credit, are the most responsive to increases in credit limits. A $100 increase is estimated to cause an additional $58 in borrowing for these households. This effect is driven by increased spending, rather than simply shifting borrowing across credit cards. In contrast, households with the highest FICO scores, which typically enjoy the highest credit limits, are much less responsive to changes in their credit limits. A $100 increase for this group is estimated to cause only an additional $23 in borrowing. Moreover, this effect is driven by shifting across credit cards rather than by increased total spending.

This evidence suggests that credit expansions only stimulate consumer spending if banks use their access to low-interest funds to increase credit limits to households that are inclined to use the opportunity to spend more. Did they do this in the period following the Great Recession? To answer this question, the researchers model bank lending practices. Again comparing similar households with different credit limits, they estimate the costs that banks incur when choosing credit limits and find that when banks expand credit to households with low FICO scores, they incur much higher marginal costs than when they expand credit to households with high FICO scores. The model predicts that when banks see their cost of funds reduced by one percentage point, high-score households will see their credit limits increase by $2,203, while low-score households will only see their credit limits increase by $127.

— Andrew Whitten

Eliminating Earnings Test Increases Ranks of Low-Income Older Women

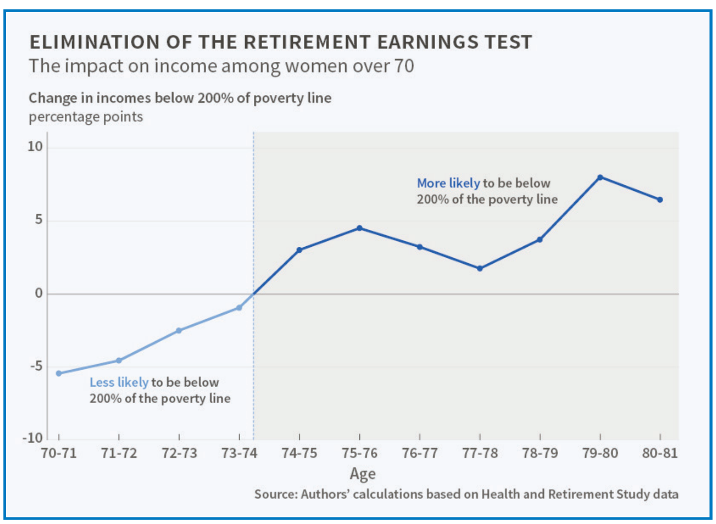
Until 2000, the Retirement Earnings Test (RET) reduced the net Social Security benefits of some senior citizens who had income from working. Then the test was eliminated for seniors who have reached full retirement age in an effort to encourage those who want to work to continue doing so. The change allows seniors working past retirement age to avoid reduction in their Social Security benefits. But it also encourages them to claim Social Security benefits earlier than they otherwise would, which lowers their annual benefit payments.

At older ages, after individuals no longer have income from labor, this reduction in benefits may translate into lower financial status, especially for women, who tend to live longer, according to the analysis in **Does Eliminating the Earnings Test Increase the Incidence of Low Income Among Older Women?** (NBER Working Paper No. 21601).

“The results for the sample first observed at age 70 or older suggest that, as women age into their mid-70s, the effect of lower Social Security benefits from early claiming comes to dominate the effects of higher earnings (and whatever effect those higher earnings had on income from saving),” researchers Theodore Figinski and David Neumark report.

Using Health and Retirement Study data, the authors compare two samples: nearly 3,000 women ages 70 and 71 and nearly 2,000 women ages 75 and 76. The study concentrates on older women because they are more likely than men to have become principally dependent on their Social Security benefits. The authors confirm what previous research has shown: Congress’s elimination of the RET in 2000 caused women to claim Social Security benefits months earlier than they otherwise would have. By one estimate, women who were 69 in 2000 claimed about 6.5 to 7.8 months earlier. Rates are even higher for slightly younger women, who could take greater advantage of the changes in the law. Those who were 65 or younger in 2000 claimed 8.2 to 9.6 months earlier. The result: lower annual benefits of about $650 to $800, according to the researchers’ estimates.

The change encouraged some workers to claim Social Security benefits earlier than they otherwise would have, decreasing their benefits.



A similar result is found for the husbands of married women: their husbands also tend to claim benefits earlier, leading to lower annual benefits for the couple of about $1,500.

For a time, the extra income that the early claimants earn from work tends to offset the lower benefits associated with early claiming. Previous research suggests that elimination of the RET through age 69 boosted seniors’ earnings by 19 to 20 percent. But that advantage dissipated in later years as earnings declined and seniors continued to receive lower annual Social Security payments because they elected to begin receiving their benefits at an earlier age.

The authors find that women affected by the elimination of the RET who are 70 or older are 5.5 percentage points less likely to be below 200 percent of the poverty line than those not affected by the elimination of the RET. The older these women get, the greater their risk of having income that is below, or close to, the poverty line. Women 75 or older are 3.4 to 4.5 percentage points more likely to fall under the 200 percent poverty line. For older women whose husbands are observed, the net effect is similar but more muted; they are 2.9 to 3.8

percentage points more likely to be under the 200 percent poverty line.

"The results for poverty and low-income status tend to fit the conjecture about higher income and hence of lower incidence of low income initially — when women are at or just above age 70 — but a higher incidence of low income as women get into their mid-70s and beyond," the researchers conclude. "These findings suggest that the incidence of low income among old women was increased by the elimination of the RET."

— Laurent Belsie

Movies, Margins, and Marketing: Encouraging Use of Iron-Fortified Salt

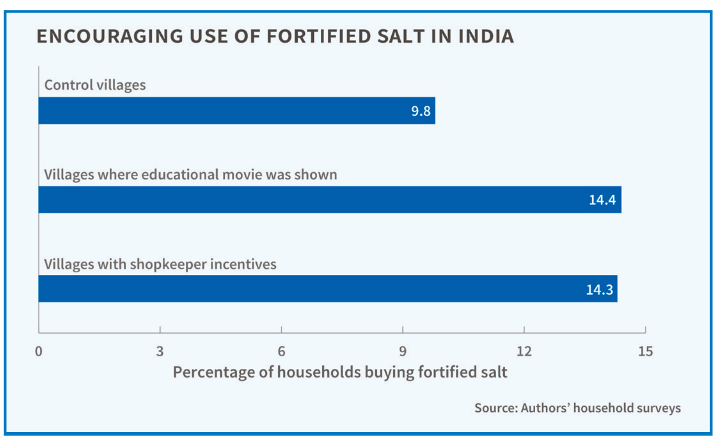
Anemia is estimated to affect 1.6 billion people worldwide. Iron deficiency is one of its leading causes, along with other nutritional deficiencies, illnesses and diseases such as diarrhea and malaria, and parasitic infections. Iron deficiency anemia (IDA) is associated with a slowing of physical and cognitive development, with potentially long-lasting effects. IDA may lower productivity among affected working-age adults, as feeling weak is the most common symptom of the disorder. Severe anemia during pregnancy can lead to low birth weight and child mortality. High rates of anemia are observed broadly among older adults, and low hemoglobin levels in the elderly are associated with cognitive decline and reduced physical performance.

In the mid-2000s, India's National Institute of Nutrition developed salt fortified with iron and iodine — known as doubly-fortified salt, or DFS — in an effort to reduce anemia rates by increasing the public's iron intake. The efficacy of this approach was demonstrated among small-scale tribal populations and school children, but there has been little exploration of whether the general public would be willing to buy and use the salt, what households' responses to various pricing and marketing schemes would be, and whether it would be effective enough, at stable, safe levels of fortification, to make a significant difference.

In **Movies, Margins, and Marketing: Encouraging the Adoption of Iron-Fortified Salt** (NBER Working Paper No. 21616), Abhijit Banerjee, Sharon Barnhardt, and Esther Duflo explore these questions.

An entertaining, educational movie and an incentive for shopkeepers to push the product led to large gains in the number of Indian household users.

DFS is a new product, with some characteristics that would positively influence adoption (it is clean and white, sold in a fancy packet with a trusted brand name) and some drawbacks (people are generally reluctant to try new foods, and there were some instances of food blackening early on). Moreover, the authors found that many people did not understand the links between the product and anemia, or between anemia and wellbeing. The basic marketing campaign conducted by the manufacturer at launch was ineffective; two years after the introduction of the salt, absent any additional information campaign, the researchers found that no one who bought DFS knew that it helped reduce anemia, or reported buying it because it was good for the health of household members.



Even when the fortified salt was provided free, only about half of households actually used it for cooking. When they had to buy it at just below half price, with no other intervention, about 20 percent of households gave it a try, but only 10 percent still were using it after about three years.

Against this backdrop, the authors conduct a randomized control trial that shows the power of a strong communication campaign. In 64 villages, randomly selected out of 200 villages where DFS salt was made available in shops, an entertaining movie promoting the salt's use was seen by about 20 percent of the households. For households that had to buy the salt, consumption of DFS increased from 9.8 percent in villages where the movie was not shown to 14.4 percent in villages where it was shown, an increase of 50 percent over the mean. For comparison, when the DFS was distributed free, 54 percent of households consumed it. Eight percent of households who bought DFS in the villages where the movie was shown reported that they bought this salt because it helped in fighting anemia, as against none in other villages, and they paid a lower price on average, as advertised in the movie.

The authors also find that shopkeepers are powerful influencers of what households do. A small increase in retailer profit margins resulted in an increase in take-up at least as large as that caused by the movie screening. There is some ambiguity on how this was achieved, the researchers report. The retailers claim that they dropped the final price of the salt, albeit very little. Village households do not report such a decline and instead claim that they bought the salt because it was the only one available.

—Les Picker

The Impact of High Deductibles on Health Care Spending

After years of providing completely free medical care to its employees, a large company switched to a high-deductible insurance plan that, in its first year, covered 78 percent of expenditures. The subsequent change in the spending patterns of employees suggest that textbook models of rational consumer behavior do not apply to demand for health care.

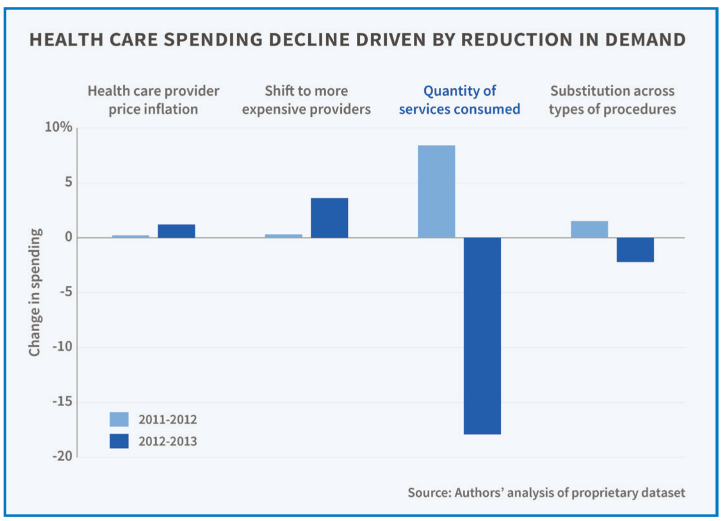
The patterns are scrutinized in **What Does a Deductible Do? The Impact of Cost-Sharing on Health Care Prices, Quantities, and Spending Dynamics** (NBER Working Paper No. 21632) by Zarek C. Brot-Goldberg, Amitabh Chandra, Benjamin R. Handel, and Jonathan T. Kolstad.

The researchers studied individual health records from nearly all the self-insured firm's 35,000–60,000 employees and 105,000–200,000 dependents for six years. Median income was between $125,000 and $150,000. The company implemented the high-deductible plan in the fifth year of the data, but continued to offer employees access to the same broad set of medical providers and services available under the entirely free plan.

After controlling for inflation and demographic changes, the researchers found that the deductible reduced overall employee health care spending by about 13 percent annually, and that some of the services consumers elected to forgo were "likely of high value in terms of health and potential to avoid future costs."

They found that nearly the entire decline resulted from an outright reduction in the consumers' demand for services, rather than from them price shopping or substituting less costly procedures. In fact, there was actually a shift to more expensive providers. This was despite the employees being offered a tool to search for doctors by location, specialties, fees, and other factors, as well as to compare pricing of such standardized services as MRIs.

Implementation of the deductible reduced employee health care spending by 12 to 14 percent, nearly all from reduction in demand for services.



The researchers also found that once individuals spent enough to reach the deductible, their health care spending patterns reverted to pre-change levels. Strikingly, this was even the case among those with a medical history that made it all but certain they would exceed the out-of-pocket maximum. Had they acted like forward-looking consumers, these less-healthy individuals would not have deprived themselves of care while under the deductible. They had no reason to be price-sensitive, since they could have predicted that they inevitably would have reached the stage when their care would be entirely free.

The researchers found that during the deductible phase, demand for services slackened across the board—both for preventive care, which might have saved money in the long run, and for expensive tests of questionable value. Demand also dropped for services that are free under the Affordable Care Act, such as mammograms and colonoscopies, perhaps because individuals were unaware of the benefits because they had avoided the doctor. Another possible explanation is that they feared that the free tests would lead to costly services.

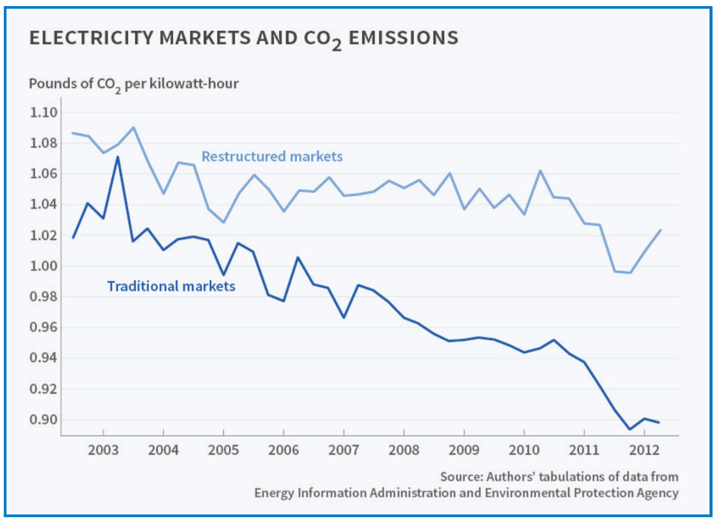
The authors conclude by questioning whether a high deductible may be too blunt an instrument with which to rein in health care costs. They note that even relatively well-educated and well-paid consumers in their data sample appear to act in ways counter to their financial and medical interests.

—Steve Maas

Natural Gas Prices and Coal Displacement in Electricity Markets

In many parts of the United States, the electricity market was restructured in the 1990s and early 2000s in an effort to increase competition by breaking up regional monopolies. But an unforeseen side effect of this restructuring has emerged, Christopher R. Knittel, Konstantinos Metaxoglou, and Andre Trindade report in **Natural Gas Prices and Coal Displacement: Evidence from Electricity Markets** (NBER Working Paper No. 21627). Utilities operating in markets that were not restructured were more likely to take advantage of the past decade's falling natural gas prices, and they are reducing carbon emissions more than utilities operating in markets that were restructured.

For more than a century, fossil fuels — particularly coal — have been the primary energy source for electricity generators. Early in the last decade, coal-fired plants were producing about 51 percent of the total electricity generated in the United States, while natural gas-fired plants accounted for 17 percent. But the burning of fossil fuels — and of coal in particular — emits large amounts of carbon pollutants linked by researchers to global climate change. This has prompted public demands and policy moves by government to reduce carbon emissions from power plants, especially from coal-fired plants.



Wholesale electricity markets have also undergone a transition in another dimension. To encourage greater competition, federal regulators in the 1990s and early 2000s embarked on a sweeping program to restructure the nation's electricity markets. Historically, regional utilities dominated several functions of the electricity industry: generating the power, transmitting it through regional networks, and distributing it to local household and business customers. The restructuring movement effectively unbundled those functions, creating a new wholesale market in which power plants were separately owned and operated by independent power producers (IPPs) within new regional markets overseen by independent system operators (ISOs). Electricity markets in some regions of the country never underwent restructuring. There, traditional investor-owned utilities (IOUs) with control of electricity supply from generation through distribution remain in place.

The shale gas boom has brought a much greater reduction of emissions to electricity markets not affected by restructuring than to restructured markets.

The researchers set out to explore the environmental impact of the recent natural gas glut and subsequent plunge in prices caused by the shale-gas boom in the United States. Using data from the Energy Information Administration, a division of the U.S. Department of Energy, the Environmental Protection Agency, the Federal Energy Regulatory Commission, and other sources, they sought to quantify short-term coal-to-gas switching decisions by different types of electric power plants in response to changes in the relative price of coal and natural gas from 2003, just prior to the shale-gas boom, to 2012, when the boom was fully underway. In particular, they wanted to analyze the reactions by investor-owned utilities operating in traditional markets, investor-owned utilities operating in restructured markets, and independent power producers.

The research revealed that IOUs operating in traditional markets were far more sensitive to changes in fuel prices than both IOUs and IPPs in restructured markets, and were more likely to switch to gas-fired plants to take advantage of lower natural gas prices. The switching partly explains why total U.S. electricity generation from gas-fired plants increased to 30 percent in 2012 from just 17 percent in 2003, while coal-fired plants' share of total electric generation fell to 37 percent in 2012 from 51 percent in 2003.

The authors say one plausible explanation for the different reactions is that the restructuring process appears to have reduced the incentives of ISO market participants to invest in natural gas capacity, which limits their ability to respond to changes in the relative price of the two fuels. The authors present empirical evidence that the investment rate in natural gas generation was higher in traditional markets, compared to restructured markets.

The heterogeneity in generators' responses of fuel consumption to fuel price has material implication for carbon dioxide emissions. The nearly 70 percent drop in the price of natural gas between June 2008 and the end of 2012 translated into as much as 33 percent reduction in carbon emissions for investor-owned utilities in traditional markets, but only up to 19 percent for investor-owned utilities in restructured markets.

— Jay Fitzgerald

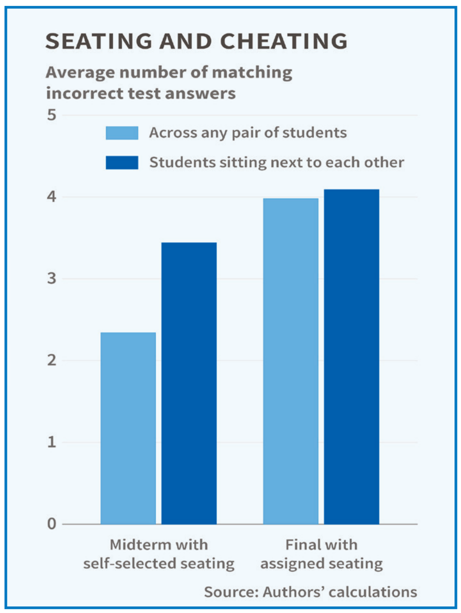
How to Catch Cheating Students? It's Algorithmic

An introductory natural science course at a top American university offered in the spring of 2012 had three midterm exams and one final. Two hundred fourteen students took both the third midterm and the final. After the third midterm, two students reported that other students cheated, and the professor in charge of the course asked Steven D. Levitt and Ming-Jen Lin to develop a method to uncover the cheaters. In **Catching Cheating Students** (NBER Working Paper No. 21628), Levitt and Lin describe how the "simple algorithm" they developed enabled them to identify roughly 10 percent of students who were very likely to have cheated on the third midterm.

Nearly every classroom seat was occupied when students took the midterm exam. Students chose their own seats; there was one test monitor, and seating positions were recorded. Students also chose their own seating positions when they arrived to take the final exam. Again their choices were recorded. But before the final exam was handed out, students were moved to randomly assigned seats. The exams were multiple choice tests. There were two versions of the final with the same questions in different order.

The researchers hypothesized that the simplest way to cheat is to copy from the student sitting next to you. They compared the number of matching pairs of incorrect answers in all of the theoretically possible 22,791 pairs of students who took the third exam with the number of matching pairs of incorrect answers in pairs of students who actually sat next to one another. Because the typical student answered most of the questions correctly, the mean number of shared incorrect answers across all theoretical pairs of students was 2.34. Cheating was a likely explanation when student pairs actually sitting next to one another averaged an additional 1.1 shared incorrect answers, more than would be expected by chance alone.

To identify likely cheaters, the researchers compared the predicted number and the observed number of matching answers for all possible pairs of students.



To identify pairs of potential cheaters, the researchers compared the predicted and observed matching answers for all possible pairs of students, using the percentage correct on each of the midterms and the final to model a student's predicted answer to a particular question. Then they calculated the predicted number of matching answers for each pair and compared it to the actual number of matching answers observed for each pair. The difference between observed and predicted matching answers was computed both for matching correct and matching incorrect answers. Matching incorrect answers were a stronger indicator of potential cheating. Student pairs with more than six residual matching incorrect answers showed up as clear outliers in a scatter plot.

Some pairs of students who sat next to one another were more than 60 times more likely to be in the upper one tenth of one percent of the distribution of the number of residual matching incorrect answers than randomly constructed pairs. About nine percent of the pairs, consisting of 18 students, showed up in the extreme tail. By chance, less than one pair of students sitting together should have shown up there.

When seating was randomized for the final, the distribution of the percentage of residual matching incorrect answers was indistinguishable from one that would have been produced by chance. The distribution of residual matching correct answers still had more pairs of students with relatively high numbers of matches than one would expect. After examining the possibility that students studying together might be more likely to produce matching correct answers, the authors concluded that even with randomized seating four students probably cheated on the final.

—Linda Gorman

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