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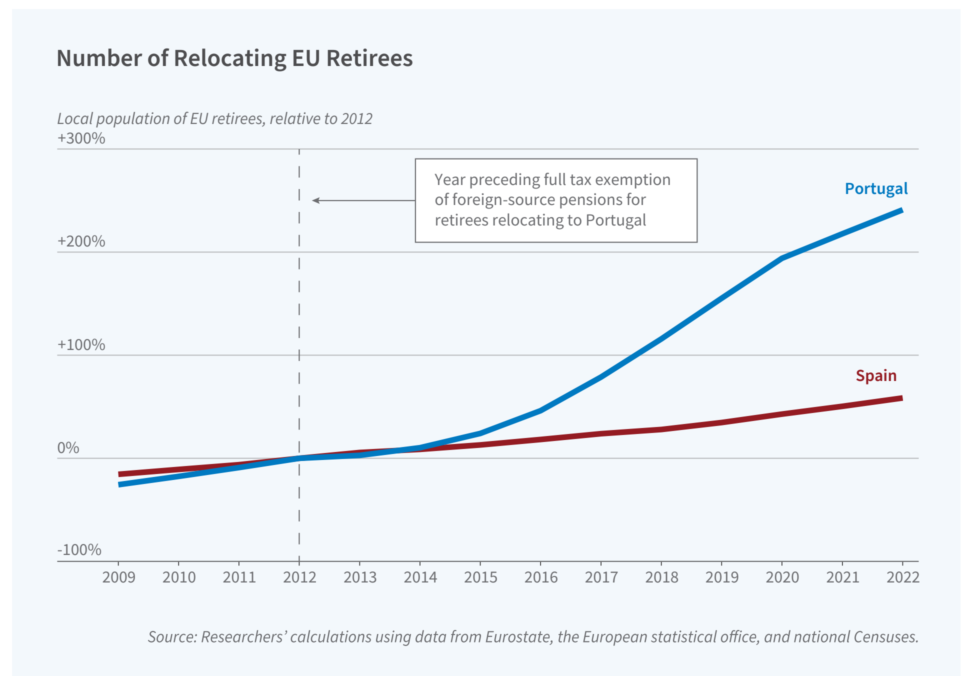
Retirees Relocate for Income Tax Exemptions

In 2013, the Portuguese government offered foreign retirees relocating to Portugal a 10-year tax exemption on their foreign-source pension income, provided their country of origin had a tax treaty with Portugal. As the number of immigrant retirees grew, the amount of forgone income taxes grew, reaching 1.5 billion euros, or about 0.6 percent of GDP, by 2021. In that year, the tax exemption was replaced by a 10 percent rate. In 2024, the exemption was repealed.

In Pensioners Without Borders: Agglomeration and the Migration Response to Taxation (NBER Working Paper 32890), Salla Kalin, Antoine B. Levy, and Mathilde Muñoz examine Portugal's tax experiment and find that individuals who were aged 55 and older, particularly those who were wealthier, more educated, and from higher-tax countries, were willing to resettle in exchange for lower taxes.



Source: Researchers' calculations using data from Eurostate, the European statistical office, and national Censuses.

Data from Eurostat, national population registers, and national censuses show that Portugal's inflows of foreign retirees and working-age immigrants were similar from 2008 to 2012. After the 2013 tax reduction, foreign retiree inflows rose sharply. By 2017, when the number of foreign pensioners in Spain was about the same as in 2012, the number in Portugal had tripled — a 200 percent increase — compared to 2012. The number of working-age individuals moving to the two countries also remained stable. Tax-induced migration to Portugal was larger for retirees from countries with longer expected retirements and higher taxes. The inflows of retirees to Portugal decreased substantially when the 10 percent tax went into effect in 2021.

To pinpoint tax changes as the driver of immigration inflows, the researchers compare retiree inflows to Portugal with those to Spain. The inflows to the two countries were similar from 2009 to 2012 but diverged beginning in 2013. Using data from Spain and other European countries, the researchers estimate that a 10 percent increase in the net-of-tax income that a pensioner receives in a country — the equivalent of a drop in the income tax rate from 20 percent to 12 percent, meaning the pensioner would keep 88 percent rather than 80 percent of pre-tax income — would increase the number of pensioners choosing to live in that location by between 15 and 20 percent.

To learn more about the attributes of migrating pensioners, it is necessary to obtain data from the countries they are leaving. The researchers were able to access data from Finland on Finns who migrated to other nations. The database includes information on education, lifetime earnings, capital income, and past firm and establishment affiliations. The data show that the Finns who migrated to Portugal or Spain prior to 2013 were similar and that they were more likely to be in the top decile of incomes when they worked, more likely to receive capital income, more likely to be highly educated, and more likely to be married. Their average pension was €1,600 a month.

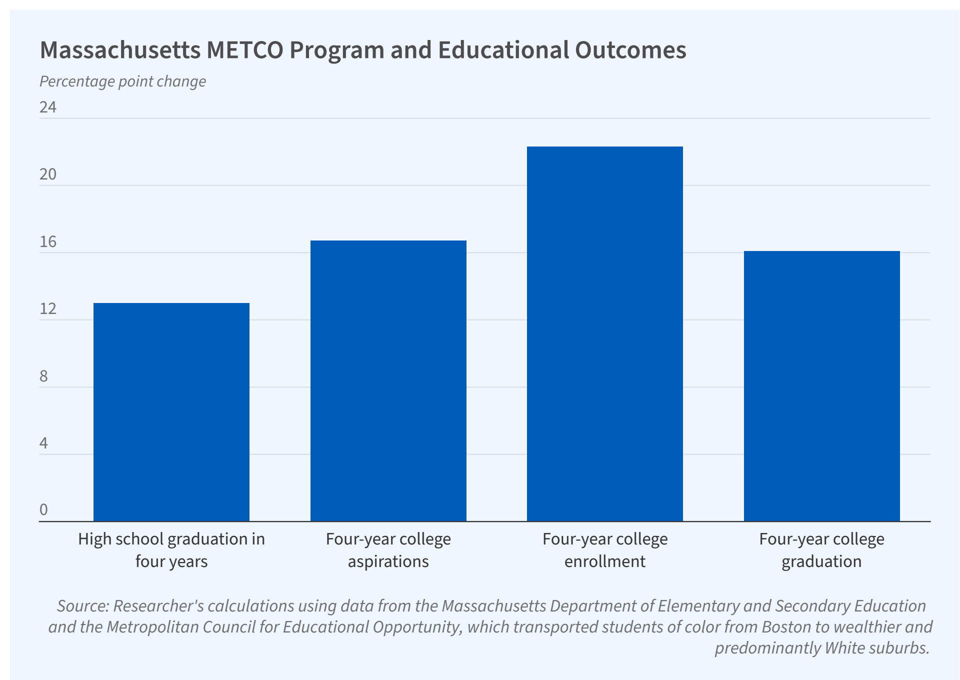
After 2013, Finnish retirees in Portugal received a much higher average pension — €3,500 — than those in Spain. Education levels and the probability of receiving income from capital also rose. The share of married individuals dropped.

Finland unilaterally ended its double taxation treaty with Portugal in 2018 "to protest the zero tax rate granted to foreign pensioners." Sweden followed suit in 2022. Without treaties, retirement income was taxed at the rates existing in the countries where it originated. Portugal's Finnish population peaked in 2018 at five times its 2013 level. Though some Finns left after the treaty was repealed, the number of retired Finns in Portugal stabilized by 2023 at about three times the pre-2013 level. The number of Swedes living in Portugal followed a similar trajectory before and after Sweden unilaterally suspended its tax treaty. The number of Finns and Swedes in Portugal remained permanently at higher levels even after the tax treaty repeal, with the stark initial increases not fully offset by later return migration. The researchers' findings suggest that such permanent changes in residence choices induced by temporary tax changes could justify aggressive tax policies designed to trigger a "big pull" of migrants from a certain demographic.

— Linda Gorman

The Impact of a Boston Desegregation Busing Program on Student Outcomes

The Metropolitan Council for Economic Opportunity (METCO) program in Boston is a voluntary program, for urban students and suburban school districts, that busses non-White students from Boston to wealthier, Whiter suburbs. In Busing to Opportunity? The Impacts of the METCO Voluntary School Desegregation Program on Urban Students of Color (NBER Working Paper 32864), Elizabeth Setren examines how participation in the METCO program affected students over the period 1991 through 2020.



Source: Researcher's calculations using data from the Massachusetts Department of Elementary and Secondary Education and the Metropolitan Council for Educational Opportunity, which transported students of color from Boston to wealthier and predominantly White suburbs.

Boston students who are bussed to suburban school districts through the METCO school desegregation program have stronger academic and labor market outcomes than similar students who apply to be bussed but are not selected.

METCO students attend schools where a much higher percentage of the students plan to go to a four-year college than in the Boston public school system. On average, Boston students who were offered seats in the METCO program by first grade attended high schools at which 81 percent of the students planned to attend 4-year colleges, 92 percent graduated from high school in four years, and 74 percent enrolled in a four-year college. For students who applied to the METCO program but were not admitted, the comparable statistics were 62 percent, 82 percent, and 55 percent. The student peer groups in suburban schools also differ on other dimensions: they are far less likely to be economically disadvantaged and less likely to have special needs or to have been suspended from school.

Setren finds that students who applied to the METCO program and were admitted were 13 percentage points more likely to graduate from high school on time, 22 percentage points more likely to enroll in a four-year college, and 16 percentage points more likely to graduate from a four-year college than their peers who applied to the program but were offered an opportunity to participate.

Parents could apply to the METCO program on behalf of their children at any time from birth through twelfth grade. Almost three quarters of applications were submitted for children who had not yet started first grade. The METCO program received requests from the suburban school districts for students in particular grade, racial, and gender subgroups. Since there were more applicants than available seats, METCO staff admitted students from the waitlist. The study considers only the children who applied before first grade — because the METCO program administrators would not have any information on the academic performance of these students. The METCO applicants who are selected for participation are broadly comparable to the applicants who are not — they have similar demographics, parents with similar levels of educational achievement, and come from similar neighborhoods.

Setren points out that there is selection bias in the group of Boston students who apply to the METCO program; this is why the comparisons focus only on applicants, and do not compare METCO students to all other Boston Public School (BPS) students. Only 20 percent of METCO applicants are Latino, compared to 42 percent of BPS students who did not apply. Immigrant families apply to METCO at only about one eighth the rate of non-immigrants. METCO students are more likely to have a mother with a bachelor's degree and less likely to be considered economically disadvantaged than the general BPS student population.

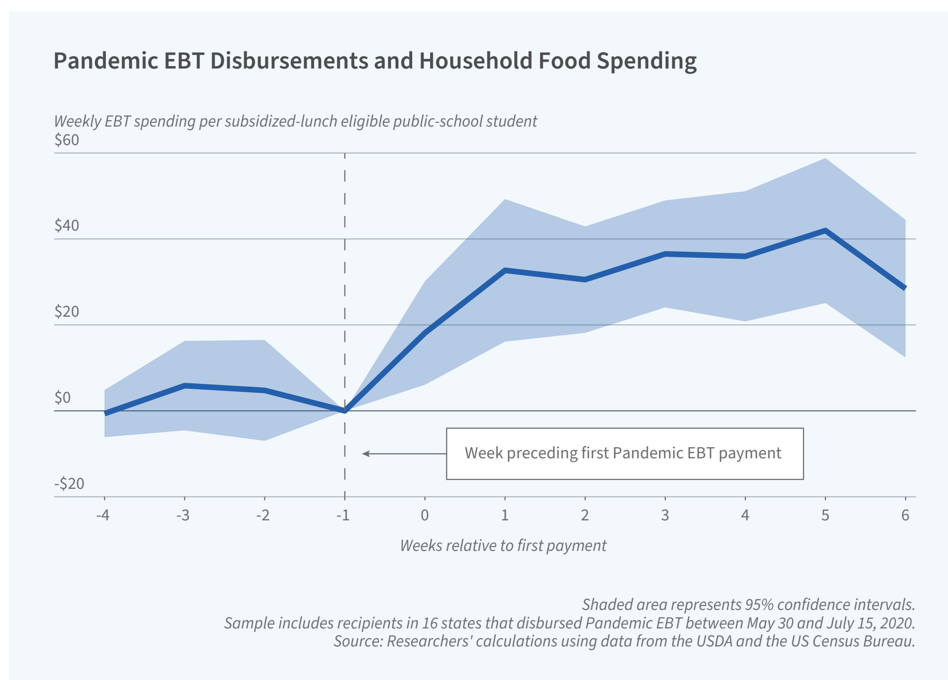
Being selected from the METCO waitlist had pronounced effects on student outcomes. METCO participants were more likely to enroll in four-year colleges than METCO applicants who were not selected to participate: 23 percentage points more likely for male students and 16 percentage points more likely for female students. The effects were larger for students whose parents did not have a bachelor's degree — 83 percent of the METCO students — than for those whose parents did. At age 35, on average, students who were selected to participate in the METCO program make $16,250 more than those applied for the program but were not selected from the waitlist. Increased earnings of METCO students are observed at earlier ages as well.

— Greta Gaffin

Food Assistance for Families During COVID-19

Unemployment can jeopardize the ability of households to purchase enough food. During the COVID-19 pandemic, when unemployment rose rapidly, 27 percent of households with children reported that they could not always afford enough food. In The Effects of Lump-Sum Food Benefits during the COVID-19 Pandemic on Spending, Hardship, and Health (NBER Working Paper 33199), Lauren L. Bauer, Krista J. Ruffini, and Diane Whitmore Schanzenbach examine the effects of a transfer program that provided vouchers for food purchases to American families with children during this period.

More than 20 million low-income children in the United States receive free or reduced-price breakfasts and lunches at school. Students qualify for free meals if their family income is less than 130 percent of the poverty line, if their household receives benefits under the Supplemental Nutrition Assistance Program (SNAP) or Temporary Assistance for Needy Families, or if they attend a school with a school-wide free meals program. During the COVID-19 pandemic, school closures meant that these children were no longer receiving such meals. In response, Congress authorized the Pandemic Electronic Benefits Transfer (P-EBT), a program that provided vouchers for food purchases to households that otherwise would have received free or reduced-price meals. The payments per student were calculated by multiplying the daily federal free breakfast and lunch reimbursement ($5.70 in the continental US) by the number of days schools were closed. States typically made one-time payments that averaged $311



Receipt of P-EBT payments during the pandemic reduced reported food insufficiency by 30 percent.

per child; these payments were added to the balances on EBT cards. The amount of these transfers was roughly twice the maximum monthly SNAP benefit per person for a family of three.

The researchers studied families that were income-eligible to participate in the SNAP program, many of whom still report food insecurity. They exploit the fact that different states implemented the P-EBT programs at different times to compare the spending of P-EBT recipients with that of other broadly similar households. In the six weeks after P-EBT payment were issued, on average per-student food spending increased by between $18 and $42. Families were also 30 percent less likely to report food hardship during this period, and the share of children reported to be in very low food security was cut in half. P-EBT receipt was also associated with an improvement in maternal mental health.

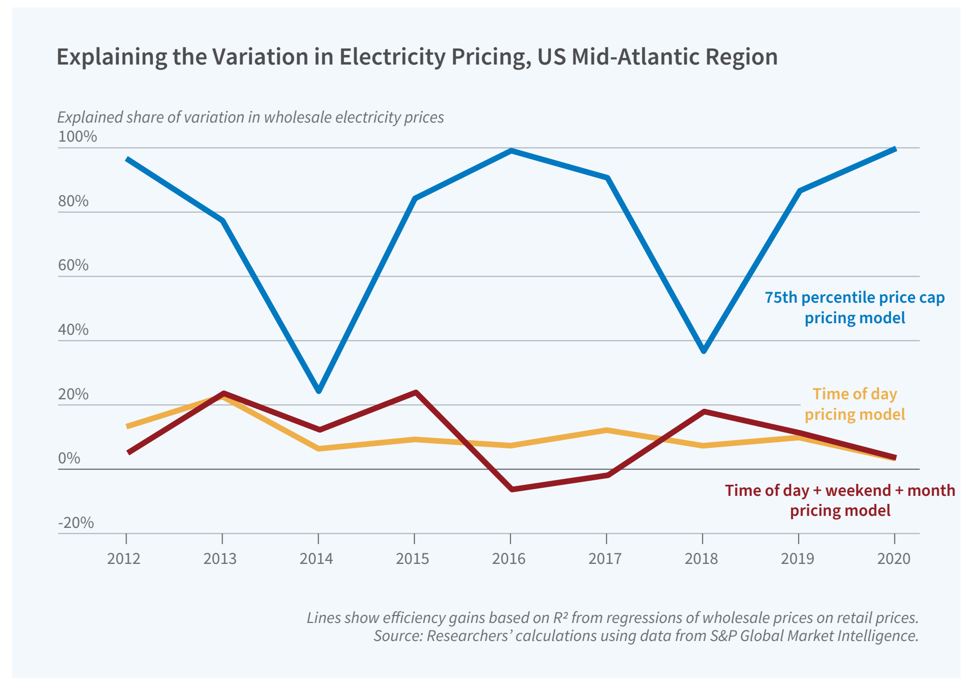
The data suggest that families did not use the full benefit immediately after disbursement but rather chose to increase spending over at least 6 weeks. The researchers found no improvement in households' perceived future financial security after P-EBT receipt. This may be because families did not think they would receive additional payments and therefore anticipated returning to food insecurity after the P-EBT had run out.

— Greta Gaffin

Comparing Retail Electricity Pricing Programs

Most retail electricity customers face constant electricity prices even though the hourly costs of electricity production vary substantially. In The Efficiency of Dynamic Electricity Prices (NBER Working Paper 32995), Andrew J. Hinchberger, Mark R. Jacobsen, Christopher R. Knittel, James M. Sallee, and Arthur A. van Benthem examine how closely the retail charges associated with time-of-use rate plans, critical-peak pricing plans, and real-time retail pricing with price ceilings match wholesale electricity prices, which vary at high frequency and reflect volatile production costs.

Two of the most common variable retail pricing structures are time-of-use (TOU) and critical peak pricing (CPP). TOU prices specify rates based on the time of day, day of the week, or season, and are calibrated using historical data. CPP rates add a cost premium during time periods called "events," when the grid is expected to be near capacity. Although events are announced only hours in advance, the rates that apply when an event is in progress are often held constant for years.



Time-of-use and critical-peak electricity pricing models are jointly 20 percent better than flat-rate pricing at matching the variation in wholesale electricity prices, but fall far short of real-time pricing with price ceilings.

To construct a time series on wholesale electricity prices, the researchers use data on real-time and day-ahead locational marginal prices from the hourly auctions in the seven US wholesale electricity markets from 2000 through 2020. They use these data to fit alternative rate schedules onto historical wholesale prices using standard regression tools, accounting for out-of-sample fit and the fact that alternative policies change equilibrium wholesale-market prices.

The researchers consider several simulated TOU price schedules for each year using data from the three previous years. These schedules layer on three different types of price variation: peak hours of the day, peak hours and whether it is the weekend, and peak hours and whether it is the weekend and which month it is, respectively. To compare the retail price from each schedule with the wholesale price, they use three years of historical data and calculate the average wholesale price within each period. They define peak periods for wholesale prices as those time periods with the highest expected prices, and they use their estimates of average wholesale prices in each period to calibrate the TOU prices for the next year.

TOU pricing schedules calibrated from the previous three years of data are poor predictors of wholesale prices in the next year. They explain only about 10 percent more of the variation in wholesale prices than a flat-rate electricity pricing schedule. However, even a 10 percent efficiency gain generates about $200 million per year in efficiency gains, which may pass a cost-benefit test. A similar approach to calibrating CPP price schedules, using contemporary day-ahead prices to call events and the three previous years of data to calibrate event prices also has only modest success in tracking wholesale prices. Even when utilities can call events in real time, the pricing algorithm only explains about 10 percent of the wholesale price variation. TOU and CPP pricing together yields a 16–20 percent efficiency gain on average.

In contrast to the TOU and CPP algorithms, real-time price variation with price caps allows the retail price to track the wholesale prices very well. Even when the price cap is set modestly, at the 75th percentile of the price distribution, the retail price tracks most of the movement in wholesale prices and achieves a much larger efficiency gain than any of the TOU schedules studied. Automation may relieve an otherwise larger burden on consumers' ability to follow a complex and irregular price schedule.

— Whitney Zhang

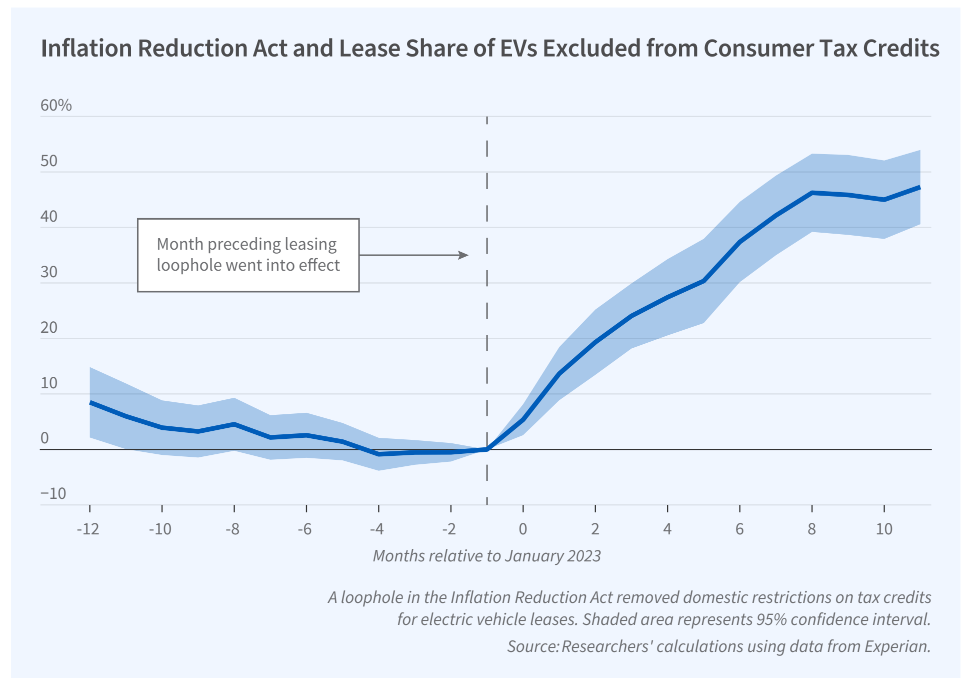
The Inflation Reduction Act and the Electric Vehicle Market

The Inflation Reduction Act (IRA) relied heavily on electric vehicle (EV) subsidies to advance its goal of decarbonizing the US transportation sector. In The Effects of "Buy American": Electric Vehicles and the Inflation Reduction Act (NBER Working Paper 33032), Hunt Allcott, Reigner Kane, Maximilian S. Maydanchik, Joseph S. Shapiro, and Felix Tintelnot find that the net social benefits of these subsidies were moderate compared with their costs.

The researchers estimate that the EV incentive program generated $1.87 of US benefits per dollar spent in 2023 when they compare this program with the pre-IRA structure of incentives, but only $1.02 when compared with a no-subsidy baseline. They calculate the benefits by estimating CO_2 and local air pollution emissions from manufacturing and driving various electronic and gasoline-powered cars, the number of fatal accidents associated with driving, and the fiscal externalities from explicit or implicit taxes on gasoline and electricity.

The benefits would have been larger if the IRA had not allowed tax breaks to US companies that lease EVs, even those that do not meet the domestic-content requirements. This drove down the cost of leasing an EV relative to owning one. Leasing surged, especially for foreign models that no longer qualified for purchase subsidies. The share of leased EVs jumped from 15 to 30 percent between December 2022 and December 2023.

The market and welfare effects of replacing the EV incentive program are complex. The researchers estimate that if the US scrapped the IRA credits and offered no subsidies for EV purchases, the number of new EV registrations would fall by 27 percent. Reverting to the pre-IRA subsidy regime would reduce registrations by only 8 percent, and a much higher share of new EVs would be produced abroad. Because the researchers assign benefits to domestic vehicle production, the IRA's incentive structure generates larger benefits. Their analysis suggests that many of those who leased foreign EVs to claim IRA incentives would have either bought a domestic EV or an unsubsidized foreign EV instead if the leasing option had not been allowed.



A loophole in the Inflation Reduction Act removed domestic restrictions on tax credits for electric vehicle leases. Shaded area represents 95% confidence interval.

Source: Researchers' calculations using data from Experian.

A leasing provision in the IRA that allowed foreign-made EVs to qualify for a tax subsidy resulted in a sharp increase in EV leasing but reduced the bill's benefits relative to its cost.

The total government cost of encouraging one additional EV purchase is between $23,000 and $32,000, even though the buyer receives only $7,500.

The researchers indicate that the most cost-effective policy would be a tax on all vehicles, including gasoline-powered ones, because they generate externalities, including harmful emissions and fatal accidents. But if gasoline-powered vehicles cannot be taxed, subsidies to EVs can provide incentives for a shift away from gasoline-powered cars, which have substantial negative externalities.

The researchers estimate that, ignoring the distortionary costs of raising revenue to pay for the subsidies, the optimal one-size-fits-all EV subsidy would be $6,355 — not far from the current $7,500 credit. If the costs of taxation were included, the optimal subsidy would be much lower.

Vehicle-specific subsidies would allow a higher ratio of benefits to costs. The net social benefits of a small EV, for example, are estimated to be greater than those for heavier models. Subsidizing more efficient EVs more than less efficient ones could increase the net benefits from the EV subsidy policy by as much as $2.5 billion annually.

— *Laurent Belsie*

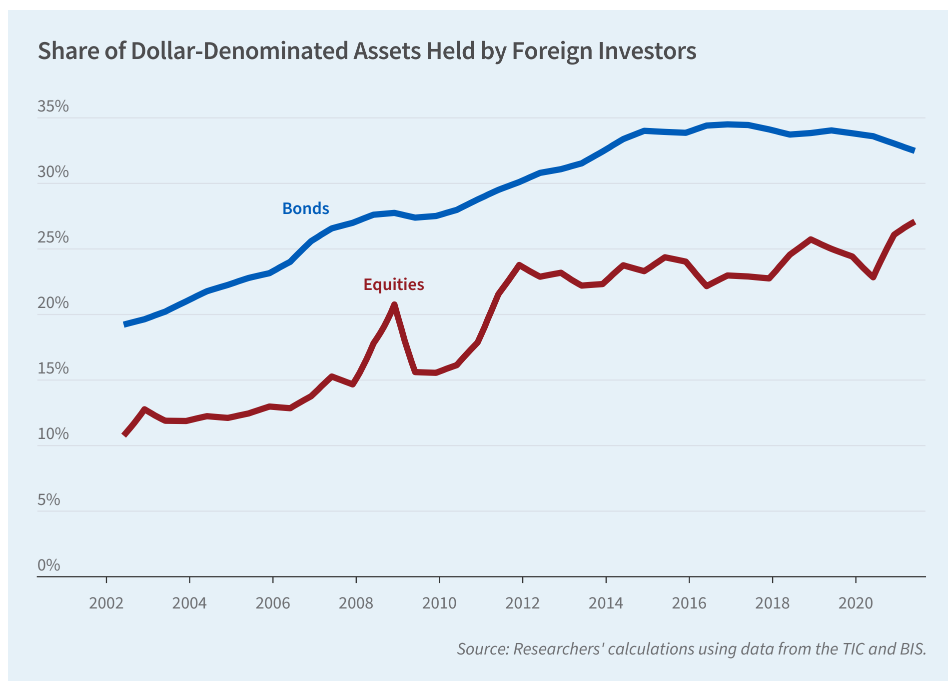
International Holdings and Hedging of USD-Denominated Assets

Foreign investors' demand for US dollar (USD) denominated securities and their currency hedging activities are important for analyzing international capital flows, exchange rates, and the dollar's global dominance. In Dollar Asset Holdings and Hedging around the Globe (NBER Working Paper 32453), Wenxin Du and Amy W. Huber combine information from a range of disparate data sources — industry filings, company reports, and national statistics from many nations — to provide new insights on these issues. They study seven groups of foreign institutional investors: insurance companies, pension funds, mutual funds, banks, hedge funds, nonfinancial corporations, and official institutions like central banks.

The researchers document a sixfold increase in nominal foreign holdings of USD-denominated securities, from $5.5 trillion in 2002 to $33.4 trillion in 2021. This growth reflects foreign investors shifting their portfolios toward USD assets relative to those denominated in domestic and other foreign currencies, not just an increase in the value of foreigners' total portfolio holdings.

They also find an increase, particularly after the 2007–09 financial crisis, in the degree to which foreign mutual funds, insurance companies, and pension funds hedge their foreign exchange (FX) exposure to the dollar. The "hedge ratio," the share of dollar asset exposure that foreign investors hedge, rose by around 15 percentage points despite an increase in hedging costs as a result of pricing dislocations in currency markets.

Although there is notable cross-country variation, collective FX hedging demand from insurance companies, pension funds, and mutual funds exceeded $2 trillion in 2019. The global banking sector supplied only around $333 billion in net USD FX hedging in that year, underscoring the role of nonbank financial institutions in facilitating the transfer of currency risk exposures.



Foreign investors have tilted their portfolios toward dollar-denominated assets over the last two decades.

The researchers compare the observed degree of currency hedging with the predictions of a standard model of hedging demand by an investor who divides her portfolio between a local risk-free asset and a riskier USD-denominated asset with the objective of maximizing expected returns subject to a given level of risk. Assuming that the expected return on dollar-denominated assets has risen over time, this framework can account for the time series pattern of rising USD asset ownership. It is not very successful, however, in explaining the cross-country variation in the degree of dollar exposure hedging.

The researchers note that varying liquidity needs across currencies, which are driven by interest rate differentials, may influence FX hedging practices to a greater extent than the analysis of risk-return trade-offs predicts. In particular, they document a negative relationship between currency-specific FX hedging demand and pricing dislocations in FX derivatives markets, which they attribute to constrained financial intermediaries facing balance sheet segmentation.

— Emma Salomon

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