NBER | NATIONAL BUREAU of ECONOMIC RESEARCH

The Digest

January 2026

In This Issue

Projecting Federal Deficits and Debt

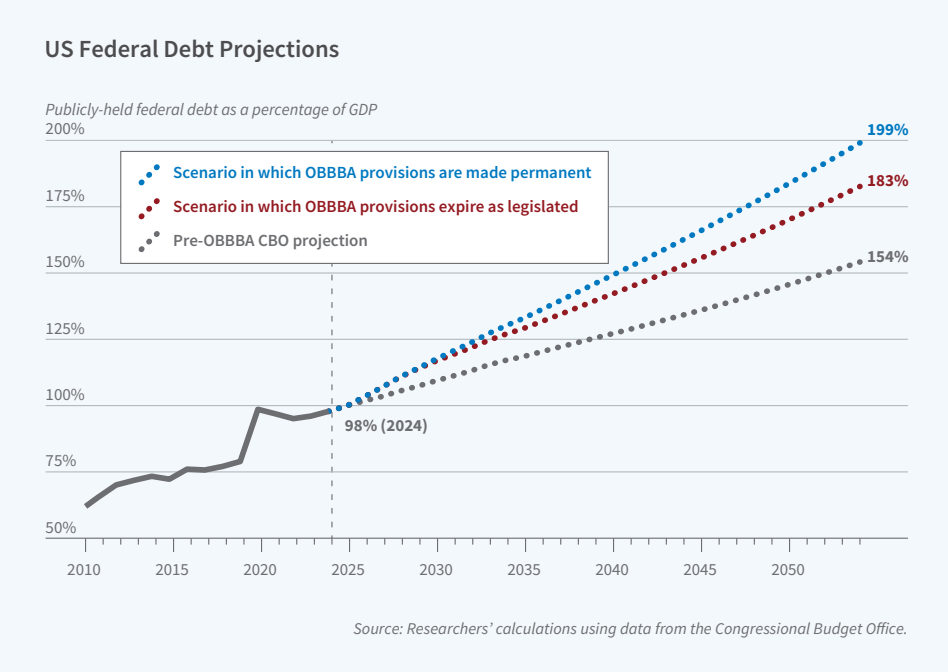
The US federal budget situation has changed dramatically in the last 25 years. In 2001, projected surpluses totaling $5.6 trillion over the ensuing 10 years were expected to eliminate all public debt by 2006. At the end of the 2024 fiscal year, federal debt held by the public stood at approximately 98 percent of GDP, or $28 trillion. Recent legislative changes have accelerated the accumulation of federal debt, raising questions about the sustainability of current policies and their economic implications.

In Then and Now: A Look Back and Ahead at the Federal Budget (NBER Working Paper 34455), Alan J. Auerbach and William Gale develop fiscal projections that incorporate the recently enacted One Big Beautiful Bill Act (OBBBA) and analyze the economic ramifications of rising debt levels.

The researchers construct three scenarios for debt and deficits through 2054. The first, the "March 2025 baseline," uses pre-OBBBA Congressional Budget Office (CBO) projections. The second, the "July 2025 baseline," incorporates OBBBA as legislated. The third, their "current-policy baseline," assumes OBBBA's temporary tax and spending provisions become permanent.

The researchers rely on the CBO's projections for the next decade. For the years beyond that 10-year window, they assume that revenues and mandatory spending grow at the rates projected in CBO's March baseline, while discretionary spending remains constant as a share of GDP. Interest payments are calculated as the product of average interest rates from CBO projections and accumulated debt.

In the July 2025 baseline scenario, which incorporates OBBBA as written, the debt-to-GDP ratio reaches 183 percent by 2054, compared to 154 percent in the March baseline without OBBBA. The cumulative effect of OBBBA is thus a 29 percentage point increase in the debt-to-GDP ratio after three decades. If OBBBA's temporary provisions are made permanent, as assumed in the current policy baseline, debt rises to 199 percent of GDP by 2054.



The primary deficit—the gap between non-interest spending and revenue—averages around 3 percent of GDP throughout the projection period. This is an unprecedented, sustained imbalance during a period of peacetime prosperity. Net interest payments are projected to rise from 3.2 percent of GDP in 2025 to 6.3 percent in 2054 under current law, far exceeding the previous historical peak of 3.2 percent in 1991. Rising interest payments account for more than 100 percent of the increase in the unified deficit through 2054.

Social Security, Medicare, and net interest together account for more than all of the projected growth in government spending relative to GDP through 2054. The projections assume that defense spending falls to its smallest share of GDP since before World War II, while nondefense discretionary spending as a share of GDP approaches its lowest level since 1962.

The researchers calculate "fiscal gaps" — the permanent, immediate policy changes needed to meet specific debt targets by 2054. Starting in 2026 from the current-law baseline, stabilizing the debt-to-GDP ratio at its 2024 level would require permanent spending cuts or tax increases equaling 2.9 percent of GDP. This represents approximately $827 billion in 2024 dollars, equivalent to 34 percent of income tax revenues or 14 percent of non-interest spending. If OBBBA's provisions are made permanent, the spending cuts or tax increases needed to close the gap rise to 3.4 percent of GDP.

If productivity growth exceeds current projections by 0.5 percentage points annually, the 2054 debt-to-GDP ratio under current policy scenario falls from 199 to approximately 158 percent. However, if productivity remains as forecast and instead interest rates respond to higher debt levels in a manner that is consistent with recent empirical estimates, rising 3 basis points per percentage point increase in the debt-to-GDP ratio, the ratio reaches 233 percent by 2054 in the current policy scenario.

William Gale thanks Arnold Ventures and the California Community Foundation for generous research support.

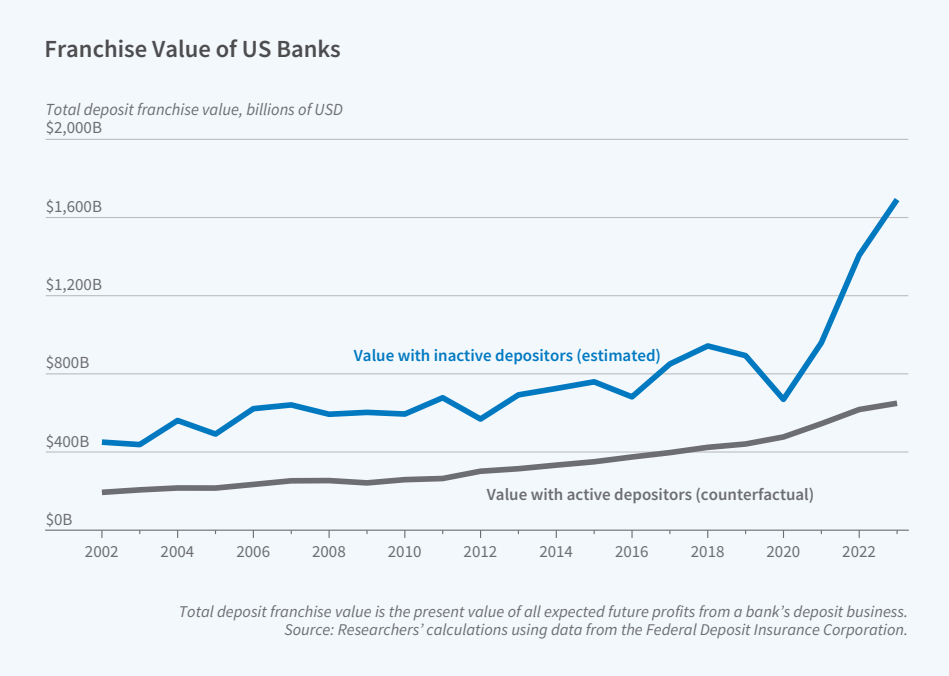
Bank Competition and Inattentive Depositors

Banks compete to attract depositors, who care about the interest rates they earn on their deposits, the fees they are charged, and the services they receive. However, once they have chosen a bank in which to deposit their money, depositors rarely switch, even when, as is regularly the case, superior alternative options become available. This "sleepy" behavior by depositors mutes competition between banks and can cause depositors to leave large amounts of money on the table.

In Dynamic Competition for Sleepy Deposits (NBER Working Paper 34267), Mark L. Egan, Ali Hortaçsu, Nathan A. Kaplan, Adi Sunderam, and Vincent Yao combine anonymized consumer financial data with a model of interbank competition to explore the implications of sleepy depositor behavior.

The researchers begin by demonstrating that sleepy behavior is widespread. Fewer than 15 percent of the checking or savings accounts active in a given year were opened that year, and the typical account is used for about 8 years after being opened. Account turnover is particularly low among older depositors, while it is higher for business accounts and high-balance accounts, perhaps indicating the greater sophistication or lower search or switching costs of the latter type of depositor.

When depositors do switch banks, it is usually not because they have sought out a better deal. Instead, it is typically driven by major changes in life circumstances such as moves or deaths. Only 17 percent of account closures involve a depositor who reports that they are switching to another bank because it offered them better terms.



Total deposit franchise value is the present value of all expected future profits from a bank's deposit business.
Source: Researchers' calculations using data from the Federal Deposit Insurance Corporation.

Most bank depositors rarely switch banks, a "sleepy" behavior that allows banks to offer lower interest rates and to charge higher markups.

The researchers also estimate a dynamic model of competition between banks, postulating that depositors alternate randomly between periods of "sleeping," when they do not consider changing banks, and periods of "waking," when they reassess their depositing choices.

Banks face a trade-off between setting high interest rates to attract awake depositors and setting low interest rates to extract profits from their current sleeping depositors. The effect of a decline in depositor wakefulness is ambiguous. On the one hand, when fewer depositors are awake and poachable each period, the incentive to raise rates is weaker. On the other hand, fewer waking periods mean that a poached depositor is expected to stay with the bank longer, heightening the incentive to raise rates to attract new depositors.

The researchers' estimates suggest that the average markup charged by banks, the difference between their cost and the effective "price" that they charge to depositors, is 68 basis points per year. The researchers estimate that in the absence of sleepy depositors, the markup would fall by half to 32 basis points.

Increases in market concentration do not seem to change markups very much. About 58 percent of the average bank's deposit-related profit stream can be attributed to depositor sleepiness and correspondingly higher markups, but the researchers find substantial heterogeneity across banks in the relative importance of depositor sleepiness. Sleepiness particularly benefits banks with high costs as well as banks with low-quality deposit services.

—Shakked Noy

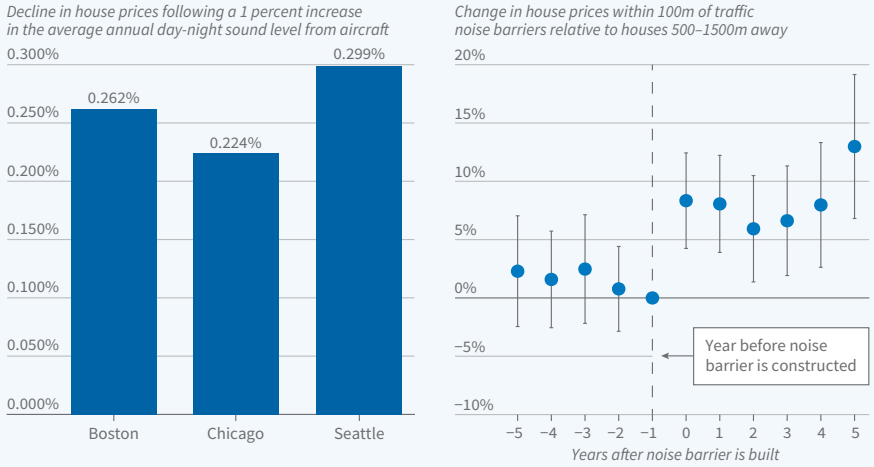
The Economic Costs of Noise Pollution from Aircraft and Traffic

Noise pollution from transportation reduces property values. Two new studies quantify these costs by examining aircraft and traffic noise, providing estimates of both the aggregate burden and its distribution.

In Planes Overhead: How Airplane Noise Impacts Home Values (NBER Working Paper 34431), Florian Allroggen, R. John Hansman, Christopher R. Knittel, Jing Li, Xibo Wan, and Juju Wang examine how changes in aircraft noise exposure affect residential property values near Boston Logan International, Chicago's O'Hare International, and Seattle-Tacoma International airports. The researchers leverage the Federal Aviation Administration's rollout of Performance-Based Navigation procedures beginning in 2006, which replaced conventional radar-based navigation with satellite-guided routing, creating more concentrated flight paths that altered noise exposure in ways residents could not anticipate. They also utilize runway reconfigurations associated with airport capacity expansions, which changed takeoff and landing patterns.

The researchers combine high-resolution flight trajectory data with detailed noise propagation modeling to create precise measurements of aircraft noise. They merge this information with geocoded housing transaction records from 2011 to 2016, yielding over 85,000 transactions across the three cities. They find house price declines of between 0.6 and 1.0 percent per one-decibel increase in day-night average sound level. On an annual basis, the average willingness to pay for a one-decibel reduction in sound levels is approximately $152 in Boston, $104 in Chicago, and $221 in Seattle. Higher household income in a locality is associated with a higher willingness to pay for noise reduction, and non-White households appear to have a lower willingness to pay. These findings suggest that aircraft noise externalities have meaningful distributional consequences.

Noise Pollution and House Prices



Thin gray bars in right panel represent 90% confidence intervals. Source: Researchers' calculations using data from the US Department of Transportation, CoreLogic, the Federal Aviation Administration, and Zillow.

A second study, The Traffic Noise Externality: Costs, Incidence and Policy Implications (NBER Working Paper 34298) by Enrico Moretti and Harrison Wheeler, examines traffic noise. The researchers use an approach based on the construction of noise barriers alongside highways and analyze transaction-level housing data from CoreLogic covering 1990 to 2022. The main empirical strategy compares changes in house prices after barrier construction for properties located 0–500 meters from traffic with changes for properties 500–1,500 meters away. There is a rapid decline in noise intensity with distance, so the barriers have a much smaller effect on noise levels for the second than the first group of properties.

In the five years following barrier construction, properties within 100 meters experience an increase in value of 6.8 percent, on average. The effect diminishes with distance from the barrier. For distances greater than 400 meters, the researchers find no statistically significant effect of barrier construction. The study also exploits variation in the expected noise reduction achieved by different barriers and finds that price effects increase with the degree of noise reduction. These estimates yield a willingness to pay of approximately 0.94 percent of local median income per decibel of noise reduction. Boston has the highest per-capita costs at $1,310 per resident, more than 13 times Atlanta's $100 per resident.

A 10 percent decrease in a tract's median family income is associated with 1 percent higher per-capita noise costs, with low-income households and Black residents overrepresented in high-noise areas.

The researchers extrapolate their results to estimate that traffic noise imposes an aggregate economic burden of $110 billion on the United States, with low-income and minority households bearing a disproportionate share. They also estimate that the Pigouvian tax on noise pollution would be $974 per vehicle over its lifetime and project that universal adoption of electric vehicles could generate noise reduction benefits of $77.3 billion, concentrated among low-income families in dense urban areas.

Harrison Wheeler acknowledges support from the TD Management Data and Analytics Lab and Enrico Moretti acknowledges support from the Berkeley Opportunity Lab.Florian Allroggen, R. John Hansman, Christopher R. Knittel, Jing Li, Xibo Wan, and Juju Wang acknowledge support from the US Federal Aviation Administration Office of Environment and Energy through The Center of Excellence for Alternative Jet Fuels and Environment (ASCENT), Project 72, through FAA Award Number 13-C-AJFE-MIT under the supervision of Adam Scholten and Joseph Dipardo.

Technological Advance and Labor Demand: Evidence from Two Centuries

There have been concerns about technological progress displacing workers since the start of the Industrial Revolution, but systematic evidence on how such advances affect labor demand is limited. In Technology and Labor Markets: Past, Present, and Future; Evidence from Two Centuries of Innovation (NBER Working Paper 34386), Huben Liu, Dimitris Papanikolaou, Lawrence D. W. Schmidt, and Bryan Seegmiller construct novel measures of exposure to technological change for occupations between 1850 and 2020 by applying natural language processing and large language models to patent documents.

They first use large language models to generate comprehensive task descriptions for each US Census occupation in each decade and then measure exposure by calculating the semantic similarity between patent summaries and these task descriptions. Motivated by a simple model in which workers optimally choose how to allocate their time across tasks, while technology can substitute for certain tasks, the researchers measure both the average technology exposure across an occupation's tasks as well as the degree to which this exposure is concentrated in a few tasks.

The researchers then study the relationship between employment by occupation, as reported in decennial censuses, and their technology exposure measures. They find that occupations with 1 standard deviation higher mean technological exposure experienced 11–13 percentage point lower employment growth over the next decade. Consistent with their theoretical framework, however, when technology exposure is concentrated in specific tasks, labor demand increases: A one-standard deviation increase in exposure concentration leads to about 6 to 7 percentage point higher employment growth, holding mean exposure constant.

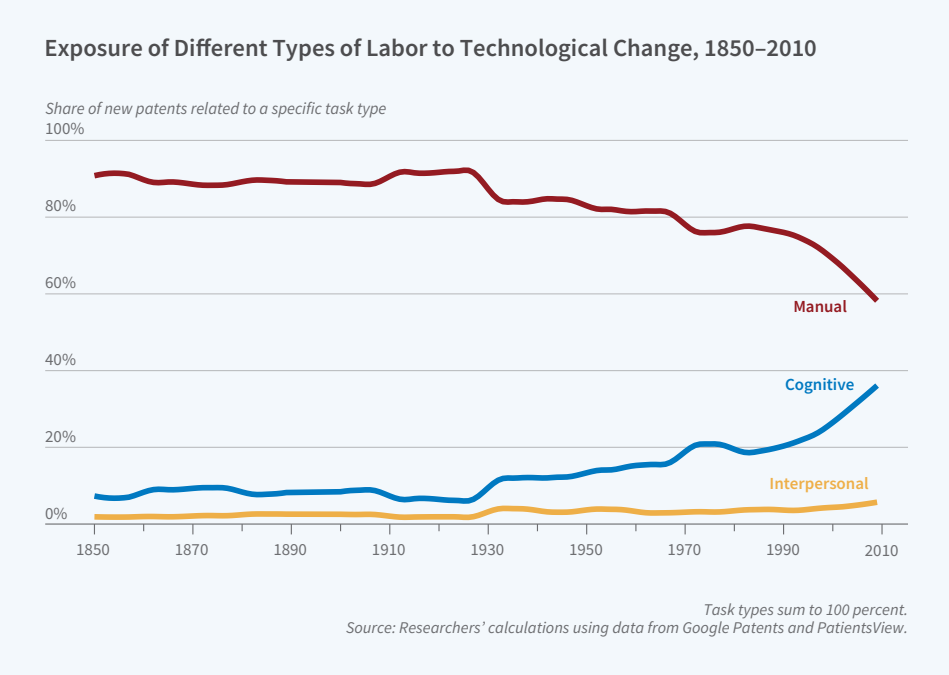
Examining industry-level effects using data from 1910 onward, the researchers find that increases in industry-relevant patents were associated with about 8–11 percentage point higher employment growth over 10 years, capturing productivity spillover effects.

Between 1910 and 2020, employment growth was about 3.1 percentage points higher per year for the most highly-educated relative to the least-educated occupation groups. Total occupational exposure to technological progress explained between about 35 percent of this gap. In the full sample, the researchers' measures of technological exposure account for roughly half of the observed 1.7 percentage point per year shift toward low-skill service occupations and away from middle-skill jobs, and about 43 percent of the 2.1 percentage point per year relative shift towards high-skill occupations. They also account for nearly half of the 1.6 percentage point per year relative growth in female-intensive occupations.

Technology-induced employment reallocation fell heavily on incumbent workers relative to labor market entrants. Older cohorts experienced significantly larger negative employment effects from mean exposure, consistent with older workers having accumulated specialized skills tied to older technologies that became less valuable when innovations arrived.

Examining heterogeneity by task type also uncovered a secular shift in technological exposure towards cognitive tasks. Manual task exposure predicted employment declines throughout the sample. Cognitive task exposure showed time-varying effects: Before 1960, it was associated with employment gains, but in later years, its effect was negative. During this same time period, cognitive tasks were becoming increasingly more exposed to technology relative to manual tasks. The researchers conclude that the Information and Communication Technologies revolution fundamentally changed how technology interacted with cognitive work.

The researchers use their empirical findings to inform a model simulation-based forecast of how AI might affect labor markets. Assuming that AI primarily substitutes for cognitive tasks requiring less than five years of specific vocational preparation, the baseline forecast predicts an increase in relative demand for middle-skill occupations of between 0.29 and 0.85 percentage points per year relative to different types of white-collar work, with the largest gain being relative to technicians and clerical jobs. There is also an increase in male-dominated occupations of 0.53 percentage points per year. This suggests that while twentieth century technological change consistently favored more educated, higher-paid, and female-intensive occupations, AI may substantially alter these long-standing patterns by automating cognitive rather than manual tasks.



Dimitris Papanikolaou and Bryan Seegmiller thank the Financial Institutions and Markets Research Center and the Asset Management Practicum at Kellogg-Northwestern for their generous financial support.

The Rise of High-Skilled Migration from Asia to the US

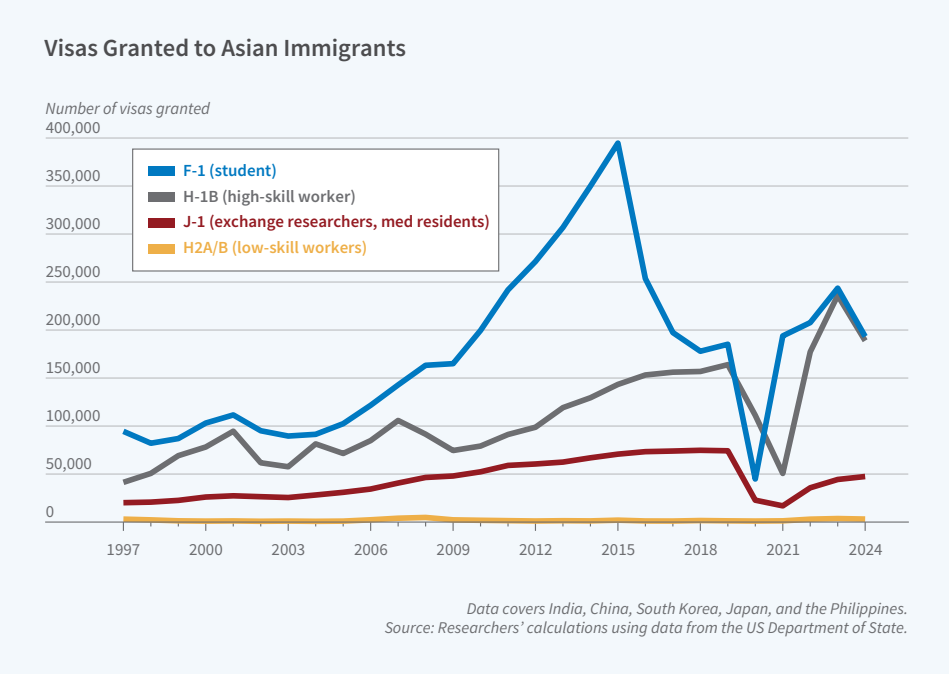
In 1990, workers from India, China, South Korea, Japan, and the Philippines accounted for 3.6 percent of the US college-educated workforce. By 2019, their share was 7.3 percent, with concentration in the information technology, higher education, innovation, and healthcare sectors.

In From Asia, With Skills (NBER Working Paper 34449), Gaurav Khanna examines the factors driving this migration surge, and its economic consequences. The study draws on US Census microdata, American Community Survey data, visa records, Current Population Survey data, and administrative records on international students.

Migrants from these five countries accounted for 38 percent of the growth in US software developers, 25 percent of the increase in scientists and engineers, and 21 percent of the growth in physicians between 1990 and 2019. By 2019, 78 percent of Indian-born and 63 percent of Chinese-born workers in the US labor force held bachelor's degrees, compared to 39 percent of US-born workers.

The H-1B visa program, established in 1990 for specialty occupations, became the primary pathway for technology workers to enter the US in subsequent decades. Student visas (F-1s) emerged as an uncapped alternative pathway. Chinese student enrollment surged between 2005 and 2016, followed by rapid Indian student growth after 2014. By 2023, Indian students surpassed Chinese students to become the largest international student group.

Three major demand shocks drove US need for foreign talent. First, internet commercialization in the mid-1990s led to the growth of the tech sector, and expanded computer science employment fourfold from 1 million in 1990 to 4.3 million workers by 2019. Second, state funding cuts to public universities after 2008 prompted institutions to enroll full-fee-paying international students, bringing in much-needed revenue. Finally, an aging US population increased healthcare demand while policy restrictions limited US physician supply. As a result, pathways to immigration for foreign doctors were established, and international medical graduates now comprise over 30 percent of physicians in the lowest-income rural areas, delivering care quality comparable to US-trained doctors.



Rising US skill demand and Asia's education boom fueled high-skill migration, reshaping innovation, universities, and healthcare.

When US demand for skilled workers rose, Asian countries developed complementary supply advantages. China's tertiary enrollment expanded from 3 percent to 75 percent between 1990 and 2023, while India's grew from 6 percent to 33 percent. China expanded the number of universities from 1,000 in 1999 to 2,900 by 2021, with graduates rising from 1.1 million to 7.9 million. Indian H-1B lottery winners experienced large earnings increases compared to workers who remained in India, providing strong incentive for migration. High-quality STEM institutions and English-language instruction in India created readily transferable skills.

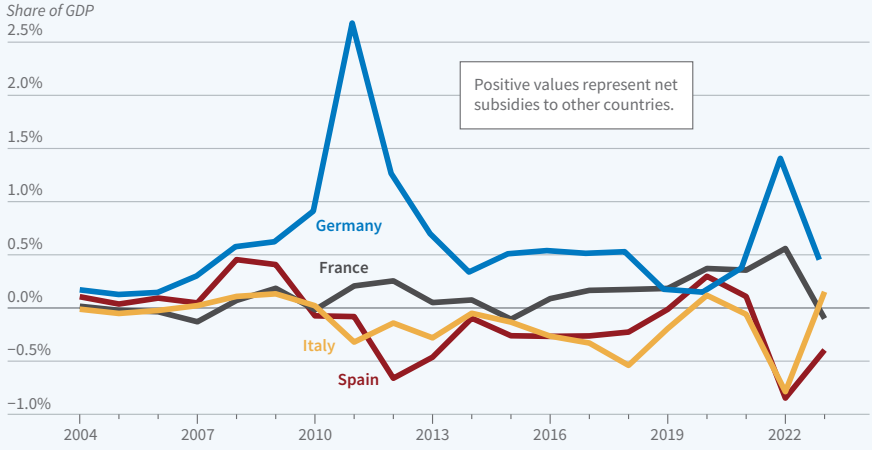
Across occupations, growth in native-born employment and growth in Asian-born employment are positively correlated, a finding that suggests Asian migrants filled expanding positions rather than displacing US workers in most sectors. Supply constraints from policy restrictions in healthcare and rapid technological change in computing may have resulted in worker demand outstripping domestic training capacity.

The foreign-born workers who emigrated from Asia had important economic effects. These immigrants had higher patenting rates than natives and increased innovation at the firms that employed them. By the late 1990s, Chinese and Indian-born engineers ran one in four tech startups in Silicon Valley. In 2022, 55 percent of US startups valued over $1 billion had immigrant founders. International students, many of whom returned in the US as workers after graduation, contributed $56 billion to the US current account in 2024 through educational services exports.

The effects of emigration on origin countries varied. India's IT sector expanded through "brain gain", whereby migration prospects induced skill accumulation benefiting workers who remained. Binding H-1B caps and lengthy green card processes resulted in many Indian emigrants returning after six years in the US. Return migration rates are relatively high for Chinese, Korean, and Japanese migrants, supporting knowledge transfer and potentially catalyzing the growth of entrepreneurial technology sectors in their countries of origin. The Philippines, which trains nurses for emigration, benefits from remittances from those who are working in the US.

Cross-Country Redistribution from Eurozone Monetary Policy

The eurozone is a monetary union without a fiscal union: Each national central bank is ultimately backed by its own government. When the European Central Bank (ECB) engages in cross-border lending or asset purchasing, the gains and losses are borne unevenly by taxpayers in different countries. In What Does It Take? Quantifying Cross-Country Transfers in the Eurozone (NBER Working Paper 34311), Yi-Li Chien, Zhengyang Jiang, Matteo Leombroni, and Hanno Lustig demonstrate that the ECB's large-scale bond purchases and bank loans have led to significant transfers.



European Central Bank policies create a fiscal transfer system when fiscally stronger countries such as Germany lend to fiscally weaker ones such as Italy at below below market rates.
Source: Researchers' calculations using data from Bloomberg, the European Central Bank, and other central banks.

Before the 2009 sovereign debt crisis, private investors, especially German banks, lent directly to Italy and other southern economies at market rates that reflected default and currency risk. When those private flows froze, the ECB stepped in, first through emergency lending and later through large-scale bond purchases. Each national central bank intervened in credit markets, buying primarily its own government's bonds to stabilize markets and suppress borrowing costs.

This arrangement created an asymmetry. When the Banca d'Italia purchased Italian bonds from German banks, it paid with newly created reserves that ultimately accumulated at the Deutsche Bundesbank, where banks preferred to hold them because reserves held in the German central bank were viewed as safer, should the eurozone ever fracture, than those at other central banks. Italy's central bank, unable to attract reserve holders, financed its purchases by borrowing from Germany's central bank through the ECB's TARGET2 settlement system. The borrowing rate was the ECB policy rate, which was well below the market rate that Italy would otherwise have faced. This created a hidden subsidy for Italy and a corresponding burden on Germany.

The researchers calculate that between 2004 and 2023, the subsidies from Germany to other eurozone countries amounted to close to 11 percent of its GDP. Italy and Spain received the equivalent of 5.9 percent and 7.2 percent of their GDPs, respectively. Part of those gains were passed through to domestic banks via cheap lending programs. Adding the ECB's own impact in reducing sovereign yields increases the estimated transfers further, to nearly 13 percent of GDP for Germany and roughly 8 to 10 percent for Italy and Spain.

The contrast between cross-jurisdiction redistribution in the eurozone and the US is notable. When the Federal Reserve buys US government bonds, any associated gains or losses are shared across all states because the US is both a monetary and fiscal union. In Europe, however, the risks and benefits of monetary interventions fall unevenly across national lines. German taxpayers bear the credit and redenomination risks of Italian and Spanish debt.

In short, unlike the US Federal Reserve system, where reserves are treated uniformly across districts, the Eurozone's monetary system reflects investors' concerns about potential fragmentation. These concerns contribute to a persistent core–periphery divide in reserve holdings. Ultimately, the results indicate that while the ECB's monetary policies are designed to stabilize financial markets, they also function as a channel of implicit fiscal redistribution across Eurozone member states.

—Abby Hiller

The National Bureau of Economic Research is a private nonprofit research organization founded in 1920 and devoted to conducting and disseminating nonpartisan economic research. Its officers are:

James M. Poterba—President & CEO
Peter Blair Henry—Chair
Karen G. Mills—Vice Chair
Barry Melancon —Treasurer

The Digest *summarizes selected Working Papers recently produced as part of the NBER's program of research. Working Papers are intended to make preliminary research results available to encourage discussion and suggestions for revision. Neither the Working Papers nor* The Digest *have been subject to peer review or review by the NBER Board of Directors. The NBER editorial team leverages AI in the construction of summaries. All summaries are edited by multiple experts, including the summarized paper's authors.*

Requests for print Digest *subscriptions, changes of address, and cancellations may be sent to Digest, NBER, 1050 Massachusetts Avenue, Cambridge, MA 02138-5398 (please include the current mailing label), or emailed to subs@nber.org. Print copies of the* Digest *are only mailed to subscribers in the US and Canada; electronic subscriptions may be managed at my.nber.org/email_preferences.*