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An Unintended Consequence of Limiting FX Borrowing by Banks

Regulators have worried about both banks and companies — especially in emerging markets — incurring debt denominated in foreign currency. Yet, the practice keeps expanding. Between 2009 and 2015, cross-border foreign exchange (FX) borrowing, consisting of international debt securities and loans, rose by about U.S. \$2.5 trillion.

Bank regulators can use a range of macroprudential policies to discourage banks from borrowing in foreign currency, thereby reducing the banking sector's vulnerability to exchange rate fluctuations. But such regulations on banks have the unintended effect of causing firms to shift to other sources for their FX borrowing, according to findings in **Macroprudential FX Regulations: Shifting the Snowbanks of FX Vulnerability?** (NBER Working Paper No. 25083). This shift does not eliminate the gains in terms of a more secure banking sector,

but it does shift the risk of foreign-currency-denominated debt elsewhere in the economy.

Discouraging banks from borrowing in foreign currencies causes firms to increase their foreign currency borrowing from sources which may be less able to screen for risks.

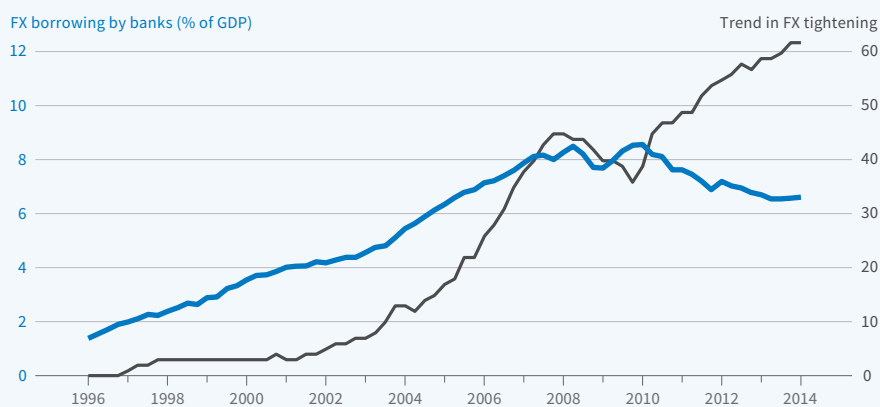
“When the snowplow moves the snow off the road, it makes the road system safer,” conclude researchers [Toni Ahnert](#), [Kristin Forbes](#), [Christian Friedrich](#), and [Dennis Reinhardt](#). “Yet, just as the snow plow inevitably

pushes a portion of the snow to block your driveway, macroprudential FX regulations can also shift some vulnerability to

other sectors that are outside the regulatory perimeter. These other institutions may be harder to monitor and less well informed than banks, less able to screen for the risks inherent in corporate borrowing in FX, and less able to handle subsequent losses after a depreciation.”

Borrowing in foreign currency is often preferred, as it is cheaper than borrowing in local currency. One downside to such borrowing, however, is that it carries exchange-rate risk. When a local currency depreciates against the foreign currency in which debts are denominated, the bank or company must pay

Foreign Exchange Regulations and Cross-Border Borrowing



Trend in FX tightening is the cumulative number of regulations aimed at tightening FX risk regulations, net of loosening policies. The researchers' dataset represents a sample of 48 developed and emerging economies, but excludes reserve issuing countries. Source: Researchers' calculations using data from the Bank for International Settlements and a proprietary dataset of FX regulations.

more to service its debt. Severe depreciation could precipitate a default. Macroprudential rules that are designed to discourage FX borrowing by banks make such borrowing more expensive, and lead to less borrowing of this sort. The end result should be an economy less sensitive to exchange rate fluctuations.

The researchers report that tighter FX borrowing rules lead banks to cut such borrowing by about one third, on average. That amounts to an average debt reduction of between 0.5 and 0.7 percent of GDP. Effects of these regulations are even larger in major emerging markets such as

Indonesia or Brazil, where FX borrowing appears to fall by about half in response to such regulations.

In the face of such regulations, corporations, which are now unable to borrow in FX from local banks, increase their FX borrowing from other sources (such as through issuing bonds) by about 10 percent. This effect is also large — as much as a 20 percent increase — in major emerging markets. The researchers draw this conclusion by analyzing data from 48 nations over the period 1995 to 2014. They caution that not all FX transactions are captured in

their data, such as those that occur through a third country, and that it is possible that exchange rate hedging reduces the corporation's vulnerability. They nevertheless conclude that the corporate response weakens, to some extent, the regulatory guardrails against financial disruption from exchange rate fluctuations that the financial authorities have tried to install. They note that macroprudential FX controls could provide an alternative to capital controls for countries concerned about excessive borrowing in foreign currency.

—*Laurent Belsie*

Why Are STEM Doctoral Completion Rates Lower for Women?

More than half of all doctoral graduates in the United States in 2016 were women, but women accounted for just 23 percent of engineering and 26 percent of mathematics graduates.

In **Nevertheless She Persisted? Gender Peer Effects in Doctoral STEM Programs** (NBER Working Paper No. 25028), [Valerie K. Bostwick](#) and [Bruce A. Weinberg](#) explore differences in PhD class composition in an attempt to explain why women are underrepresented in science-related fields. They find that women who enter PhD programs in which they have no female peers are 12 percentage points less likely to graduate than men in the same program. A one standard deviation increase in the percentage of female students (a 20.7 percentage point increase) closes that gap in the probability of on-time graduation by 4.6 percentage points.

The researchers use data on individual PhD program classes (cohorts) for public universities in Ohio over the period 2005–

09. The data include information on transcripts and funding for each student, allowing the researchers to follow individual

In STEM cohorts with no female peers, women are 12 percentage points less likely to graduate within six years than their

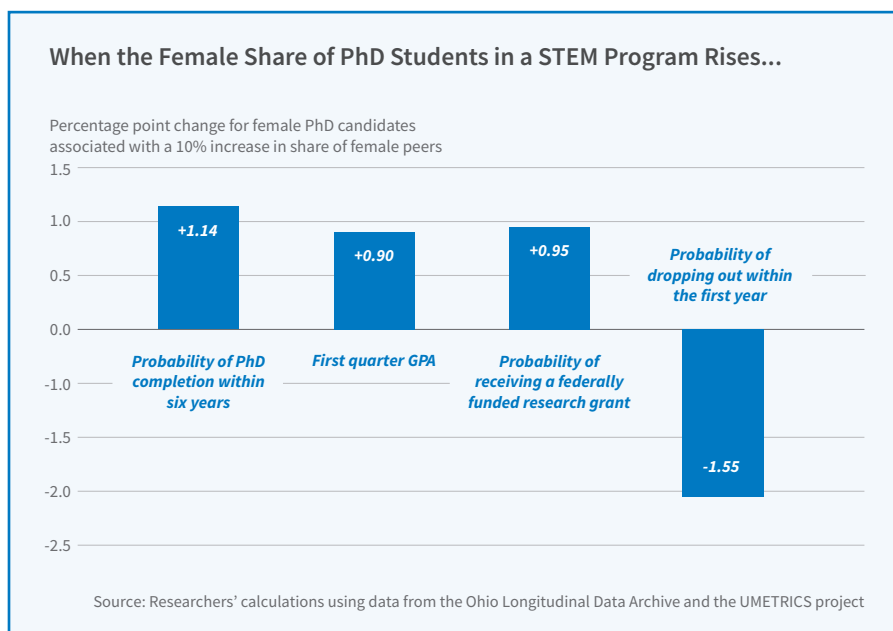
Women entering PhD programs in which they have no female peers are 12 percentage points less likely to graduate than men entering the same program.

outcomes over time. They focus on degree programs in science, technology, engineering, and mathematics (STEM). For each STEM degree program, they calculate the share of each cohort that is female and then estimate the impact of that share on completion rates.

male counterparts. This disparity in progress-toward-degree is largely due to different progression rates early in the doctoral programs. Women in the first year of a PhD program are 10 percentage points more likely to drop out before the second year if there are no other women in their cohort.

A 10 percentage point increase in the share of women within a cohort increases the probability of on-time graduation for a female student by 1 percentage point.

The researchers then analyze how these effects vary across different STEM fields. They group doctoral programs as either “typically male,” defined as a program with more than 61 percent males in the sample period (the median value), or



“typically female” (all the rest). Typically male programs include engineering and physics; typically female programs include psychology and public health. The gender gap in graduation rates is larger for typically male programs: Women are 16 percentage points less likely to complete typically male programs. The researchers do not find consistently different graduation rates for the

genders in typically female programs.

Women in cohorts with no female peers have worse first-term grades than men, compared to women in mixed-gender programs. However, this accounts for less than a quarter of the differential graduation rates between females and males. Women in a heavily dominated male cohort are no less likely to obtain research funding. Moreover, the lower gradu-

ation rates do not appear to be driven by any effects of the gender composition of faculty or older cohorts. The researchers hypothesize that that graduate school cohorts with a relatively large share of women are more likely to have a positive climate for women, and that this climate increases the likelihood of program completion.

—Morgan Foy

Explosive Growth and Plummeting Prices in the Cloud

The rise of the virtual cloud—the array of computer services that are offered for off-site use via the internet—has been one of the most important information technology (IT) developments of the last decade. Data on “the cloud” has not, however, been compiled systematically. David Byrne, Carol Corrado, and Daniel E. Sichel remedy this shortcoming, and chart the course of this latest technological revolution in *The Rise of Cloud Computing: Minding Your P’s, Q’s and K’s* (NBER Working Paper No. 25188).

The researchers find that the prices of cloud services have plummeted, market size has burgeoned, and investment in related technology has soared. But because much cloud spending is on intermediary inputs classified in overly broad categories, its contribution to the economy has been difficult to gauge. Moreover, it appears that official statistics are undercounting a significant chunk of investment in IT equipment that is constructed internally by cloud service providers.

To measure price trends, the researchers rely on the cloud’s largest provider, Amazon Web Services, which began posting prices on the internet in 2009. Prices dating back to that period were drawn from web pages stored

in the Internet Archive, a nonprofit digital library of books, movies, software, music, and websites.

The prices Amazon charged for cloud computing services trended downward at

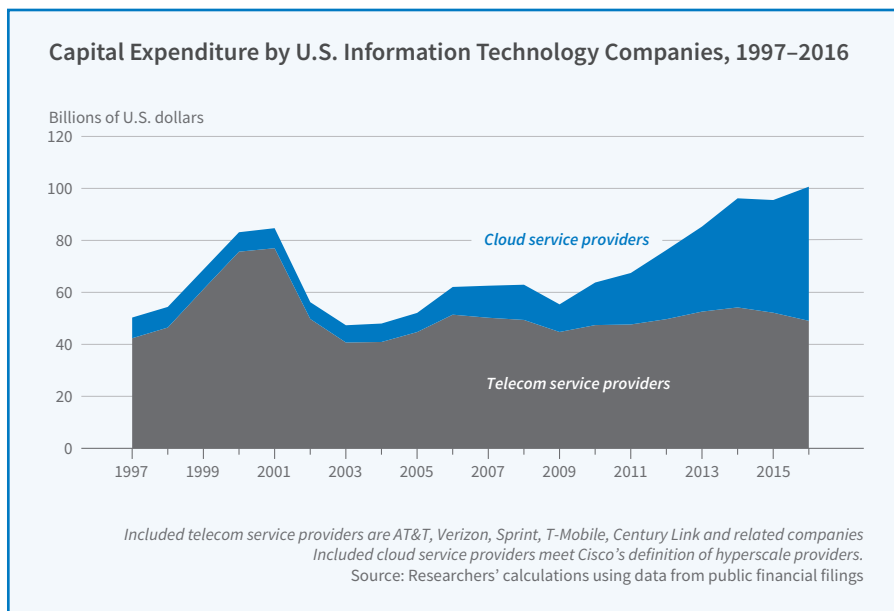
To assess the growth rate of business purchases of cloud services, the researchers rely on a combination of government and corporate data. Bureau of the Census figures for the economic category cover-

Costs of basic cloud services fell at double-digit annual rates between 2014 and 2016, while revenue from web services grew by 70% in 2015 and 55% in 2016.

a steady but relatively modest pace prior to 2014. After that, Amazon cut rates dramatically, likely in response to competition from Microsoft and Google, which entered the public market in 2014. For example, over the

ing data processing, hosting, and related services grew 8 percent in 2015 and 10 percent in 2016. But sales of cloud services rose much more rapidly: Revenue at Amazon Web Services grew 70 percent in 2015 and 55 percent in 2016. Estimates of traffic at cloud data centers, compiled by Cisco Systems, indicate even faster rates of advance, at an average annual rate of increase of 62 percent from 2010 to 2016. Translating these various growth estimates into the value of purchased cloud services, however, is tricky, because of inconsistent definitions and the wide range of activities supported by cloud infrastructure.

The researchers also conclude that official economic records likely miss a significant amount of investment in IT by cloud service providers. These companies purchase



2009–13 period, prices for Amazon’s storage product fell at an average annual rate of 12 percent. From 2014 to 2016, prices fell at an average annual rate of 25 percent.

a large quantity of electronic components that appear to be used internally and incorporated into final products. The researchers estimate that had such “own-account investment” been counted as business investment,

the official figures for nominal IT equipment and software investment would have been \$58 billion higher for 2015. That amounts to 0.32 percent of GDP. Over the 2007–15 period, they calculate that includ-

ing own-account investment would boost the average annual nominal growth rate for IT equipment investment by roughly 2 percentage points.

— Steve Maas

Immigration and Nationalism: A Matter of Degrees?

Recent elections in Europe and the United States demonstrate the growing strength of populist and nationalistic causes and politicians. One explanation of this development is deep voter anger at governmental policies with regard to immigrants, whom the nationalists tend to view as poor, unskilled, and burdens on the national economy and budget.

In **Skill of Immigrants and Vote of the Natives: Immigration and Nationalism in European Elections 2007–16** (NBER Working Paper No. 25077), [Simone Moriconi](#), [Giovanni Peri](#), and [Riccardo Turati](#) explore the relationship between immigration and European elections. They develop an index of “nationalistic” attitudes of political parties to measure the shift in preferences among voters when confronted with influxes of skilled and unskilled immigrants. They find that larger inflows of highly educated immigrants dampen nationalistic sentiments, while larger inflows of less-educated immigrants heighten them. Their results imply that a more balanced inflow of high-skilled and low-skilled immigrants could attenuate voters’ nationalistic attitudes.

The economic, political, and cultural impact of immigration on European countries has been widely studied, with particular attention to how the education levels of native voters influence their voting preferences. The new study tracks voter attitudes and behavior for all political parties and elections in 12 European countries for a decade. It relies on demographic and political data from the European Social Survey and a number of other sources. In addition, the researchers collected and classified the political manifestos of 126 parties for 28 elections, focusing in particular on how frequently

these materials mentioned nationalistic subjects, the European Union, and other indicators of where parties stood on the political

regional pockets in the United Kingdom, Ireland, France, Germany, Denmark, Sweden, Norway and, especially, Italy.

Across a dozen European countries, an influx of less-educated immigrants fanned nationalism, while inflows of highly educated immigrants dampened it.

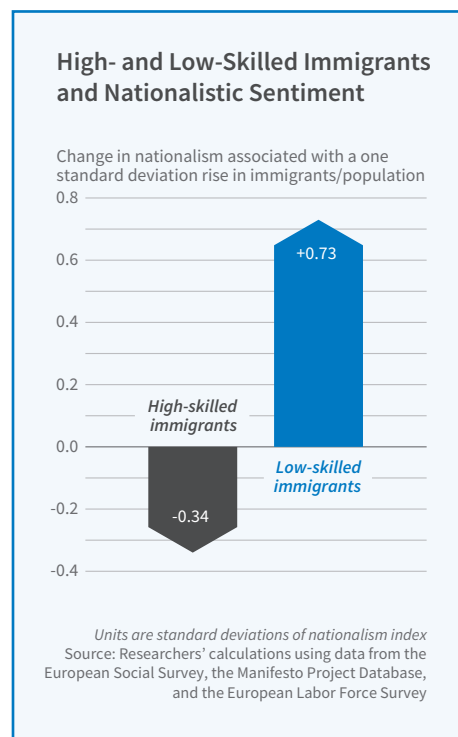
spectrum. In effect, they created an “average nationalism score” that they could use to measure voting pattern deviations either toward or away from nationalism in reaction to immigrant inflows.

The analysis of voter attitudes with

The researchers address the potential effect of native nationalism on immigrant inflows in different skill groups by using the country-specific location of previous waves of immigrants to predict what the current skill composition of a nation’s immigrant inflows would be if past patterns continued to hold. Then, they use variation in overall flows of immigrants, along with this predicted measure of skill composition, to create a measure of the skill composition of current inflows. They analyze how this measure was related to voting and voter preferences.

The results suggest that a 1 percent increase in the share of a country’s population who are immigrants in highly educated, highly skilled groups was associated with a 0.1 standard deviation voting change away from nationalism. An increase of comparable size in the number of less-educated and lower-skilled immigrants led to a 0.12 standard deviation voting change towards nationalism. The same patterns emerged when the researchers analyzed voter sentiment expressed in surveys. In this case, a 1 percent increase in high-skilled immigrants led to a 0.07 standard deviation decrease away from nationalism, while a 1 percent increase in lower-skilled immigrants led to a 0.07 increase in nationalism. The results were broadly similar regardless of whether the analysis focused on all immigrants or only on immigrants from non-EU nations.

— Jay Fitzgerald



regard to nationalism finds that highly educated native voters are less nationalistic in their attitudes towards immigrants than less-educated natives. The data also show strong nationalistic sentiments in

The Effects of For-Profit Colleges on Student Outcomes and Debt

An increasing number of students are attending for-profit colleges. These institutions receive substantial public funds through federal financial aid programs. About 17 percent of Pell grants and Stafford loans went to for-profit undergraduate students in 2017, although those schools awarded just 7.6 percent of all associate and bachelor's degrees the year prior. Those who attend for-profit schools realize worse labor market outcomes and experience higher student-loan defaults than their peers who attend public institutions.

In **How Does For-Profit College Attendance Affect Student Loans, Defaults, and Labor Market Outcomes?** (NBER Working Paper No. 25042), [Luis Armona](#), [Rajashri Chakrabarti](#), and [Michael F. Lovenheim](#) investigate whether these outcomes can be ascribed to attendance at for-profit institutions or are the result of the fact that for-profits educate disproportionate numbers of disadvantaged students. They do this by taking advantage of the interaction between labor demand shocks that generate changes in demand for college and geographic variation in the latent supply of for-profit colleges.

For example, in economic downturns, when demand for labor falls, it is common for people to pursue higher education or job retraining. Many potential students are faced with two choices: non-selective public institutions, such as area community colleges, or for-profit colleges, which are also typically non-selective. When there are more for-profit colleges in a given area, the likelihood that a potential student will enroll in one is higher.

The researchers studied areas that experienced similar changes in the demand for labor—including both positive and negative shocks—between 2000 and 2014, but which differed in the share of for-profit institutions among their colleges and

Those who opt for for-profit schools over similarly selective public colleges borrow more, default at a higher rate, and have lower likelihood of employment.

universities at baseline. Their analysis is conducted using data on 815 core-based statistical areas (CBSAs), which are geographic areas that consist of one or more counties associated with an urban area. CBSAs that had only for-profit institutions were excluded. The researchers studied two distinct time periods: from 2000 to 2008, when the labor market was generally strong, and 2008 to 2014, a period that

schools in each CBSA in 2000.

In CBSAs with a higher share of for-profit schools, the expansion in for-profit enrollment during downturns was greater. For example, the researchers estimate that, on average, a one percentage point fall

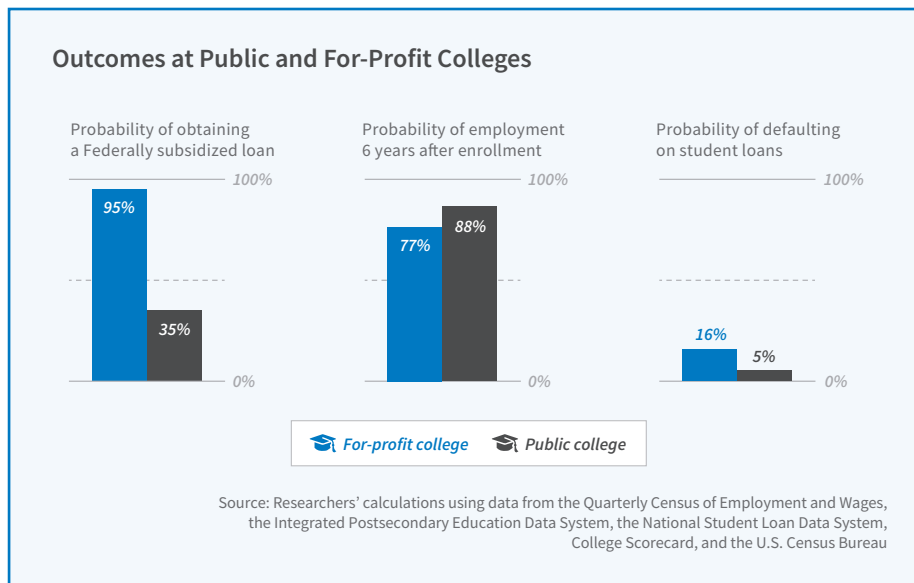
in labor demand increased enrollment in four-year for-profit schools in a CBSA by about 230 more students when the share of for-profit schools was one percentage point higher in 2000. To place this change in context, the average number of for-profit students in a CBSA was about 3100.

The researchers find that for-profit schools put students at greater financial risk than their public counterparts. They

examine the impact of attending a for-profit institution on various outcomes and find higher loan amounts (\$6,428 in additional loans for students at two-year schools, \$3,356 for four-year students), lower likelihood of employment, and higher default rates among students at both four-year and two-year for-profit institutions, relative to their peers who

went to similarly selective public schools. Students at two-year for-profit institutions were more likely to obtain a degree than their publicly educated peers, but they were less likely to be employed six years after graduation. The researchers conclude that “Students could earn more, take on less debt, default at lower rates, and be more likely to graduate if they attended a public four-year institution.”

—Anna Louie Sussman



encompasses the Great Recession. They note that labor market conditions vary between CBSAs in any given year.

To establish how local labor conditions over a three year period affected residents' decision to return to school, the researchers relate each year's enrollment figures to a rolling labor demand shock measure calculated over the three previous years. To establish a supply baseline, they calculate the proportion of for-profit

Philly's Sweetened Drink Tax Raised Prices, Altered Selection

In 2017, Philadelphia became the first large U.S. city to impose an excise tax on sweetened beverages. The goals were to promote consumers' health and to raise money. The cost of the tax was passed on fully to consumers, according to a new study comparing prices in Philadelphia stores with those in adjacent counties with no such tax.

In **The Impact of the Philadelphia Beverage Tax on Prices and Product Availability** (NBER Working Paper No. 24990), John Cawley, David Frisvold, Anna Hill, and David Jones also report that the tax spurred the city's stores to expand their inventory of unsweetened drinks.

Philadelphia instituted an excise tax of 1.5 cents per ounce of sweetened beverages on January 1, 2017. Unlike other municipalities, it imposed the tax on both diet and regular beverages. The tax was applied at the distribution level, rather than charged at the cash register.

The researchers collected data on the price and availability of a wide range of beverages in retail stores in Philadelphia and surrounding areas in November and December 2016, returning in the same months the following year to obtain comparable statistics.

Of the sampled beverages, prices on average rose 1.56 cents per ounce more in Philadelphia, where they were subject to the

new tax, than they did in the surrounding communities. The differential was even greater for energy drinks and juice drinks (up by nearly 2 cents an ounce), compared with regular soda

setting prices, and the chains may have spread the tax burden among their affiliates to avoid price competition among branches within and outside Philadelphia.

After a new beverage tax was levied in January 2017, Philadelphia stores shifted their inventories away from sweetened beverages and toward alternative drinks.

(1.55 cents per ounce) and diet soda (1.59 cents per ounce).

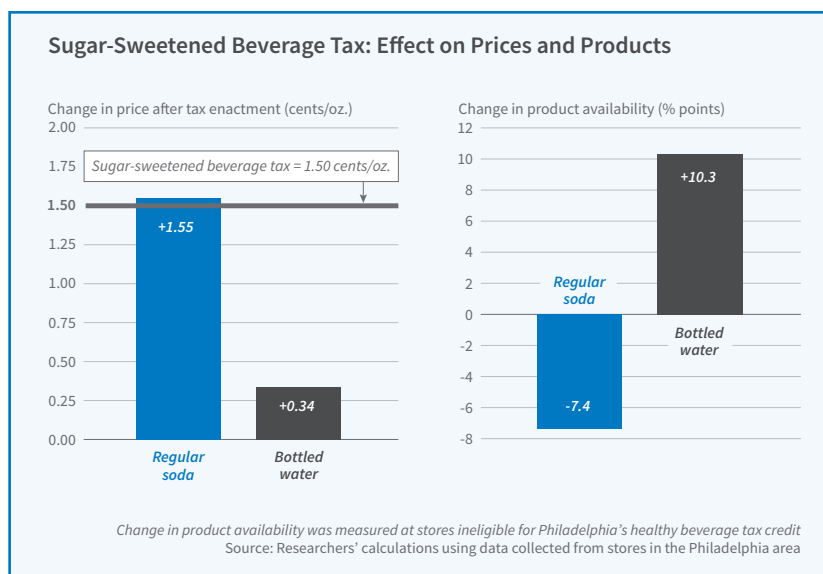
Price hikes were larger on individual servings than on large containers and multipacks, which may reflect the tendency of consumers to be less price-sensitive on single-serving drinks than on shopping trips on which they purchase large quantities.

Consumers living in high-poverty areas—where they were more likely to be dependent on small neighborhood stores—faced higher price hikes than did those living in more affluent areas. A 10 percentage point increase in the poverty rate of a given area was associated with a 0.2 cents per ounce increase in the pass-through of the tax on soda.

Stores closer to the suburbs, and those facing competition from areas without the tax, passed through a smaller share of the tax hike. For each additional five minutes of travel time a store was located from an untaxed competitor, the pass-through increased by 0.37 cents per ounce on all taxed beverages.

In the wake of the beverage tax, Philadelphia stores shifted their inventories away from sweetened beverages. For example, compared with their counterparts outside the city, Philadelphia stores were more than 10 percentage points more likely to carry bottled water after the tax was imposed.

—Steve Maas



The pass-through of the tax was higher at independent retailers than at chain stores. The researchers cite two possible explanations: Locally owned stores have greater flexibility in

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