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In This Issue

Immigration and Productivity Growth in the OECD

Chinese and US Innovation

Why Are Credit Card Interest Rates So High?

The Valuation Gap Between US and European Firms

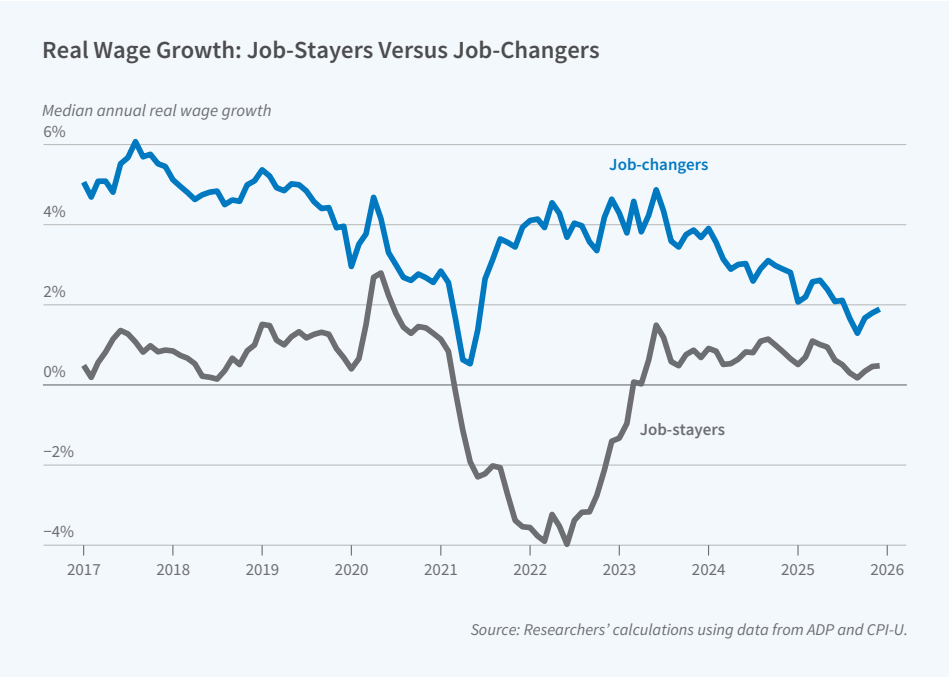
Global Externalities of US Government R&D

Inflation and Nominal Wage Adjustment

When US consumer prices rose sharply between mid-2021 and late 2023, consumer sentiment fell to levels not seen since the 2008 financial crisis, even though unemployment remained low. Surveys found that a majority of Americans identified inflation as a major financial problem. Even well after price growth abated, in 2025, roughly 60 percent of Americans still reported that inflation was a pressing issue.

In Sticky Wage Norms and the Real Wage Cost of Unexpected Inflation (NBER Working Paper 35624), Erik Hurst, Christina Patterson, Nela Thomas Richardson, and Ye Liv Wang use administrative payroll records from ADP, covering roughly 16 million US workers at firms with 50 or more employees, to study wage adjustment over the 2016–2025 period. The dataset allows the researchers to observe base-wage changes for nearly every worker within a firm each month, distinguishing annual "on-cycle" raises from other "off-cycle" adjustments, and to separately track workers who remain with the same employer and those who change jobs.

Most firms apply a single nominal wage increase to the majority of their continuing workers. The researchers find that this norm shifted only modestly even when annual inflation rose above 7 percent. Before the pandemic, 89 percent of workers were at firms with a wage norm between 2 and 4 percent; during the 2021–2023 inflation period, that share fell, but only to 76 percent. Some firms shifted toward the 4–5 percent range. Although job-stayers' median nominal wage growth rose from about 3 percent to nearly 5 percent, this was below the rate needed to keep pace with price increases.



Real wages fell and stayed depressed for more than one-third of workers after the 2021–2023 inflation surge.

Among workers continuously employed at the same firm from December 2020 through December 2024, 43 percent experienced a real wage decline; within this group, the average loss was about 9 percent. Even after accounting for job-changers, whose nominal wages rose nearly one-for-one with inflation, 37 percent of all workers still saw cumulative real wage declines.

The researchers estimate that if firms had adjusted their modal raises one-for-one with inflation, this would have closed about 40 percent of the real wage shortfall relative to the pre-pandemic wage growth trend. Real wage losses were larger for older workers as 55 percent of workers aged 50 and older experienced a cumulative real wage decline. Older workers are less likely to switch jobs or to receive large off-cycle raises.

Immigration and Productivity Growth in the OECD

Birth rates across Organisation for Economic Co-operation and Development (OECD) countries have fallen in recent decades and native working-age populations have begun to shrink. At the same time, immigration—particularly from lower- and middle-income countries outside the OECD—has risen sharply. It has become the main source of labor force growth in much of Europe. In Immigration and Macroeconomic Outcomes in OECD Countries (NBER Working Paper 35523), Gaetano Basso, Mitali R. Mathur, and Giovanni Peri examine how immigration correlated with growth in GDP per worker, investment, human capital, and productivity across OECD economies over the 1990 to 2024 period.

The researchers measure net immigration—the five-year change in the stock of foreign-born residents as a share of the initial adult population—for 38 OECD countries, drawing on United Nations, OECD, and Eurostat census-based sources. They combine this with Penn World Tables data on GDP per capita, GDP per worker, capital per worker, human capital, and total factor productivity (TFP).

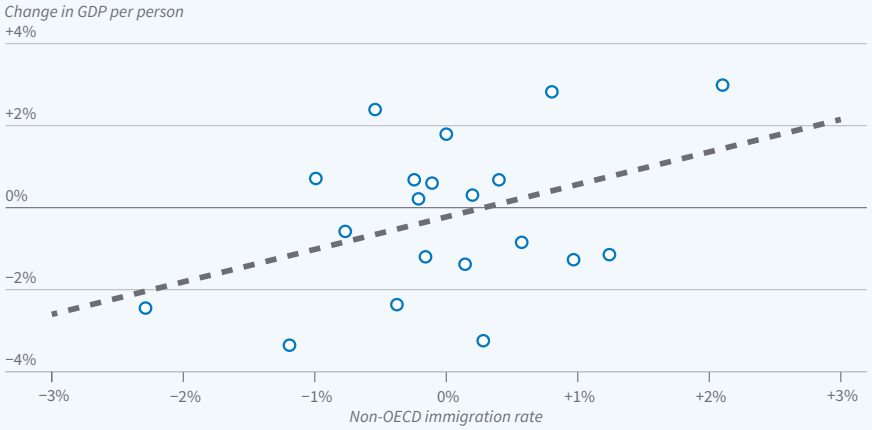
Non-OECD immigration accounted for most of the overall rise in immigration to OECD countries over this period and was, on average, evenly split between college-educated and non-college-educated arrivals—making immigrants more skilled than the native population in the large majority of country-period observations. Immigration policy indices and origin-country push factors explained little of the substantial variation in immigration rates across countries; large, unpredictable immigration shocks and surges were common.

The researchers estimate that a rise in the non-OECD immigration rate equal to 1 percent of the adult population was associated with 1.2 percent higher growth in GDP per worker within five years and 1.9 percent higher growth over ten years. Native population growth, by contrast, showed no significant association with GDP per worker and had a negative correlation at the five-year horizon. Additionally, for each percentage-point rise in the immigration rate, capital per worker rose 1.6 percentage points in the first five years and 2.9 percentage points in the next ten. Native population growth showed no comparable effect on investment.

High-skilled immigration was associated with significantly faster growth in human capital and TFP over the longer run, along with a marginally significant increase in GDP per worker. Low-skilled immigration mechanically lowered the human capital index but had no statistically significant effect on TFP, capital-per-worker, or GDP-per-worker growth. The per-unit effect on capital-per-worker growth was somewhat smaller in countries with larger existing immigrant shares, though the overall boost to GDP-per-worker growth did not decline substantially within the observed range of immigrant inflows. Sudden, less predictable episodes of high immigration produced similarly positive effects on investment, with capital per worker rising by a statistically significant 3.3 percentage points over 10 years following a surge.

The researchers estimate that Canada's 17-percentage-point rise in immigrant population share between 1990 and 2024 was associated with a 19.9 percent increase in GDP per worker—more than half of the country's actual 33 percent growth over that period. Comparable calculations imply that immigration accounted for about one-quarter of GDP-per-worker growth in the United Kingdom and roughly one-sixth in France.

GDP Growth and Non-OECD Immigration to OECD Countries, 1990–2024



The change in GDP per person is the log difference of real GDP per capita between years t and t − 5. The non-OECD immigration rate is defined as the change in the stock of immigrants from non-OECD countries between years t and t − 5 as a share of the 1990 population. Source: Researchers' calculations using data from the United Nations and the Penn World Tables.

GDP growth per worker was positively correlated with non-OECD immigration to OECD countries between 1990 and 2024, but not with native population growth.

Chinese and US Innovation

Some observers argue that technological episodes like DeepSeek's 2025 release of a low-cost, high-performing AI model provide evidence of China's rapid technological advance. Others claim that headline statistics, such as China's patent filings outnumbering those in the US by a factor of three, overstate that nation's real innovative progress. The latter group argues that incentive schemes have led to many incremental patent filings in China, and that progress there is largely a consequence of a reliance on foreign-trained talent and the appropriation of intellectual property from elsewhere, rather than domestic invention. In Chinese Sputnik Moments? (NBER Working Paper 35551), Josh Lerner, Namrata Narain, Dimitris Papanikolaou, Amit Seru, and Zunda Winston Xu explore which narrative better fits the data.

The researchers study nearly 14 million domestic Chinese patent publications, combining records from the China National Intellectual Property Administration (CNIPA), the European Patent Office's PATSTAT database, and Google Patents. They focus on 14 "critical technology areas" designated by the US Department of Defense, including advanced materials, biotechnology, quantum sciences, and trusted AI and autonomy. The researchers benchmark Chinese patenting against a comparable set of US patents. They report five main findings.

First, the ratio of Chinese patent applications to STEM tertiary graduates is comparable to that in the United States (0.67 versus 0.64), and lower than in Japan or South Korea. Annual patent counts by technology and year also correlate with independently measured high-impact scientific publications, with a stronger relationship in China than in the United States. These facts suggest Chinese patent counts contain meaningful information about underlying innovative activity.

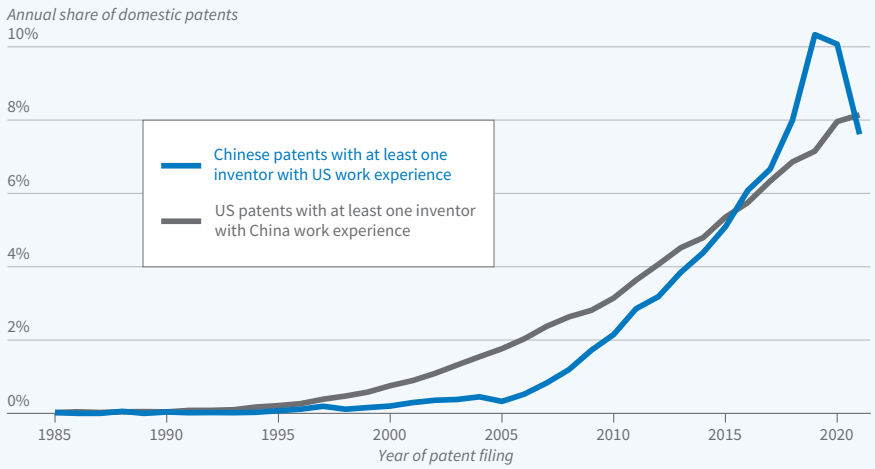
Second, the share of the top 10 Chinese patent assignees in critical technologies fell from roughly 10 percent in the late 1990s to about 4 percent in 2022, compared with a stable US share of nearly 20 percent. Innovation is actually less concentrated in large firms in China.

Third, private firms account for about 58 percent of cumulative Chinese critical-technology patents, while universities account for 27 percent. State-owned enterprises and government entities combined account for less than 6 percent. The university share is more than six times the comparable US university share of 4 percent. The role of Chinese universities in critical fields exceeds that in all domestic patenting, where the share is 18 percent.

Fourth, when the researchers examine the role of US-trained returnees, using LinkedIn-based professional profiles matched to inventors, they find that fewer than 10 percent of Chinese critical-technology patents involve an inventor with US work experience, a share that peaked near 2019 and has since declined. Those with US education remain below 5 percent throughout the sample. By contrast, more than 20 percent of US patents involve an inventor with non-US Western work experience—more than twice the corresponding Chinese peak—indicating the US patent system relies more heavily on foreign-trained inventors than does the Chinese system.

Finally, the researchers assess whether rapid growth in Chinese patenting came at the cost of patent quality. Using four text-based measures of patent quality, they find that the share of Chinese patents with at least one commercially salient word pair (bigram) rose from under 2 percent in the early 1990s to 16 percent in 2022, compared to a US rise from about 4 percent to 20 percent. Chinese patents gained textual importance relative to US patents across several major critical technologies between 2006 and 2021, with no evidence of quality decline accompanying the growth in volume.

Cross-Country Influence on US and China Patents



Estimates cover 13.7 million domestic Chinese patents and 3.3 million domestic US patents.
Source: Researchers' calculations using data from the US Patent and Trademark Office and multiple sources on Chinese patents.

Innovation in China is less concentrated among large firms and more reliant on universities than innovation in the US.

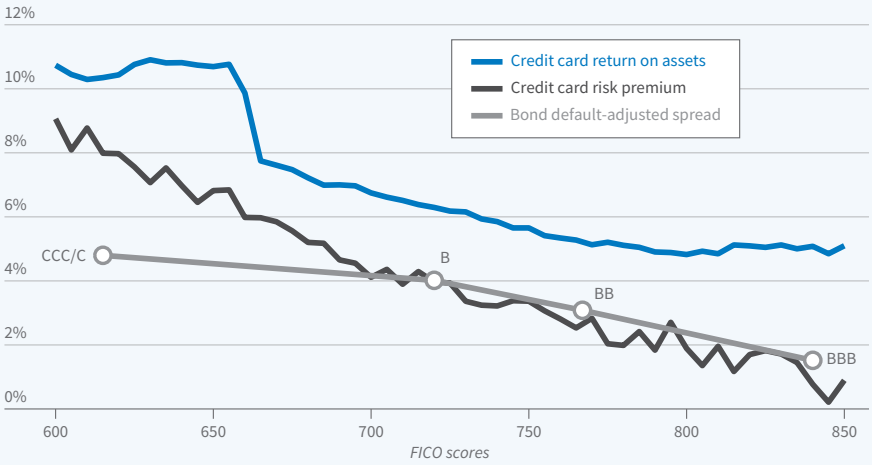
The researchers acknowledge support from the Harvard Business School Division of Research, the Hoover Institution, the Private Capital Research Institute, the Smith Richardson Foundation (Award no. 2024-3365), the Stanford Graduate School of Business, the Toulouse Network for Information Technology, and the US National Science Foundation (Award no. 2241237).

Why Are Credit Card Interest Rates So High?

Credit cards are the primary form of unsecured consumer borrowing in the United States, with nearly 800 million accounts nationwide and about 78 percent of adults holding one in their name. In 2025, total credit card purchase volume reached $6.5 trillion, or 70 percent of retail spending. Nearly half of households carry a balance from month to month, and for them, the interest rate charged on their card averaged 22 percent in 2025, an 18-percentage-point spread over the federal funds rate. This spread far exceeds those on comparable forms of credit: Commercial and industrial loans carried a 3.7 percent spread and mortgage rates a 2 percent spread over the federal funds rate, while high-yield corporate bonds carried a 2.8 percent spread over Treasuries.

In Credit Card Banking (NBER Working Paper 35607), Itamar Drechsler, Hyeyoon Jung, Weiyu Peng, Dominik Supera, and Guanyu Zhou examine why credit card rates are so much higher than rates on other loans and how the credit card lending business generates its profits. The researchers use supervisory account-level data from the Federal Reserve's FR Y-14M reports, covering approximately 550 million monthly credit card accounts from the 20 largest US banks—more than 90 percent of the credit card market. They track accounts originated between January 2015 and December 2017 through December 2023, sorting them into portfolios by FICO credit score at origination to examine how revenues, expenses, and defaults vary with borrower risk.

The analysis tests four possible explanations for elevated credit card rates: compensation for defaults, the cost of rewards programs, a premium for undiversifiable default risk, and market power. Charge-offs, or loan losses, account for a spread of about 6 percentage points on average and reach 9.3 percent for the riskiest (600 FICO) borrowers. However, even after subtracting charge-offs from APR spreads, a large "default-adjusted" spread remains—averaging 8.8 percent. Default compensation alone cannot explain the rates charged.



Corporate bond ratings are mapped to FICO scores based on the 5-year expected default rates. Source: Researchers' calculations using data from the US Federal Reserve.

A large undiversifiable default risk premium and market power sustained through heavy marketing spending are key drivers of credit card rates.

Rewards programs, which cost the six largest issuers $67.9 billion in 2023, do not drive high rates. Rewards expenses, which were 1.6 percent of purchase volume that year, were more than offset by interchange income of 1.8 percent paid by merchants. Net interchange income is positive across all FICO scores for both borrowers and transactors (those who repay balances in full).

Operating expenses average between 4 and 5 percent of balances annually and explain roughly half of the default-adjusted spread. Marketing is a particularly large component as credit card banks spend between 1 and 2 percent of assets on marketing annually, about 10 times the share spent by other banks. Within the same FICO score, banks with higher operating expenses charge higher interest spreads and earn larger gross margins—a 1 percent increase in a bank's operating expense rate corresponds to a 62-basis-point increase in the interest spread charged to borrowers, suggesting these expenditures generate pricing power and are not simply passed through to customers.

After accounting for all income and expenses, the researchers find that credit card lending generates a return on assets (ROA) of 6.8 percent, more than four times the aggregate banking sector's ROA. Using a factor model that treats aggregate charge-off rates as a proxy for systemic default risk, they estimate that credit card rates price in a default risk premium of 4.3 percent per year—compensation for risk that cannot be diversified away because charge-offs are correlated across FICO portfolios and rise sharply during recessions. This premium is comparable to that found in high-yield corporate bonds of similar credit quality, though it is estimated to exceed bond premiums by roughly 3 percentage points for the riskiest borrowers (equivalent to CCC/C-rated bonds). After adjusting for this risk premium, the researchers find that credit card lending still generates a risk-adjusted excess return of approximately 1.5 percent relative to the broader banking sector.

The Valuation Gap Between US and European Firms

Since 2008, the combined stock market value of publicly listed US companies has grown far faster than that of their European counterparts. In The Value Gap: Europe Cannot Scale (NBER Working Paper 35577), Bo Becker, Efraim Benmelech, and Joao Monteiro examine potential explanations for the widening valuation gap. They construct a time series of aggregate stock market values for the US and Europe using data from the World Federation of Exchanges and the World Bank, and combine this with firm-level data from Compustat covering 9,117 US and 7,015 European firms during the 2008–2023 period.

In 2008, US market capitalization exceeded Europe's by about a third, or roughly $3 trillion. By 2023, the gap was $34 trillion. Over this period, US equity markets quadrupled in value while European markets rose by 70 percent. US market capitalization rose from 78 to 177 percent of GDP, while Europe's rose from 43 to 63 percent.

The number of listed firms in this period was roughly stable in the US and rose in Europe, so the growth in relative US value came entirely from the increasing average value of firms. This pattern holds even after excluding the largest 1 percent of firms by market value, and it holds within narrowly defined (4-digit SIC code) industry groups. Within these groups, the average ratio of market value to book value of assets is about 50 percent higher for US firms than for comparable European firms.

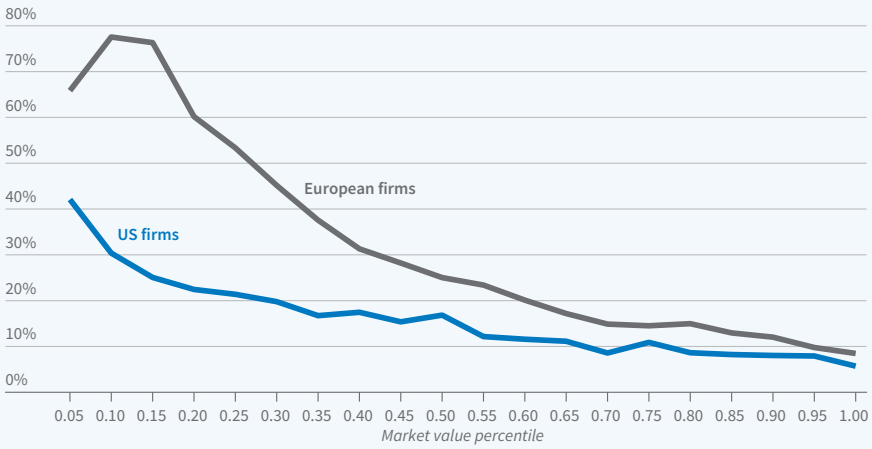
Over the 15 years the researchers study, the gap in valuations grew more for younger firms. It widened by 82 percent for the youngest quintile of firms but only 20 percent for the oldest quintile. The gap is also larger in industries where returns to scale are higher: it is 42 percent in low-scale industries and 55 percent in high-scale ones.

The researchers identify two structural constraints that limit European firms' ability to grow: challenges in scaling their markets, and higher capital costs. First, using cross-sectional variation, they find that the sales of European firms are closely tied to local economic conditions. A 1 percent increase in the GDP of the country in which a company is headquartered is associated with a 0.8 percent increase in sales for European firms, even for those operating in tradable sectors. By comparison, in the US, the correlation between GDP growth in the state in which a firm is headquartered and the growth of firm sales is not statistically different from zero. European firms thus appear tied to their home markets in a way that US firms are not.

Second, European firms face both equity and debt financing disadvantages relative to their US counterparts. With respect to equity finance, European firms have less access to venture capital funding. Such funding reached 0.5 percent of GDP in the US in 2023 but was no greater than 0.15 percent of GDP in any European country. The equity financing constraint is most binding for smaller firms. For each firm, the researchers compute the implied cost of capital: the discount rate that equates the firm's current market value with the present value of its expected future earnings. They then sort firms into percentiles by market value and compute the average implied cost of capital within each percentile. At the bottom of the size distribution, the gap is stark: Small European firms face an implied cost of capital above 60 percent, compared with below 40 percent for their US counterparts. At the top of the distribution, by contrast, the largest firms in both regions face much lower costs of capital, with no significant difference between Europe and the US.

The researchers also find that US firms are generally more levered than their European counterparts and so the valuation gap extends to total firm value and is not an artifact of capital structure. The leverage gap between US and European firms remained stable between 2008 and 2023. US firms also have access to a more diversified set of debt financing sources: bond markets and private credit play a much larger role in the US, whereas European firms rely predominantly on bank loans.

Implied Cost of Capital for European and US Firms



The implied cost of capital is not a direct measure of the cost of borrowing or raising equity capital. Rather, it is inferred as the firm's implicit discount rate using market prices and predicted cash flows.
Source: Researchers' calculations using multiple data sources.

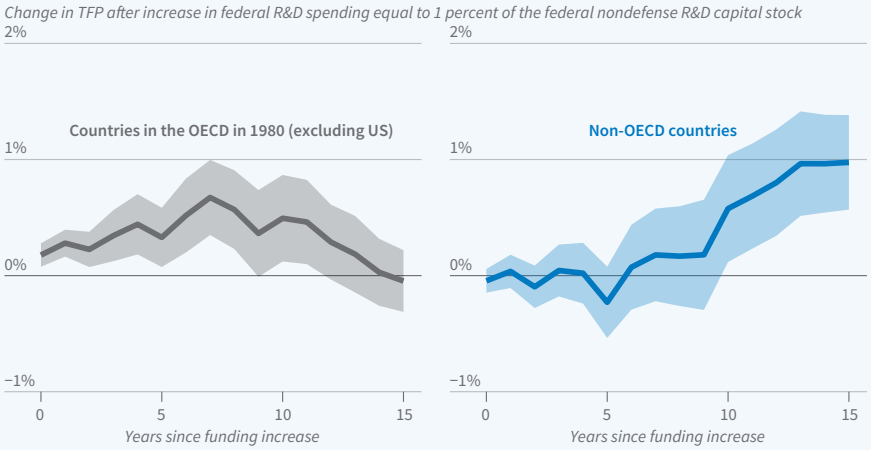
In the last two decades, US firms have grown much faster, on average, than their European counterparts. The latter appear to face barriers to scaling up their markets and higher capital costs.

Global Externalities of US Government R&D

Models of global growth emphasize cross-country knowledge spillovers to explain why countries with very different levels of innovation can nonetheless grow at similar long-run rates. Yet the size of these spillovers has mostly been inferred indirectly. In The Effects of US Public R&D on Global Growth (NBER Working Paper 35517), Gustavo De Souza, Andrew J. Fieldhouse, Karel Mertens, Ishan B. Nath, and Valerie A. Ramey provide new estimates of how US government research spending affects productivity in other countries.

In earlier work, two of the authors identified "surprise" changes in federal research and development (R&D) appropriations—funding shifts driven by factors unrelated to the ebbs and flows of the economy—for the five agencies that account for most US research spending: the Departments of Defense and Energy, NASA, the National Institutes of Health, and the National Science Foundation. In the new study, the researchers trace how these appropriations shocks affect total factor productivity (TFP) in 69 other countries over 1980–2019. Data on country productivity come primarily from the Penn World Tables. The analysis then separates the effects of nondefense research, such as basic science and health research, from those of defense research, and distinguishes results for a disaggregated sample of 23 established OECD economies from those for 40 countries that never joined the OECD.

A US R&D appropriations shock equal to 1 percent of the federal R&D capital stock raises foreign productivity by approximately 1 percent after 12 years. This effect is driven mainly by nondefense rather than defense research. Each shock is scaled to 1 percent of its own capital stock, and on that basis nondefense R&D shocks produce a larger peak response (0.6 percent) than defense R&D shocks (0.4 percent) and are far more persistent.



R&D spending refers to work funded by the government but performed by a mix of federal agencies, private firms, universities, etc. Source: Researchers' calculations using data from the Penn World Tables and federal R&D appropriations shocks from Fieldhouse and Mertens (2023).

The productivity gains are heavily concentrated among non-OECD countries. Their measured productivity response peaks at roughly 1.8 percent, about three times the roughly 0.5 percent peak effect among OECD countries, whose gains fade to zero at longer time horizons. Countries with smaller existing stocks of research capital tend to show larger productivity responses, both across the two groups and among OECD countries—a pattern that runs counter to the idea that countries need substantial existing research capacity to absorb new technology from abroad. These patterns are more consistent with diffusion through openly published scientific findings, the transfer of technology embedded in traded capital goods, and "leapfrogging," in which countries without established older technology can adopt newer innovations more readily.

The researchers do not find any evidence that increased US public R&D crowds out foreign research activity. If anything, US R&D appropriations shocks are associated with modest increases in foreign private-sector and higher-education R&D investment, suggesting a complementary rather than competitive relationship between US and foreign research efforts.

Combining the estimated foreign and domestic productivity responses, weighted by each country group's economic output, the researchers calculate that the global social returns to US public nondefense R&D are roughly twice as large as the domestic returns alone. This implies the United States captures, at most, about half of the total productivity benefits generated by its own public nondefense research investments.

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