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Explaining Why Investors Hold Sovereign Bonds with Default Risk

Why do investors lend to national governments with a history of defaulting on external sovereign bonds? New research suggests the answer is that, on average over the last two centuries, sovereign bonds have been a profitable investment.

External sovereign bonds are bonds issued by a national government in a foreign currency and traded in financial centers such as London or New York. The modern market for such bonds dates back to 1815. The emerging-market debt boom that began after the Battle of Waterloo that year ended with the financial panic of 1825. Greece defaulted for the first time on its external bonds in 1826. Since then, it has defaulted six more times. Over the same period, Russia has defaulted four times, China eight times, Venezuela nine times, and Mexico ten.

According to [Josefin Meyer](#), [Carmen M. Reinhart](#), and [Christoph Trebesch](#), investors continue lending to repeat defaulters because it

pays. In **Sovereign Bonds since Waterloo** (NBER Working Paper No. [25543](#)), they calculate that, for a global portfolio of sovereign bonds in British pounds or U.S. dol-

most decades are comparable (in the range of 5–10 percent), with the interwar period seeing particularly low returns.

That return is equivalent to the average

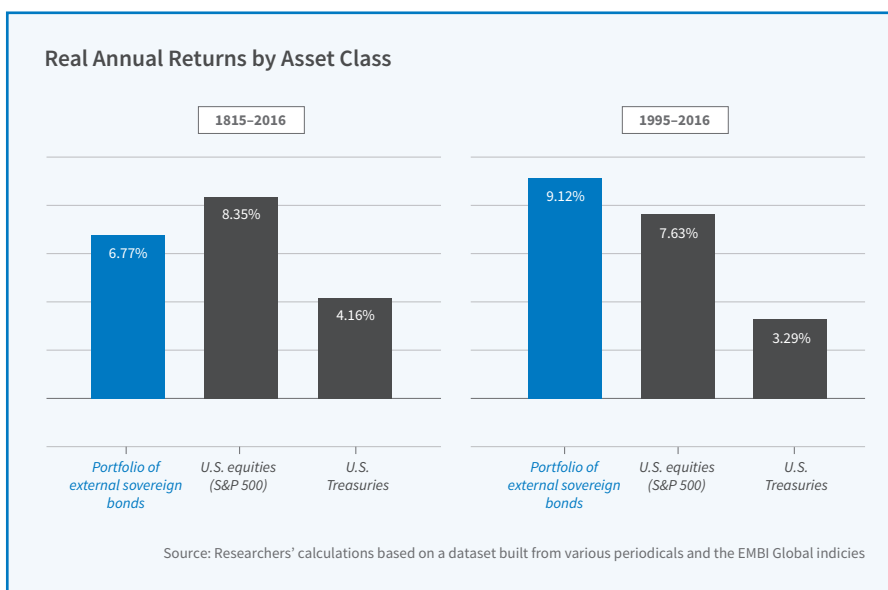
External sovereign bonds denominated in U.S. dollars or British pounds had average annual real returns of 6.8 percent between 1815 and 2016, even after accounting for defaults, wars, and revolutions.

lars, investors reaped an average inflation-adjusted return of 6.77 percent per year. This is the full-sample average over the period 1815 to 2016, but the averages for

return from stocks over the same period. It is greater than the return on corporate bonds, and about 4 percent higher than the return to holding government bonds issued by the U.S. or

U.K. government. Risk-averse investors demand, and get, higher compensation for shouldering the higher risk represented by governments with limited means or histories of serial default. The yields on bonds issued by serial defaulters are on average significantly higher than the yields paid by less-risky external debt.

To study the return on external sovereign bonds, the researchers construct a dataset containing monthly price



quotations for over 1,400 bonds from countries other than the U.S. or U.K. The dataset has 219,968 monthly observations spanning the 1815 to 2016 period. A second dataset quantifies the losses — the “haircuts” — investors incurred when bonds were restructured or repudiated. It contains information on 313 external sovereign debt restructurings in 91 countries.

Coupon payments account for about 70 percent of the returns on these bonds. Outright debt repudiation is rare, as almost all defaults are settled with restructurings, with haircuts well below 100 percent. The average haircut in the sample is 44 percent and includes restructurings after tumultuous events such as major wars, communist revolutions, and the Great Depression. Bond returns typi-

cally recover after a default. On average, cumulative bond returns drop by about 15 percent in the wake of a default event and then stagnate for a few years, but on average, investors who enter two years before a default break even four years after the default. For low haircut cases, which the researchers define as cases in which the investors lose less than 47 percent of their investment (the sample median), losses are typically recouped within two years of the initial default.

The statistic on average haircuts masks some really low returns. The worst performing 25 percent of bonds left investors with substantial losses even after six years. Some defaults took decades to settle. The researchers note that most of the bonds in the bottom quartile were issued prior to World War II.

Since the 1990s, only two defaults have produced long-lasting creditor losses: Investors exposed to Argentina’s 2001 default did not break even until 2016, and those who held Ecuadorian debt at the time of the 2008 default continued to have losses until 2013.

Between 1815 and 1973, average inflation-adjusted returns were 6.4 percent and haircuts averaged 1.3 percent. From 1973 to 1995, the external sovereign bond market was relatively small, as most lending to sovereign countries came from syndicated bank loans. Defaults on these loans in the 1980s were followed by a reinvigoration of the market for external sovereign bonds. From 1995 to 2016, real annual returns averaged 9.1 percent with an average yearly haircut of just 1.1 percent.

—Linda Gorman

Repeating 8th Grade Increases Likelihood of a Criminal Conviction

Education policies affect the academic and social skills of young adults, thereby influencing not only their earning potential but also their civic engagement, health behaviors, and criminal activity later in life. Measuring the impact of specific policies is challenging. In **The Effect of Grade Retention on Adult Crime: Evidence from a Test-based Promotion Policy** (NBER Working Paper No. 25384), [Ozkan Eren](#), [Michael F. Lovenheim](#), and [Naci H. Mocan](#) find that a Louisiana policy of retaining students in eighth grade based on their sub-standard test scores in English and math increases the likelihood of their being convicted of a crime by age 25. The researchers find a 58 percent increase, in particular, of the likelihood of being convicted of a violent crime.

While previous research has explored the relationship between years of schooling and crime, there is less evi-

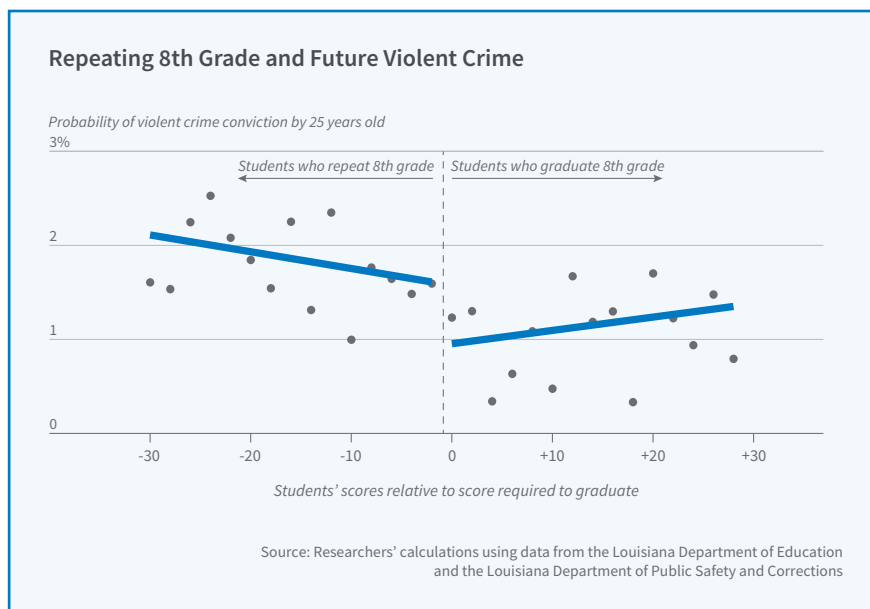
dence on how specific education policies affect the long-run likelihood of criminal activity.

Louisiana was a pioneer in this grade-retention “accountability” policy. Sixteen states, as well as

In Louisiana, students denied promotion because of low English and math test scores were more likely to be convicted of violent crimes by the time they reached 25.

This study focuses on a 1998 Louisiana education reform measure that calls for keeping students back in eighth grade if they fail to reach certain test score levels in English and math.

many large school districts across the country, now have end-of-year exams that help determine whether students are promoted to the next grade level.



The researchers obtained education data on all public K-12 students from the Louisiana Department of Education and criminal data from the Louisiana Department of Public Safety and Corrections. They focused on eighth graders in the academic years of 1998–99 through 2000–01, specifically on students who failed initial mandatory tests required for promotion to ninth grade. Their dataset consists of 22,929 unique student observations.

The researchers estimate the effect of grade retention by comparing students who earned test scores slightly above and slightly below the threshold for promotion. They find that being retained in eighth grade is associated with a 1.25 percentage point increase in the likelihood of being convicted of any crime by the age of 25, although this impact is not, statistically speaking, significantly different from zero. The effect

is driven mostly by an increase in violent crime. The probability of committing such a crime rises by 1.05 percentage points as a result of grade retention. This is nearly a 60 percent increase and it is statistically significant. The researchers did not find any statistically significant effects of test-based retentions on the likelihood of committing a property crime or a drug crime.

The researchers largely attribute the

long-run effects of retention on crime to a combination of declines in high-school peer quality and lowered non-cognitive skill acquisition. They also find that retention in eighth grade increased the percentage of school days missed three years later by almost 2 percentage points, and that it increased the likelihood of dropping out of high school by about 7.2 percentage points.

—Jay Fitzgerald

Sherman’s March Left a Lasting Legacy of Retarded Development

In the fall of 1864, General William Tecumseh Sherman wrought havoc on the economy of the Confederacy with his march to the sea through Georgia and the Carolinas.

Guided by census data, Sherman mapped out a 285-mile-long campaign with an eye toward demolishing the region’s richest agricultural territory. Even a half-century later, the local economy still felt the effects of Sherman’s scorched-earth tactics in a 10-mile-wide swath along the march’s route.

In **Capital Destruction and Economic Growth: The Effects of Sherman’s March, 1850–1920** (NBER Working Paper No. 25392), James J. Feigenbaum, James Lee, and Filippo Mezzanotti explore the medium- and long-term impacts of the military campaign on agricultural investment, asset prices in the farm sector, and manufacturing activity. They study capital destruction and the obstacles to economic recovery, and find that the South’s weak financial markets fell far short of meeting the challenges of postwar recovery, especially in the agricultural sector.

Using census data and other records, the researchers construct a control group of counties that were similar in 1860 to the counties in

Sherman’s path. In 1870, the value of farms in counties affected by Sherman’s march declined 20 percent more than those in the control

group. However, compared with agriculture, the impact on manufacturing was much less persistent. The manufacturing sector was rela-

As late as 1920, agricultural investment in Southern counties in the 10-mile-wide path of devastation lagged behind investment in counties that were spared.

At the same time, the march caused a 14 percent decline in the acreage of improved land and value of livestock relative to control counties. As late as 1920, agricultural investment—proxied by improved land—contin-

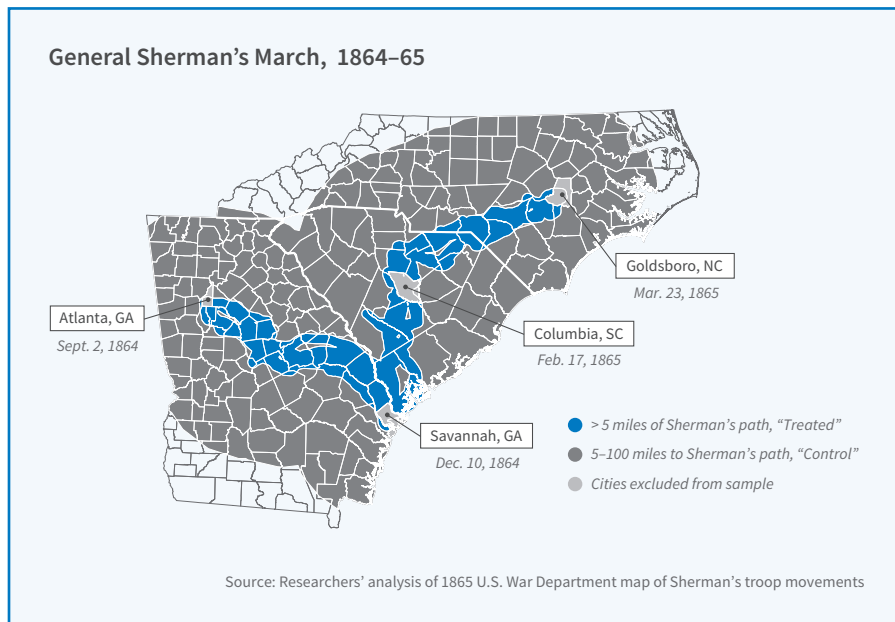
tively small in the pre-war South and expanded rapidly after 1870. This makes it difficult to determine statistically significant differences between march and non-march counties after 1870.

The war left the South with abundant investment opportunities but scant financial resources to exploit them. Before the war, the financial sector in the South was relatively underdeveloped. An 1859 financial register recorded that the Carolinas had only 2.9 banks for every 100,000 people; Georgia had 6.2; the national average was 7.1. By the end of the war, those three states had no banks.

The researchers observe that it is widely believed that banks provided little or no credit to small farmers before or after the war. Instead, these farmers obtained credit from local merchants, such as country stores, and from big landowners. Among the coun-

used to be lower in counties ravaged by the march than in those that were spared.

The researchers estimate similar declines in employment, capital, and manufacturing production in counties affected by the march.



ties in Sherman's path, those with more country stores saw a smaller decline in agricultural activity and land investments than those with fewer merchants. Counties with a large share of affluent farmers also weathered the

march better than others, but the concentration of land ownership also increased as cash-rich landowners bought property from cash-strapped farmers who had few credit options. General Sherman's stated goal was to

"make old and young, rich and poor, feel the hard hand of war." The absence of a robust financial system, the researchers conclude, prolonged the pain for affected regions. —*Steve Maas*

Women from Elite Colleges Earn More Because They Work More

There is fierce competition for admission to the country's most selective institutions of higher education. Whether attending one of these institutions substantially increases the future earnings of prospective students is a difficult research question because, on average, the characteristics of the students who attend more selective schools differ from those of students who matriculate elsewhere.

In **Elite Schools and Opting-In: Effects of College Selectivity on Career and Family Outcomes** (NBER Working Paper No. 25315), [Suqin Ge](#), [Elliott Isaac](#), and [Amalia Miller](#) provide new evidence on how college selectivity affects career and family outcomes among both full-time and part-time workers and non-workers. They explore how one element of a college's value added—a student's future earnings—is affected by a school's selectivity.

The researchers use data from the College and Beyond survey, which includes survey responses from students as well as administrative student records and other supplemental data for students at 34 selective U.S. colleges and universities. They analyze career and family outcomes for men and women in their late 30s who entered college in 1976. Their research strategy involves matching students based on their applications, admissions, and rejections, while controlling for individual factors such as their high school records, SAT scores, and parental income. Thus the comparison is in effect between students with similar backgrounds who applied to and were accepted or rejected by the same range of schools and one went to a more selective

school and the other went to a less selective one. This approach is less likely to be confounded by student differences than a simple comparison of students who

is much larger for women (13.9 percent) than for men (1.1 percent). The researchers cannot reject the possibility that there is no effect for men.

The effect of a more selective school on wages conditional on working is small compared to the effect on the likelihood of working.

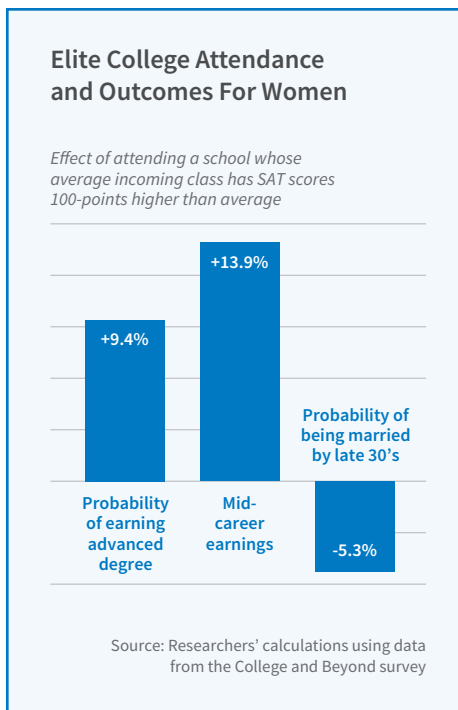
did, and did not, attend a very selective school.

The researchers find that school selectivity, as measured by the average SAT

The effect of a more-selective school on women's subsequent earnings is driven largely by an increase in labor force participation, not in earnings conditional on working. All else equal, a woman who attends a school with a 100-point higher average SAT score is 2.8 percent more likely to work. They find no statistically significant effect for men. In addition, attending a more selective school increases the likelihood of a woman obtaining an advanced degree by 9.4 percent. There is no comparable effect for men.

College selectivity is also associated with family outcomes. Married women with children are the group for whom the differential between those who attended elite schools and other schools is largest.

Attending a more-selective institution is associated with a 3.9 percentage point lower marriage rate for women, but does not appear to matter for men. Spouses of women who attend more selective schools are 8 percentage points more likely to have an advanced degree, but their earnings and labor market participation rates are comparable to the spouses of women who attend less selective colleges. The researchers do not find any effects of college selectivity on the probability of having children for either men or women.



scores of the school's admitted students, is correlated with post-college earnings for some groups, even after controlling for student characteristics. Attending a more selective institution increases earnings by 7.1 percent on average. The effect

—*Dwyer Gunn*

New Estimates of the Benefits of U.S. Highway Construction

Federal, state, and local governments spent about \$300 billion on construction and maintenance of U.S. transportation infrastructure in 2017. Highway spending alone totaled \$177 billion, or about 0.9 percent of GDP.

Analyzing economic costs and benefits of highway spending is challenging because investment in even a small segment of a highway can affect traffic patterns and economic activity throughout the network.

In *Welfare Effects of Transportation Infrastructure Improvements* (NBER Working Paper No. 25487), [Treb Allen](#) and [Costas Arkolakis](#) approach this problem using graph theory and spatial analysis. Their framework allows them to estimate the benefits of improving each segment of the U.S. highway system while accounting for how such improvements have spillover effects on the entire network, thereby enabling them to identify the areas with the best returns on investment.

Using data from the Federal Highway Administration, the researchers calculate the shortest connection between every continental U.S. city with at least 50,000 people within 10 kilometers of a highway and its 25 closest neighbors. This “adjacency matrix” results in almost 7,000 connections between about 900 U.S. cities. They then calculate how an additional 10 lane-miles on each link would affect traffic patterns, travel times, and trade between all pairs of cities, and how the resulting change in the distribution of economic activity across cities benefits U.S. residents.

The researchers then compare these welfare changes to the construction costs of such highway improvements, which they estimate based on the surrounding natural topography. They sort each segment into one of four groups based on the surrounding land: urban, rural-flat (where the slope of the road is less than 5 percent), rural-rolling (slope between 5 and

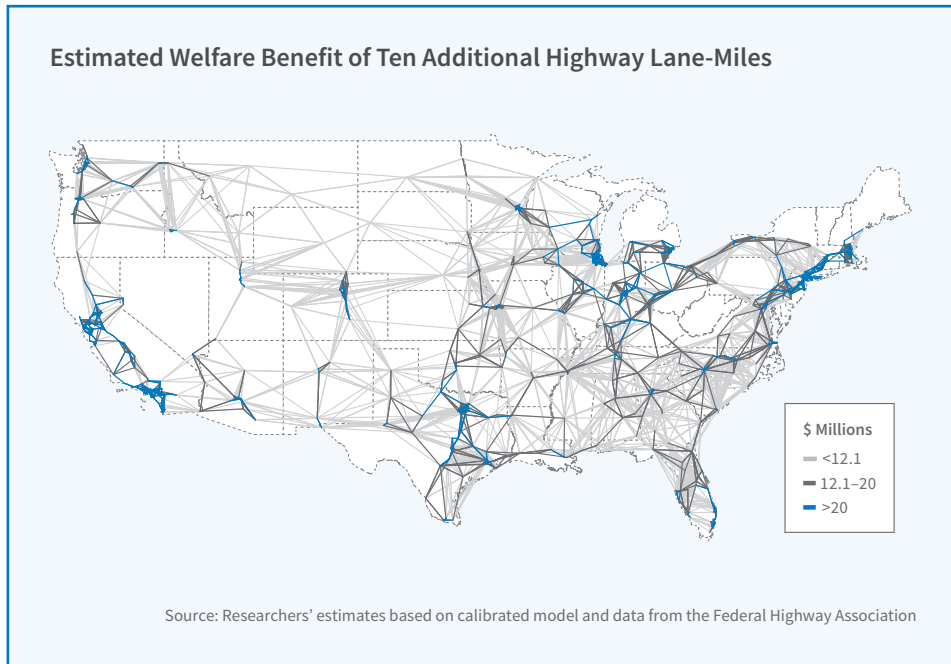
Even for highways in rural mountainous areas, the estimated economic benefits from adding an additional lane-mile exceed the annual construction and maintenance costs.

15 percent), and rural-mountainous (slope greater than 15 percent). The annual construction and maintenance costs of 10 lane-miles of highway vary from about

valued at between \$10 million and \$20 million.

For some highway segments, however, the returns are much larger. The gains tend to be largest in areas where roads connect large economic hubs where few alternative routes exist. Two segments near New York City have welfare benefits exceeding \$500 mil-

lion a year. Expanding the Long Island Expressway (I-495W) between North Hempstead and Queens has an estimated economic value of \$719 mil-



\$1.9 million in rural-flat areas to \$6.5 million in rural-mountainous areas.

The researchers find that the estimated economic benefits of improving any segment of the U.S. highway network exceed the estimated construction and maintenance costs. However, the variation in the returns on investment is substantial. For about three-quarters of all highway segments, adding 10 additional lane-miles generates benefits

lion. Expanding a segment of I-287W between White Plains and Greenburgh has an estimated value of \$510 million. In fact, of the top 10 segments with the highest rate of return, seven are in the New York City area, and one is near Los Angeles. The other two are in Indiana, which, as the researchers point out, lends some credence to the state's nickname as the “Crossroads of America.”

Although many segments with the largest net benefits are located on the East Coast and in southern California, the research also highlights highways within a particular region with the highest estimated rate of return. Such information may be particularly relevant for targeting the allocation of public resources.

—Morgan Foy

Fracking Disclosures by Firms Spur Productivity, Slow Innovation

In many different regulatory contexts — investing, data privacy, and public health, for example — regulators rely on mandatory disclosure rules to protect consumers. These policies are seen as a way of encouraging self-regulation. In **Learning by Viewing? Social Learning, Regulatory Disclosure, and Firm Productivity in Shale Gas** (NBER Working Paper No. 25401), [T. Robert Fetter](#), [Andrew L. Steck](#), [Christopher Timmins](#), and [Douglas Wrenn](#) study whether these regulations affect knowledge transmission and firms' incentives to innovate in the hydraulic fracturing industry, which has been a recent focus of regulation.

In the face of concerns about the chemicals used in the hydraulic fracturing process, 18 U.S. states have instituted public disclosure rules since 2010. Using a dataset on well-level chemical inputs and production in Pennsylvania, the researchers explore the consequences of that state's disclosure regulations.

They first analyze whether the disclosure regulations resulted in cross-firm learn-

ing. They find that firms modify the chemicals they used in their fracturing fluids based on the disclosures of other firms, documenting a "... convergence in the chemicals

Mandatory disclosure of chemicals in fracking fluids allows competitors to catch up to industry leaders but depresses experimentation at high-productivity firms.

used consistent with copying from disclosed wells." Not surprisingly, the fracturing fluid experiments that are the most likely to be copied are those conducted by the most productive firms. This finding suggests that "the disclosure laws helped to facilitate the diffusion of innovation conducted by the most productive firms."

The researchers next show that the

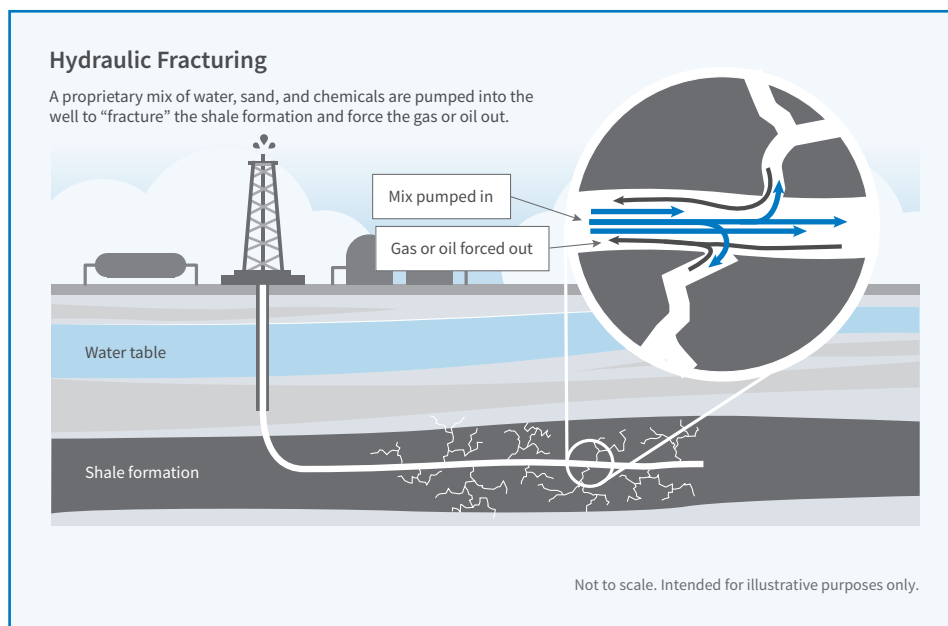
disclosed chemical formulas had economic value to the firms that copied them. The well operators who copied the chemical formulas of more productive firms enjoyed

higher productivity than comparable operators who did not.

The near-term gains in productivity as a result of cross-firm learning could be counterbalanced in part by another effect of the disclosure rules: Innovative firms may have less incentive to innovate, since they know that their valuable advances will be copied by other firms. The researchers

find a reduction in innovation after the implementation of disclosure requirements in Pennsylvania. This effect is particularly notable for operators in the top quartile of the productivity distribution. In the pre-regulation period, 15 percent of wells at high-productivity firms used experimental chemical combinations; in the post-regulation period, only 5.7 percent did.

—Dwyer Gunn



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