NBER | NATIONAL BUREAU of ECONOMIC RESEARCH

The Digest

September 2025

In This Issue

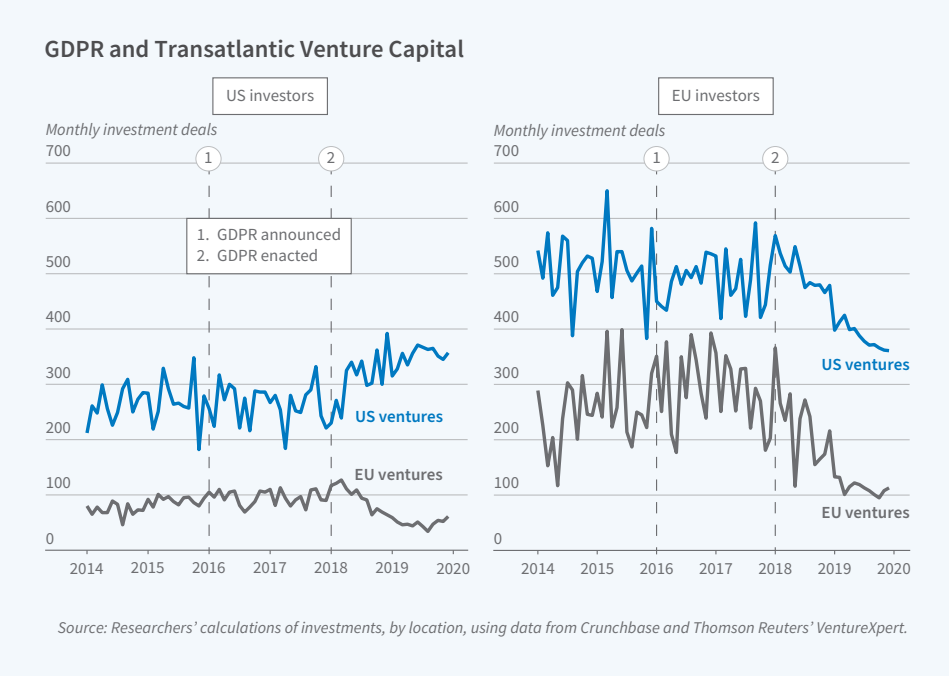
Privacy Regulation and Transatlantic Venture Investment

In the past decade, venture capital activity in the European Union (EU) has lagged that in the United States, with annual venture capital investments averaging 0.2 percent of GDP compared to 0.7 percent in the US. Since 2013, US-based venture capital funds have out-raised their EU partners by about $800 billion. European entrepreneurship relies on cross-border investment inflows from US investors to close the gap.

In How Does Privacy Regulation Affect Transatlantic Venture Investment? Evidence from GDPR (NBER Working Paper 33909), Jian Jia, Ginger Zhe Jin, Mario Leccese, and Liad Wagman examine how the EU's General Data Protection Regulation (GDPR) has affected venture investment flows between the US and the EU. The GDPR, enacted in April 2016 and enforced since May 2018, is a comprehensive privacy law that imposes strict conditions on data collection, processing, and storage. It requires companies to obtain explicit consent for data use and imposes significant penalties for violations.

The researchers utilize data on 97,717 investment deals across 24 EU member states and the 50 US states as well as the District of Columbia for the 2014–19 period. They analyze temporal variation in the investment environment associated with GDPR's enactment and enforcement as well as cross-sectional variation in the geographical location of ventures and investors.

Following the regulation's rollout in May 2018, the average number of EU deals each month led by US investors fell by 21 percent relative to US deals, while the amount invested fell by 13 percent. In contrast, the researchers did not find a statistically significant decline in the number of or amount invested in EU deals completed by EU investors. They estimate that US investment flows to the EU fell by about $1.6 billion per year. Over time, the post-GDPR pullback of US investors from EU deals moderated, suggesting partial market adaptation to the new regulatory environment.



Source: Researchers' calculations of investments, by location, using data from Crunchbase and Thomson Reuters' VentureXpert.

The impact of GDPR's rollout varied by venture type. Data-related ventures, which faced heightened compliance costs, saw the sharpest decline. New ventures that had never previously raised capital also faced disproportionately larger funding reductions compared to follow-on investments, perhaps because information asymmetries between investors and ventures are typically lower in follow-on deals.

Geographic proximity became increasingly important post-GDPR, suggesting that investors sought to reduce screening and monitoring costs by partnering with closer, more familiar ventures. The average distance between lead investors' headquarters and the location of EU ventures decreased by 14 percent after the regulation's rollout.

Deal syndication became more common after GDPR. The share of European deals that involved a syndicate including both US and EU investors rose by 37 percentage points following GDPR implementation. This increase was primarily driven by US investors participating as non-lead partners alongside EU investors in financing EU ventures—a strategy that allowed US investors to access local regulatory expertise while sharing compliance risks. The average syndicate size for EU deals increased by 10 percent, with the growth in investment concentrated among EU-based rather than US-based syndicate participants.

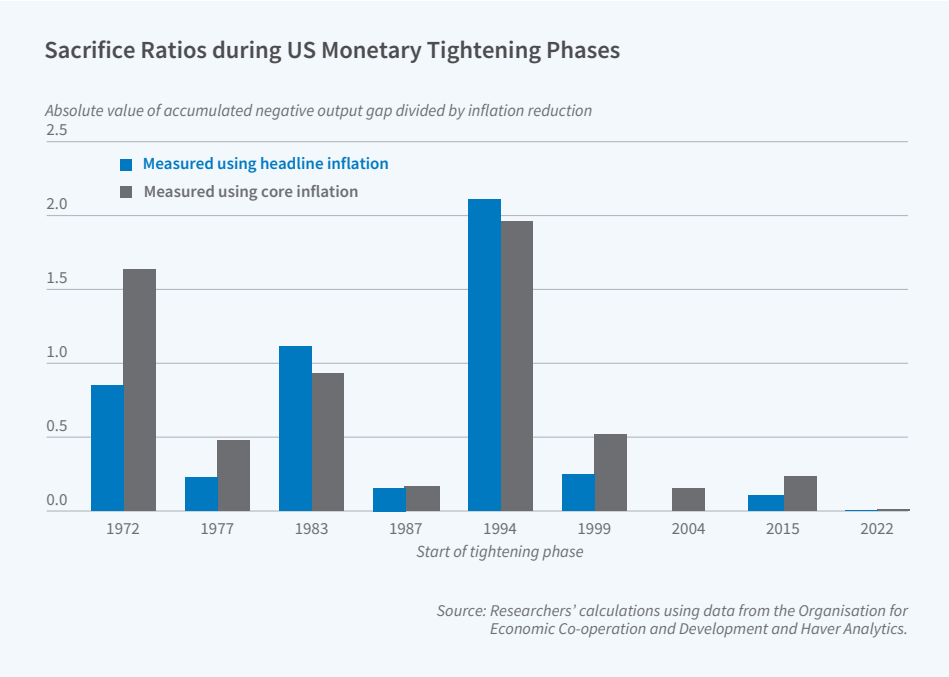
Liad Wagman and Jian Jia gratefully acknowledge support from the Data Catalyst Institute.

Post-Pandemic Disinflation in Historical Context

Central banks' decisions about when and how to adjust monetary policy require weighing multiple objectives. In Trade-offs over Rate Cycles: Activity, Inflation, and the Price Level (NBER Working Paper 33825), Kristin Forbes, Jongrim Ha, and M. Ayhan Kose estimate the policy trade-offs across 24 advanced economies from 1970 through 2024 and consider the post COVID-19 monetary tightening against this backdrop. The researchers compile a comprehensive database of "rate cycles"—periods of monetary policy easing and tightening—by identifying turning points in policy interest rates while also incorporating information on quantitative easing and tightening programs.

The researchers calculate the "sacrifice ratio," the output loss per unit of inflation reduction, during tightening phases. They also calculate the increase in the price level in excess of the increase that would have occurred with 2 percent inflation, as well as a "price-output trade-off ratio" that indicates how much of the macroeconomic adjustment during tightening phases occurs through price level increases rather than output losses. They highlight the importance of considering these types of effects on prices when evaluating different strategies for monetary policy as large increases in the price level can have long-term effects on wage and price setting, including weakening the anchoring of inflation expectations and transmission of monetary policy.

The post-pandemic tightening exhibited several distinctive characteristics. Conditional on macroeconomic conditions, central banks were unusually slow to begin raising rates, but once they began, their rate hikes were unusually aggressive. The median sacrifice ratio during the post-pandemic period was close to zero—the lowest of any historical period examined. This reflected a combination of historically large disinflations—with a median decline of 8.5 percentage points in Consumer Price Index inflation across their sample of advanced economies—paired with minimal output losses. Simulations using the Federal Reserve's FRB/US model support these empirical findings.



Analysis of monetary policy cycles in 24 advanced economies finds that delayed and aggressive rate hikes after the pandemic combined with strong central bank credibility contributed to historically low output losses per unit of disinflation, but also a large increase in prices.

However, the sacrifice ratio does not capture one key adjustment cost: the impact of monetary tightening on the price level. During the post-pandemic tightening, the median excess increase in the price level was about 4 percentage points per year above what would have occurred with 2 percent inflation—the largest such increase since the mid-1980s. More of the post-pandemic macroeconomic adjustment occurred through price increases than through output losses compared to historical patterns. These calculations also suggest caution in interpreting the sacrifice ratio; delayed starts to tightening monetary policy resulted in lower sacrifice ratios because they allowed for larger inflation overshoots, which in turn enabled larger subsequent disinflations, but also generated greater increases in prices.

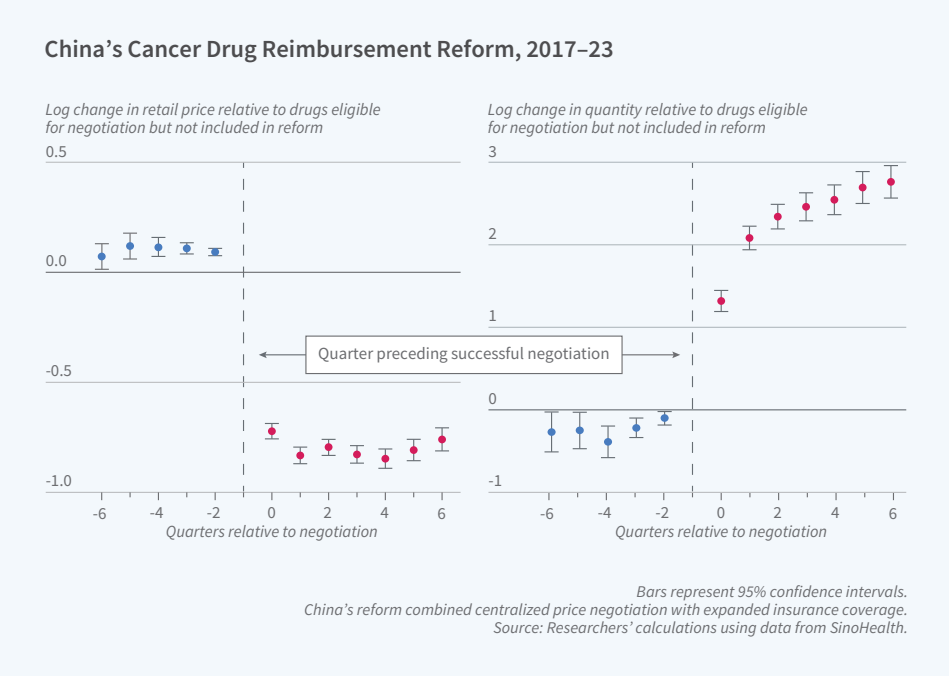
In the cross-country analysis, central bank credibility stands out as the one institutional feature consistently associated with favorable outcomes such as lower sacrifice ratios, smaller output losses, larger disinflations, and more moderate increases in the price level.

China's Expansion of Drug Insurance Increased Access While Containing Costs

China's National Reimbursement Drug List (NRDL) reform, which affected over 1 billion people, was one of the world's largest pharmaceutical insurance policy experiments. Prior to 2016, China's universal health insurance excluded innovative drugs, forcing patients to pay high out-of-pocket prices for some life-saving treatments. The reform expanded access to these drugs and also negotiated prices centrally.

In A Double Dose of Reform: Insurance and Centralized Negotiation in Drug Markets (NBER Working Paper 33832), Panle Jia Barwick, Ashley T. Swanson, and Tianli Xia examine the economic and welfare implications of this reform. They analyze comprehensive drug sales data from SinoHealth for the 2017–23 period along with information on negotiation outcomes, clinical trials, and provincial demographics. They focus their analysis on cancer drugs, which account for two-thirds of revenues among negotiated drugs.

The researchers find that the reform reduced retail prices by 57 percent for successfully negotiated cancer drugs, while about 36 percent of negotiations failed. Out-of-pocket drug costs fell by 86 percent, and drug utilization increased by 950 percent. Higher-quality drugs were more likely to be successfully negotiated. Firms retained substantial bargaining power, capturing about two-thirds of the surplus from negotiations. The data suggest that when drug prices increase by 1 percent, the average patient reduces their drug purchases by 1.6 percent. This price sensitivity is stronger for poorer patients: for households in the bottom quarter of incomes, drug purchases fall by 1.9 percent, compared with 1.3 percent for those in the top quarter of incomes.



China's pharmaceutical insurance reform, which combined centralized price negotiation with insurance expansion, reduced cancer drug prices by 57 percent while increasing access nearly ten-fold.

The researchers estimate that innovative cancer drugs successfully negotiated between 2017 and 2022 generated ¥40 billion ($5.6 billion) in annual consumer surplus gains and increased survival by 900,000 life-years among Chinese cancer patients each year. They also estimate that expansion alone would have reduced out-of-pocket prices but resulted in sharp retail price increases as firms responded to reduced consumer price sensitivity. Price negotiation without insurance expansion would have had no impact, as firms would have lacked incentives to participate.

The researchers analyze several alternative policy designs and estimate that market-access negotiation—where drugs are excluded from the Chinese market entirely if negotiations fail—could raise social surplus by as much as 19 percent if it were paired with optimal coinsurance design. They also find that centralized negotiation benefits most provinces compared to decentralized bargaining, although the wealthiest regions would prefer provincial-level negotiations. Their estimates imply that utilitarian social surplus is maximized with a moderately regressive insurance schedule, as demand expansion from high-income households increases the government's bargaining leverage, which ultimately benefits all patients through expanded drug coverage and lower prices.

Support for this research was provided by the Office of the Vice Chancellor for Research and Graduate Education at the University of Wisconsin–Madison with funding from the Wisconsin Alumni Research Foundation.

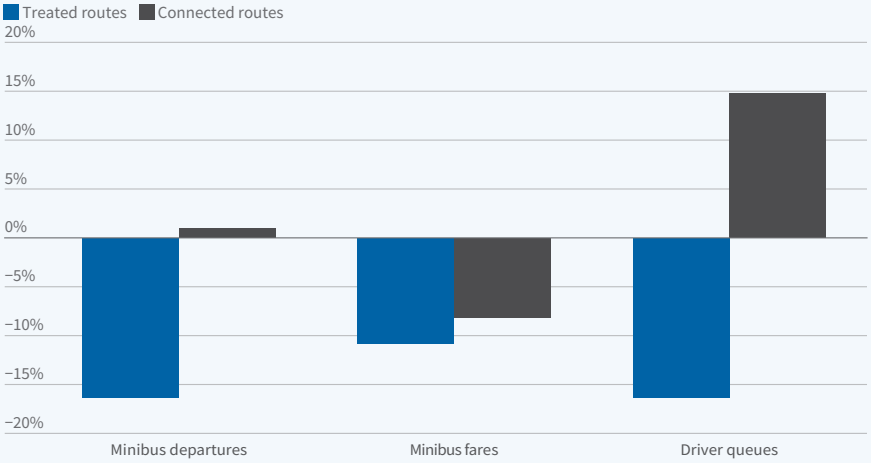
Private Sector Responses to Public Transit Initiatives

Today, 55 percent of the world's population lives in cities, a share expected to reach 70 percent by 2050. Much of this growth will occur in developing countries, which are investing heavily in mass transit to expand access to jobs and services. Private minibuses already dominate many urban markets: in Lagos—the largest city in sub-Saharan Africa—minibuses accounted for 62 percent of all trips in 2009, versus just 5 percent for public buses. New public transit investments may therefore impact commuters both directly and indirectly if private operators adjust their routes, frequencies, or fares in response.

Starting in 2020, the Lagos government launched 64 new public bus routes served by 820 large, modern buses. These public buses can carry up to 70 passengers each, compared with 14 in the most common type of private minibus. In Public and Private Transit: Evidence from Lagos (NBER Working Paper 33899), Daniel Björkegren, Alice Duhaut, Geetika Nagpal, and Nick Tsivanidis examine how Lagos's existing private minibus transit system responded to competition from new public bus routes.

From late 2020 to the end of 2021, the researchers made half-hourly observations of private minibuses' departures, fares, and driver queues during morning peak, afternoon peak, and midday off-peak periods at terminals covering 278 routes and 79 bus stops. They classified routes as "treated" (sharing both endpoints with a new public route), "connected" (sharing one endpoint), or "control" (sharing neither endpoint). The researchers also mapped the private system by hiring a firm to send out enumerators with GPS trackers to identify and ride existing private minibus routes, uncovering a transit network of 759 routes spanning almost 30,000 kilometers (18,641 miles).

The private minibus network is dense and regulated by drivers' associations that set fares, collect fees, and impose order on the industry. Within terminals, minibus drivers queue up to serve a particular route. When the minibus at the head of the line fills up, it starts its route, and people begin boarding the next bus in line. There are typically between 7 and 9 departures per hour.



Treated routes share both endpoints with a new public route while connected routes only share one endpoint.
Source: Researchers' calculations based on staggered rollout, from a large-scale data collection effort.

When Lagos, Nigeria, introduced public buses, private minibus departures declined by 16 percent on competing routes while fares fell across the network.

The new public buses depart much less frequently, with 0.5–1 departure per hour on average. When the government added public buses to an existing private transit route, minibus fares fell between 5 and 10 percent, and minibus departure frequencies fell by 16 percent. Because public buses board at different places than private buses, commuters faced longer waits regardless of how they traveled. Drivers on treated routes experienced a drop in profits and were more likely to switch to other routes: queues on treated routes shortened by about 16 percent, and queues on connected routes increased. These spillover effects also reduced prices on connected routes. The new system did not affect congestion.

The researchers estimate that riders' disutility of waiting, a key determinant of the welfare consequences of transportation reforms, was approximately $1.42 per hour—about 2.9 times the riders' average wage. The direct benefit of new public buses increased consumer surplus by an estimated $1.33 million per month, but the private sector response, resulting in longer wait times for private transit, reduced this surplus by $0.26 million. Lower prices for minibus rides raised consumer surplus by $0.41 million, so, on balance, the private sector response raised commuter welfare. While these gains were spread over a million commuters, the estimated 11,000 minibus drivers lost $0.75 million per month—about half of the commuter gains.

— Linda Gorman

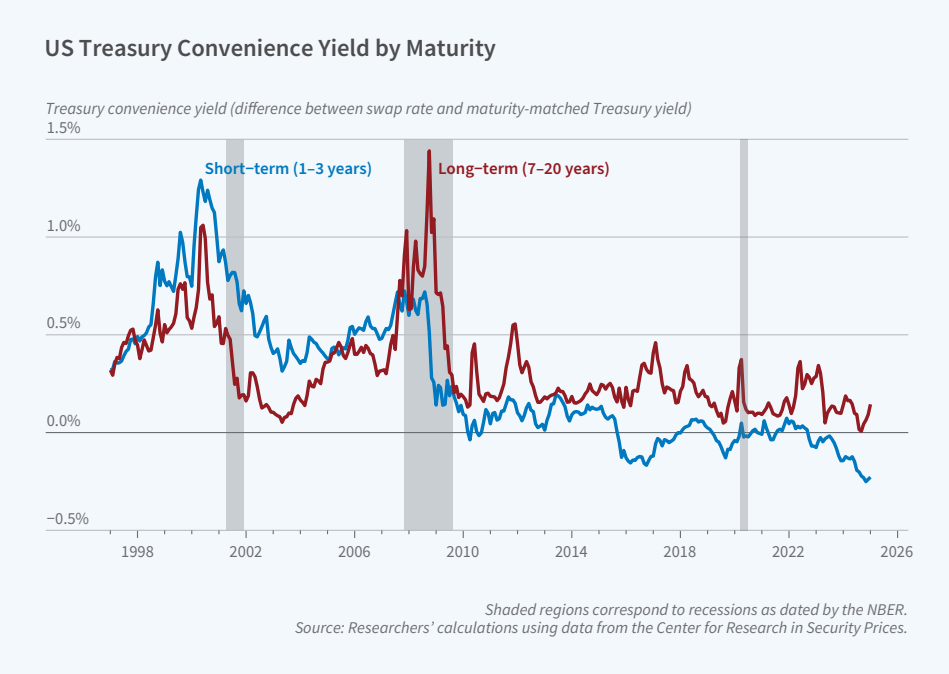
This work was supported by the World Bank's research support budget, the World Bank Knowledge for Change Program, the European Commission's Directorate-General for International Partnerships (DG INTPA) and the UK Department for International Development under the World Bank's Umbrella Facility for Impact Evaluation, the Clausen Center at UC Berkeley, the International Growth Centre, the J-PAL King Climate Action Initiative, the Brown University Seed Award, the Weiss Fund, and the Structural Transformation and Economic Growth Initiative at CEPR.

The Decline of the US Treasury Premium

For decades, the US government's reputation as a stable and reliable financial partner has meant that investors around the world have been willing to buy US Treasuries at low interest rates that in part reflect a so-called *convenience yield*. The rise in US public debt in the last 25 years has raised questions about the long-term sustainability of this situation. In Convenience Lost (NBER Working Paper 33940), Zhengyang Jiang, Robert J. Richmond, and Tony Zhang investigate whether the rising supply of US government debt has compressed convenience yields and how this relationship differs across Treasury maturities.

The researchers calculate government debt levels as the total market value of Treasury notes and bonds in three maturity buckets: short-term (1–3 years to maturity), medium-term (3–7 years), and long-term (7–20 years). They calculate the convenience yield as the gap between Treasury yields and a risk-free benchmark constructed from maturity-matched swap rates. They find that over the 1998–2023 period, convenience yields are strongly negatively correlated with the debt-to-GDP ratio. This negative correlation is strongest for long-term and weakest for short-term Treasuries.

This correlation is not, however, sufficient to establish a causal relationship between government debt issuance and falling convenience yields. Perhaps economic shocks both lower convenience yields and cause the US government to issue more debt. To circumvent this problem, the researchers identify federal tax changes motivated by long-run growth or philosophical considerations, not economic conditions, and treat them as exogenous shocks that can be used to isolate the causal effects of debt on convenience yields.



The "convenience yield" on US Treasury bonds has declined as the supply of these bonds has grown.

Their results suggest that a 5 percentage point increase in the Treasury debt-to-GDP ratio causes the convenience yield on long-term Treasuries to decrease by 0.94 percentage points while that on medium-term bonds falls by 0.41 percentage points. The researchers do not find any statistically significant effect of higher debt levels on the convenience yields of short-term Treasuries.

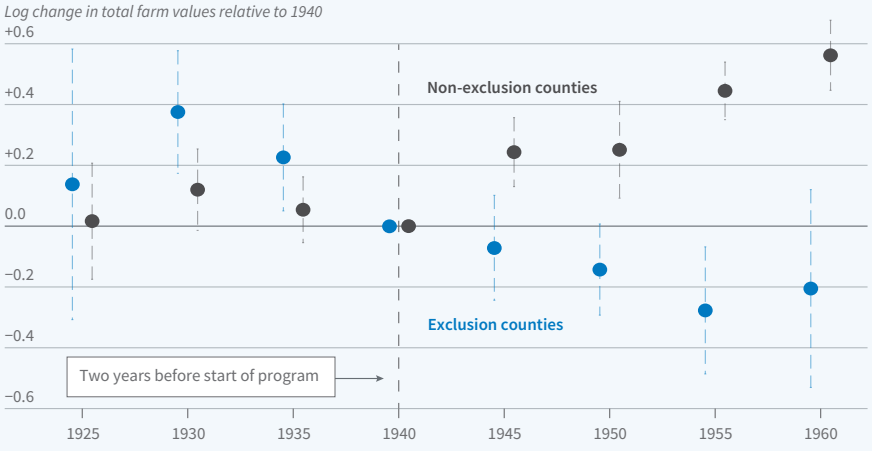
The researchers also consider an alternative measure of the premium investors place on holding US Treasuries: the gaps between the convenience yields of US Treasuries and those of other government bonds, or the "Treasury basis." They find that a 5 percentage point increase in the debt-to-GDP ratio causes the Treasury basis for long-term Treasuries to decline by 0.74 percentage points while that for medium-term Treasuries declines by 0.35 percentage points. Once again, there is no statistically significant decline for short-term Treasuries.

In the aggregate, convenience yields on Treasuries contribute to the seigniorage revenue earned by the US government for providing a safe and liquid store of value. By summing up the effects of Treasury issuance on convenience yields over the supply of debt outstanding, the researchers find that the US government's seigniorage revenue has declined by around 5 to 10 percent of the annual federal interest expense over the past 20 years. This long-run decline in seigniorage revenue is largely explained by the rising supply of medium- and long-term Treasury bonds.

— *Shakked Noy*

Expelling Japanese Americans Lowered US Farm Productivity

The expulsion of Japanese Americans from western states during World War II upended nearly 120,000 lives, including those of nearly 22,000 agricultural workers, and set back farming in affected regions for several decades. Citing security concerns in the wake of the surprise attack on Pearl Harbor, the US government in spring 1942 declared that all individuals of Japanese ancestry, regardless of citizenship status, were subject to mandatory removal from all of California and parts of Washington, Oregon, and Arizona. Most were eventually resettled in internment camps. At the end of the war, fewer than half of the internees returned to their original states, and fewer still reclaimed their farms or returned to agriculture.



During World War II, Japanese Americans living in "exclusion zone" counties along the West Coast were moved to internment camps. Bars represent 95% confidence intervals. Source: Researchers' calculations using data from the US Census Bureau.

In How the 1942 Japanese Exclusion Impacted US Agriculture (NBER Working Paper 33971), Peter Zhixian Lin and Giovanni Peri show that Japanese Americans made up a disproportionate number of agricultural workers in the counties affected by the expulsion order. Drawing on county-level data from the Population Census and the US Census of Agriculture in years between 1925 and 1940, they show that Japanese Americans tended to be better educated and to possess greater expertise than their non-Japanese counterparts. They grew more profitable crops, such as fruit and vegetables, and were more likely to adopt the latest innovations in machinery, fertilizer, and other farming techniques.

In the 1940 Census, 42 percent of working-age Japanese Americans (age 14 and up) in the exclusion zone counties held jobs in agriculture, compared with 11 percent of the general population. Thirty-one percent of Japanese farm workers had finished high school, compared with only 12 percent of their White counterparts. The average land value of Japanese farms was $246 per acre, compared with $40 for non-Japanese farms.

As a result of the evacuation orders, affected counties suffered an agricultural brain drain. Slower to mechanize and adopt innovative technologies and fertilizers, these counties fell behind in farm performance. Each percentage point reduction in the number of Japanese farm workers was associated with a 23 percent decrease in fruit and vegetable sales in the post-1942 period. This negative effect stems from slower growth of farm productivity and farm value rather than from fewer farms.

Meanwhile, counties outside the exclusion zone that had larger shares of Japanese farmers as of the 1940 Census grew relatively faster in the postwar years. For every percentage point increase in Japanese farm worker share, non-exclusion counties experienced nearly 9 percent higher total growth in farm value over the 1945–60 period. Counties from which Japanese workers were expelled experienced 12 percent slower growth in farm value for each percentage point reduction in the share of Japanese Americans among farm workers.

Expelling Japanese farmers reverberated beyond the agriculture sector. The researchers conclude that "the loss of these skilled farmers hindered technological adoption, creating lasting negative effects on both agricultural performance and broader local economic development."

— Steve Maas

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